
Consumers' Acceptance of the Principles of a Circular Economy

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Izabela Ostrowska¹, Halyna Krul²

Abstract:

Purpose: The aim of the article is to show the readiness of consumers for the exit of the circular economy and to identify consumer motivations and concerns related to this topic.

Design/Methodology/Approach: The study was based on group interviews with three age segments to gain in-depth insights into consumer attitudes towards the circular economy.

Findings: The results suggest that individual consumer motivations and habits play a key role in its implementation. The waste hierarchy (prevention, preparation for reuse, recycling) indicates the importance of informed consumer choice, which can contribute to extending the life of products and their responsible disposal.

Practical Implications: Current excessive consumerism is leading to environmental degradation, prompting the need to move towards a circular economy in which raw materials, products and waste are effectively managed to minimise their impact on the environment.

Originality/Value: The article cites a literature review that describes the circular economy as a response to the challenges of resource depletion and ecological degradation. The shift from a linear to a circular model promotes the idea of producing resilient products that are repairable, renewable and recyclable.

Keywords: Circular economy, consumer motivations, consumer behaviour.

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¹Corresponding author, Institute of Spatial Management and Socio-Economic Geography, Faculty of Economics, Finance and Management, University of Szczecin, Poland, ORCID: 0000-0001-5746-2749, e-mail: izabela.ostrowska@usz.edu.pl;

²Yuriy Fedkovych Chernivtsi National University, Ukraine, ORCID: 0000-0001-9760-5468

1. Introduction

If the entire world's population consumed at a similar level as high-income countries, it would consume almost four times more natural resources than are available on Earth. This means that there is currently an overconsumption of resources, which has a negative impact on the ecological balance and sustainability of the planet (WWF, 2016). Empirical data shows that economic growth is linked to an increase in material consumption.

The vast majority of raw materials entering the economy are primary, and the share of secondary materials is even declining: from 9.1% in 2018 to 7.2% in 2023. Meanwhile, the total amount of materials consumed by the global economy is steadily increasing: in the last six years alone, more than half a trillion tons of materials have been consumed, almost the same amount as in the entire 20th century (CEF, 2024).

Faced with the growing challenges of continuous population growth, depletion of natural resources and the problem of waste management, the introduction of a circular economy has become a major area of research. The idea of a closed (circular) economy is an alternative to the linear economy, which is based on the idea that products are produced, used and, when unnecessary, discarded.

The circular economy refers to an economic system in which raw materials, products and waste are rationally managed to minimise waste and protect the environment (Kirchherr, Reike, and Hekkert, 2017). The determinants of consumer behaviour are a key element influencing the implementation of a circular economy. Understanding these determinants is crucial for developing strategies to promote sustainability and protect the environment.

The research method used in the in-house study: focus group interviews, the so-called focus group interview (FGI). Three different market segments were investigated - young people up to 30 years old, adults 31-59 years old, older people 60 years old and above. Selecting participants by age allows for a better understanding within each group, due to similar interests and life situations.

The three interviews also allow comparisons to be made between the groups studied, in order to find commonalities (motives, attitudes, problems), as well as to identify differentiating factors. Interviews allow for more issues to be discussed and considerable depth compared to quantitative research. The survey consists of a free discussion guided by moderators according to a pre-described scenario containing problem questions to be addressed during the meeting.

The aim of the article is to show the readiness of consumers for the exit of the circular economy and to identify consumer motivations and concerns related to this topic.

2. Literature Review

CE is considered the best way to promote economic growth in the face of pressing contemporary issues of environmental degradation and resource depletion (Heshmati, 2015; Kirchherr, Reike and Hekkert, 2017). CE aims to replace the traditional linear economy model of fast and cheap production and cheap storage with the production of durable goods that can be repaired or easily dismantled and recycled. The closed-loop model promotes the repair, renewal and reuse of products, i.e., extending their life cycle (Sauvé, Bernard, and Sloan, 2016).

Many authors emphasize that CE has emerged as a result of regulations (primarily in China) than an actual concept developed in the scientific community (Murray, Skene, and Haynes, 2017; Pondel and Bludnik, 2018). The implementation and refinement of the CE concept on a wider scale began only at the beginning of the 21st century, first in Asia (i.e., China, Japan), then appeared in EU legislation (European Commission, 2014; European Commission, 2015), and then many EU member states began to implement it (Kulczycka, 2019; Kotlinska and Zhukowska, 2023).

The country where the idea is developing most dynamically in the world and on the largest scale is China. This is because it was introduced in 2009 through a top-down policy as a national development strategy (Yong, 2007). It seems that completely different practices regarding CE solutions are in countries such as Japan and the US.

In these countries, the CE concept is treated as a tool for designing bottom-up environmental and waste management policies (Ghisellini, Cialani, and Ulgiati, 2016). The transformation to a closed-loop economy is one of the main goals of the European Green Deal 6, which is expected to lead to the ecological transformation of Europe (European Green Deal 7, 2024).

Non-EU countries are also introducing the principles of the circular economy. One example is Ukraine, where despite the ongoing war, recycling principles are still being implemented. The development of waste management in Ukraine is described by Khomenko et al. (Khomenko, Babachenko, and Padii, 2017), efficiency and effectiveness and analyses of the problem of recycling and disposal of domestic and industrial waste in Ukraine are presented by Ivanova and Muratova (2015) and Chuprina and Fedorova (2017), and an overview of current waste management approaches and recycling methods by Doskich (2016).

The circular economy assumes that raw materials should be used for as long as possible. Reuse remains the form of recovery that is most desirable and that all waste holders are obliged to pursue. Waste generated is the result of manufacturing, consumption of products or implementation of service processes (min. commerce, construction, tourism), but through ongoing recycling can be reintegrated into productive activities (Bongers and Casas, 2022).

The hierarchy of waste handling includes in turn (as per Directive 2008/98/EC, 2008), waste prevention, preparation for reuse, recycling, other recovery processes, disposal. It is clear from this hierarchy how significant a role the consumer plays in the circular economy - his consumption choices make it possible for products to be used longer in the household and later passed on to the next user or disposed of in a responsible manner. It is the motives, attitudes and habits of individual consumers that determine how long products will be used and whether the raw materials used to produce them go to waste.

At the operational level, the closed-loop economy is based on the 3R concept (D'Amato *et al.*, 2017), as well as its expanding modifications, such as 5R, 8R and now 10R. The individual R's form refuse, rethink, reduce, redesign, reuse, repair, refurbish, remanufacture, recycle, recover (Potting *et al.*, 2018).

The motive behind these concepts is to increase the share of secondary raw materials used in production and reduce the use of energy and natural resources (Kwiecień, 2018; Brząkała 2023). Consumer behavior in disposing of unnecessary products can also be related to the sharing economy, which increases resource efficiency in the economy.

3. Research Methodology

In order to verify the research hypotheses, 3 desktop focus group interviews (FGI) were conducted in the focus studio of the research agency in Warsaw. The interviews were conducted on 20-21.03.2024 and the duration of each interview was up to 2h. The research was conducted by two moderators (including the author of this article) with 8 respondents each time. Thanks to the synergy created at the group interviews, an attempt was made to obtain diverse and in-depth opinions.

An interaction analysis was included, which, in addition to presenting how individual respondents reacted to the communicated content, allowed the influence of the group on the perception of individual respondents to be tracked. The stationary groups provided a better opportunity to observe the non-verbal behaviour of the respondents and the interview dynamics and group interaction itself is at a higher level than with online-only group interviews or during individual interviews.

The study used purposive sampling, a type of non-random, non-representative selection of study participants. Individuals were selected on the basis of criteria that were identified at the survey design stage (Frankfort-Nachmias, Nachmias).

The main criterion for division was the age of the subjects, which determined the allocation to a particular group. The target group was differentiated by education level, income, gender and interests. In each study group, 1 or 2 people declared an interest in ecology.

Group 1: young people up to 30 years old, 8 participants/2 reservists
Group 2: adults 31-59 years, 8 participants/2 reservists
Group 3: older people 60 and over, 8 participants/2 reserve persons
Total: 24 participants and 6 reserves.

4. Research Results and Discussion

4.1 The Approach to Reducing Consumption

The first important issue in the introduction of a circular economy is the implementation of the postulate on consumption reduction. In the survey conducted, respondents were asked whether they buy new products despite having working counterparts in the household. The question referred to actual consumer behaviour, without introducing the context of environmental protection or environmental problems.

GROUP Young (up to 30 years of age):

In the Young group, exchange for better products most often refers to clothes, shoes, small electronics. It happens that the purchasing process is treated unreflectively, and in the case of the clothing category, previously used clothes remain at home, are put up for sale on OLX or Vinted-type websites, and if no buyers are found, they may be passed on to family members or, as a last resort, to organisations supporting the needy (e.g., Caritas). According to the statements of young respondents, they sometimes do not pay much attention when it comes to purchasing products such as, for example, home decorations (unnecessary, previously owned items are thrown away).

GROUP Adults (31-59 years of age):

The motivation of Adults to buy new products, despite having working counterparts, is most often the need to have up-to-date versions of devices in the context of technological changes, to 'keep up and be on trend'. - categories cited were computers, phones, cycling equipment. Most respondents, in this context, declare buying new clothes and shoes. In the category of clothes, children's clothes were also highlighted as the ones that are bought and mentioned most often. Unnecessary ones are often sold on ad portals or passed on to other people (family members, friends). One of the threads spontaneously raised was 'circular boutiques. A category of equipment that is often 'passed on' is mobile phones.

GROUP Elderly (60+):

Product substitution, in the case of the older group of respondents (60+), refers to situations where they perceive the equipment they are currently using to be obsolete (example of a Hoover) and the change will make the new equipment more energy efficient. The elderly also consider such changes when there are problems with the functioning of the appliance that significantly limit the comfort of use. Exchanged, previously used products are passed on to family members (example of a bicycle

given to a daughter) or to social organisations, people in need (hoover given to an orphanage). An additional motivation to speed up the exchange process can be finding a product at a promotional price. Some promotions are perceived as very attractive (*'big discounts that are hard to resist'*), encouraging purchase. At the same time, older respondents declare a sense of fatigue with excessive promotional activities and communication. Special events, occasions (e.g. a family celebration in the case of clothes, sporting events - a TV) can also be a motivation to buy and replace a product: *'I have a 30-inch one and I want a 60-inch one and I'm going to buy one because, after all, there's going to be the European Championships'*.

Differences and Similarities:

In the older group, the purchase motivation related to a very attractive price reduction (clothes) was most evident, while at the same time situations of rational purchase resulting from the feeling that the appliance (white goods) was already obsolete were indicated. In the group of Young People and Adults, an inherent part of the process of getting rid of unnecessary products is an attempt to sell them via websites such as OLX or Vinted, to give them to the family (children's clothes) or to the needy.

In the case of adults, the need for replacement is further motivated by product novelties and related technological and hardware updates. Spontaneous references to environmental issues, such as limiting purchases due to the waste of raw materials or the negative impact of their production on the environment, did not appear in any of the groups.

Younger respondents in particular declare that the items they own make them feel better and influence their image. From the point of view of the circular economy, the sense of responsibility and the willingness to manage an unnecessary object is a positive phenomenon, noticeable in all surveyed age groups. In this context, both unpaid donation and resale are beneficial solutions. Unfortunately, respondents declare that some items that are cheap or that they do not know what to do with end up in the waste bins.

4.2 The Importance of Environmental Issues

The main motive for introducing the circular economy is the desire to protect the environment. For this reason, respondents were asked how important environmental protection is to them.

GROUP Young (up to 30 years of age):

The noticeable and perceptible environmental problems mentioned by the young respondents were increasingly high temperatures, air pollution and drying up of rivers. Concerns were also indicated about the consequences and effects in the future, as well as the financial dimension of the pro-environmental regulations introduced, which are already and will increasingly be felt by citizens. The

importance of action at the local level was emphasised, as well as an awareness of global neglect and lack of environmental regulation on the part of major countries. There were also voices of dissatisfaction related to the fact that as a society we bear the financial costs (price increases) resulting from environmental protection measures.

GROUP Adults (31-59 years):

Visible and noticeable environmental problems mentioned by adults are air pollution, smog, littered areas (example forests) and electro-waste discarded in many, often random places. The main reasons why environmental issues are important to those in the adult group are the longer term and thinking about the future, as well as caring in terms of the present: *'This is for our children, grandchildren and so on and so forth. It's for everyone to be aware that in 100 years' time someone will be walking on these beaches, forests, mountains (...) but also for pleasure: how clean it is, how cool it is, how there's not this rubbish everywhere in this forest'*

GROUP Elderly (60+):

In the older group, respondents pointed out the gap between declarations, slogans related to environmental protection and actual, everyday action: *'The theory is beautiful, all the slogans are beautiful, only the practice is not'*. In this context, examples were pointed out of Western countries in which the public manifests far more care-related behaviour, e.g. cleaning up litter in public places, leisure zones.

Differences and Similarities:

The statements of all three groups indicate the great importance of environmental issues, mainly in terms of the present and the future of the planet and its future inhabitants. Young people, in particular, additionally drew attention to the negative financial consequences associated with the deterioration of the environment, as well as those resulting from corrective measures taken in this area. Young also highlighted the issue of the scale of neglect in the context of environmental protection of major countries at a global level.

4.3 Consciously Limiting Purchases of Certain Products for Environmental Reasons

It can be inferred from those presented that the representatives of all the groups surveyed are aware of the problems associated with climate change and environmental pollution. However, it is worth looking at whether this awareness influences the purchasing behaviour of the respondents.

GROUP Young (up to 30 years old):

In addition to examples of practical ecological behaviour when shopping, such as carrying one's own bags, there were also voices indicating explicitly that ecology is often not taken into account and does not play a significant role as a factor

influencing decisions. The topic of manufacturers, who the young respondents believe should be responsible for the packaging of manufactured products, was also raised. The example of the toothpaste category was given, which, through top-down regulation, could only be available without additional cardboard packaging.

GROUP Adults (31-59 years old):

Water in plastic bottles was identified as a category of products about which reducing purchases has a real impact on the environment - here filter bottles and home filters were identified as an effective substitute. Clothes are also an example of a category that is limited in terms of purchases - some people declare that they try to buy less of them and do not react to fads. At the same time, some of the people surveyed from this group openly admit that they show little activity in matters of environmental behaviour: *'I guess I'm the one who has to admit that no, that I haven't consciously matured in this respect yet'*.

GROUP Elderly (60+):

Motivations for limiting purchases of specific product categories among older respondents are mainly financial and environmental in nature.

Differences and Similarities:

Representatives of the Older and Younger groups clearly emphasised the problem of excessive, often unnecessary packaging of purchased products, thus drawing attention to the role of producers, who should be restricted in this area by top-down regulations. Among Younger and Adults, attitudes also emerged indicating little interest in limiting purchases for environmental reasons.

4.4 Assessment of the Current Waste Recycling System

Recycling is an important issue in the practical implementation of the circular economy. Here, consumers and their household behaviour play a major role. Their behaviour determines the quantity and quality of raw materials collected.

GROUP Young people (up to 30 years old):

According to the young, there has been a noticeable improvement in recycling, given, among other things, that the topic has become commonplace. At the same time, it was pointed out that not everyone follows the rules of recycling or simply does not separate rubbish at all: *'(...) It was very puzzling to me why so many people nevertheless - and I live on quite a large block of flats - do not separate this waste'* and other opinion: *'I try to. But I think it's still a bit too little controlled. So it works out differently (...) because it's a bit more convenient for me to throw everything in one'*

Young people complain that recycling is a thankless, cumbersome job and that there is often not enough space in the house for additional recycling bins. This is a problem especially in small flats. There is still not recycling in all places on the

estates, the recycling bins are far from the houses. Respondents suggested that the effectiveness of recycling could be improved by the introduction of control rules, as well as by paying more attention, in terms of compliance with the segregation rules, to places other than just housing estates, which are potential sources of large amounts of different types of waste (e.g., construction projects).

GROUP Adults (31-59 years):

On the one hand, the opinions of Adults surveyed indicate an improvement in awareness and behaviour related to waste segregation in Poland, on the other hand, there is still room for improvement. In addition, suggested educational activities at school level. Some packaging causes problems in terms of segregation (example of 'two-component' packaging). The functioning of segregation within the bins for the basic groups of rubbish on the estates (paper, plastic, glass) was well appreciated. Attention was also drawn to the good availability of bins for electro-waste (small white goods, e.g. cables, kettles) in selected neighbourhoods.

A problem, however, is the access to containers and places where one can dispose of used light bulbs and batteries. Respondents also found it problematic to separate waste in their households due to limited space: *'If someone at the stage of designing their kitchen did not think out that they would have various separate bins, containers and a much wider cabinet in connection with this, and they also have large families - the problem is simply the space for this segregation at home.'*

Respondents are open to a glass packaging system (an example of the rules in place in Germany), as well as the possibility of buying products using their own packaging: *'For example, also a cool idea would be, in Italy I lived a little bit. And there we just fill ourselves - milk, water, everything (...) the most popular ones are probably soaps.'*

GROUP Elderly (60+):

The main objections related to the current recycling system in the Elderly group are:
- Lack of adequate, sufficient bins in relation to needs, sometimes overflowing as a result.

- The inconvenience of home segregation, with a lack of persistence and motivation to stick to the recycling rules and to educate themselves continuously in this area .

- Limited knowledge and awareness of recycling rules (for more complex packaging, or with different degrees of soiling). There are also negative emotions related to the feeling that some packaging is difficult to separate (despite the desire and motivation): *'And it annoys me, for example, that I have to think about what to do with the foil packaging that has a paper sticker on it and that I can't tear off. Paper, foil, mixed together, what? Shouldn't it be the manufacturer who is charged with this and not me? And it's examples like this that get me off balance.'*

- Concerns about the final destination of the contents of the recycling bins.

- Doubts about the disposal of waste from electronic devices: *'I know what happens to it, it lands in a container, and the container lands in the desert. These devices,*

well yes, batteries, for example, lithium batteries are not recyclable. That is, these batteries from watches, from phones and so on, they are, nothing can be done with them.'

- Unpleasant odor from bio waste garbage cans. This is an acute problem especially during the summer.

- Doubts about washing packaging as part of the segregation procedure: *"I, for one, have such a problem with this segregation that I really like to save water,"* or *"(...) packaging from some, or candy, or porridge, it is only when it is clean to plastics, and if it's already dirty, I don't wash it and throw it into the mixed"*.

- Attention was drawn to the lack of recycling compliance in local communities (neighbors, roommates).

Differences and Similarities:

The main recycling problems indicated in all three groups are very down-to-earth and pragmatic in nature - first, there is insufficient space in the household for storing trash for recycling (even at the stage before it is taken to outside bins). Second - the problem of "multicomponent" packaging and doubts about which bins it should go into.

In addition, in all groups there were voices that many people in their neighborhoods do not segregate waste, because it is more convenient for them to throw everything into mixed waste. In the youth group, it was suggested that additional control rules be introduced to, among other things, motivate those who do not follow the recycling rules.

4.5. Knowledge of the Circular Economy Issue

The survey also asked about familiarity with the concept of the circular economy, with the aim of examining the level of knowledge on the subject, but also the emotions that accompany the issue.

GROUP Young (up to 30 years old):

Moderate familiarity with and understanding of the definition itself among the young, although at the same time there was support for the idea itself and the principles of operation - primarily with regard to designing and producing durable things that can be used for a long time: *'To me it definitely connotes, when it comes to things, things of good quality. And it's like this, that ... I, for example, am in favor of buying less and better things that will last me longer.'*

They call for procedures for production that fit into the circular economy to be top-down imposed on companies through appropriate legislation. Because they currently observe the practice that companies are paid to produce less durable items so that consumers have to replace equipment faster. On the other hand, there have been concerns that the production of durable products may involve a higher purchase cost on the part of consumers.

GROUP Adults (31-59 years old):

The topic of the circular economy received a positive response, it was not an unfamiliar issue to the adult group, and companies that are already implementing this way of working were also pointed out: *'You can still make something, for example, out of something that is no longer needed (...) it's even on various products that it was recovered, for example, recycled in segregation (...) from bottle recycling or something there. Information that this backpack is made from 15 bottles.'* At the same time, this issue is of little concern to some, and there were concerns about whether products made in this way would be harmful to health: *'For example, won't such a backpack or a T-shirt recycled this way contain some toxic ingredients that will, for example, damage my health?'* Attention was drawn to the fact that this is a common topic (consumers, producers), and the need for a functioning institution to oversee this area.

GROUP Elderly (60+):

Associations in the elderly group related to the concept of the circular economy concerned the reuse of materials from items that are no longer used in production several times (the example of car production was cited, as well as items of everyday use such as clothes hangers, garbage pails). An issue associated with "difficult topics," a complex problem that requires a lot of money and advanced knowledge, and about which decisions should be made in a top-down manner: *'Someone should be globally responsible for this, and we could just fall under it, join in, and have the satisfaction of having made such a small contribution to it.'*

This type of solution may meet with interest, assuming that citizens are provided with tools (e.g. dedicated places, containers), and transparent communication is carried out to build awareness of how donated used items will be reused in this way: *'If there were conditions created where we could give it away and with this feeling that someone made something out of it, used it, that we didn't throw it in the trash, we would also have a much better feeling'*. And other opinion: *'(...) Surely a mass of people would be happy to use it, giving it away and knowing that it will be used, and not as you probably said here, that it goes into one dumpster in general anyway.'*

At the same time, people in this group expressed their dissatisfaction with the disconnect between the commitment at the micro level (citizens segregating garbage) and the macro level - the state contributing significantly to environmental degradation (China is an example): *'(...) Why should I drink from a paper straw, when in China they don't care about ecology at all. Over there, they have the biggest such harmful impact on the world.'*

Differences and Similarities:

The concept and principles of the circular economy were familiar to all three groups, and there was also agreement that the area should be regulated and controlled in a top-down manner at the municipal or state level. An additional theme that emerged in the Young group was, first, the question of the durability of the items produced

(as a principle inherent in the circular economy), as well as concerns about the potential increase in the purchase price of products produced in this way. Adults also pointed to concerns about the impact of “circulating products” on the health of their owners.

5. Conclusions, Proposals, Recommendations

The closed-loop economy, which has been promoted for several years, is based on the assumption of prosperity, which is achieved while respecting the environment and the needs of future generations. For this reason, the decoupling of economic growth from consumed non-renewable resources is assumed.

The global economy is in transition to a closed-loop economy. One of the primary challenges is to target resource efficiency in the broadest sense. In this context, an area that is relatively underutilized is the extraction of raw materials from municipal waste (Ciechelska, 2017).

Consumers play a significant role in the transition to a circular economy. Products are used and consumed by people and reported demand influences what is produced in the world. To achieve emission reductions through circular economy principles, consumption must be reduced and directed toward more sustainable, higher quality and longer-lasting products.

According to the rational choice theory of G. Gigerenzer and D. Goldstein (2002), the rationality of decisions depends on the structures present in the environment. People are ecologically rational, using limited information processing capacities, applying simple and intelligent algorithms that allow them to achieve their goals. The circular strategies available to consumers are mainly related to the first six of the ten R's: refuse, rethink, reduce, reuse, repair, renew. The main outcomes are reducing consumption by using fewer things or using goods more intensively (refuse, rethink, reduce) or reducing consumption by using products longer (reuse, repair, refurbish).

Due to the research method used - in-depth group interviews, or qualitative research the results obtained cannot be generalized to the entire population. However, the considerations presented are in-depth in nature, so that attitudes and deeper motivations of participants can be observed, which quantitative research will not reveal. Analysis of the in-depth group interviews conducted indicates a growing environmental awareness among consumers, although this is dominated primarily by pragmatic and financial aspects.

The value of environmental protection is widely appreciated, but consumer motivations are still strongly linked to economic benefits, and the issue of ecology plays a secondary role. Also important is the approach to responsibility for owned

items - there is a tendency to pass them on to others or resell them, which is in line with the principles of the circular economy.

On the one hand, younger groups express concern about the future costs of environmental remediation and the negative consequences of major countries' negligence. On the other hand, however, there is a lack of spontaneous reference to more complex environmental measures, such as reducing consumption due to the environmental impact of production or avoiding waste.

The main problems associated with recycling are very pragmatic, lack of storage space and the difficulty of segregating complex packaging. At the same time, all groups agree that circular economy issues should be top-down regulated, as well as controlled by relevant institutions. This approach indicates an openness to adopting new rules, but on condition that they are supported by systemic and infrastructural measures.

Further research could identify specific areas of knowledge that need to be developed for consumers to see the connection between their purchasing decisions and environmental impact. It may be important to explore how consumers respond to the potential higher costs associated with sustainable, more sustainable products. This type of research can provide information about needed actions to justify the higher price of products produced according to circular economy principles.

Future research should also focus on the practical barriers to recycling (e.g., household segregation problems) to develop more friendly and efficient systems. Analysing specific difficulties, such as with the segregation of multicomponent packaging, can provide valuable insights for designing better solutions.

The transition from the traditional linear economy to a circular economy will certainly affect all sectors of the economy (industry, trade, agriculture, tourism). However, the implementation of a circular economy allows for benefits in the form of increased business efficiency (less waste of resources), benefits for society (redistribution of products, more durable products) and benefits for the environment (less use of resources, less waste, less CO₂ emissions). This benefits the region's economy in the social, environmental and economic areas, providing better ways to use resources and eliminate environmental pollution.

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