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The Barriers Related to the Implementation of the Circular Economy in Poland

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Abstract

Aim: The main goal of the research was to identify barriers that arise on the path to implementing a circular economy in Poland and to propose solutions to reduce these barriers.

Methodology: The research was conducted based on a critical analysis of the literature on the subject and survey research among companies engaged in environmental/waste-related activities, as well as among households.

Results: The research results indicated that there is a completely different approach among companies and households regarding the barriers to implementing a circular economy.

Implications and recommendations: A practical aspect of the discussed issues is the possibility of utilising the research results by the Ministry of Climate and Environment to shape policies in line with the European Green Deal. In order to overcome these barriers, institutional support is essential, both in financial, technological, legal, and educational aspects.

Originality/value: Filling a research gap in the literature regarding the identification of barriers arising on the path to implementing a circular economy based on the example of Poland.

Keywords: circular economy, barriers, Poland

1. Introduction

The implementation of a circular economy model is a multifaceted endeavour that demands time, innovation, and financial investment. Current research indicates that the global economy achieves a circularity rate of only 7.2%, representing a decline from previous years (2018 – 9.1%, 2020 – 8.6%) due to increased extraction and utilisation of materials and resources (Circle Economy, 2023). Therefore, an urgent and effective shift from the prevailing linear economic model to a circular one is imperative. However, this transformation faces numerous barriers that significantly impede progress in embracing the circular economy concept.

This article seeks to address a research gap in the literature by identifying barriers to implementing a circular economy, with a focus on Poland as a case study where circularity stands at 10.2%. This disparity indicates a substantial 'gap' in circularity amounting to 89.8%. This discrepancy reflects the predominant use of primary resources in Poland, notably as the largest producer of energy from coal--fired power plants in Europe. Of all materials circulating in the Polish economy – from metal ores and non-metallic minerals to biomass and fossil fuels – only one-tenth comprises secondary raw materials. Annually, Poland consumes a total of 613.4 million tons of materials, with primary raw materials accounting for 517.9 million tons, or 13.8 tons per person per year. While this figure is moderate compared to other European countries (e.g. Sweden's average consumption of 25 tons per person per year), Poland's material footprint surpasses the global average of 11.9 tons per person per year, significantly straining the planet's regenerative capacity. Moreover, with 16.7 tons per inhabitant per year, national resource extraction in Poland notably exceeds the EU average (10.3 tons per inhabitant) (The Circularity Gap Report Poland, 2022). Despite similar consumption and extraction rates in other high-income European countries, their ramifications necessitate solutions beyond conventional recycling, offering broader environmental, social, and economic benefits.

The goals, formulated in this manner, significantly influenced the structure of the article. Section 2 provides a comprehensive literature review on the topic of the circular economy. Section 3 outlines the methodology, which is based on surveys conducted among companies engaged in environmental and/or waste-related activities, as well as among households. The pivotal segment of this study, Section 4, presents the empirical findings, meticulously categorised into four distinct sub-sections, each focusing on elucidating the multifaceted barriers encountered in the adoption of circular economy principles: legal and administrative, technological, economic, and socio-cultural. In Section 5, a set of strategic recommendations essential for the successful implementation of circular economy practices in Poland is presented. The final Section 6 summarises the considerations.

2. Literature Review

The concept of a circular economy (CE) originated in the 1960s, proposed by Boulding (1966), who recognised the necessity of implementing circular systems within the global economy to ensure long--term sustainability. The rapid development of consumer, industrial, and extractive economies in the latter half of the 20th century led to the emergence of negative external effects during production (Ellen MacArthur Foundation, 2015). This prompted a shift in focus towards the necessity of a new stage in the product life cycle, aimed at transforming products to ensure their reusability in subsequent production cycles (Dudzik, 2018). The first theoretical model of a circular economy was developed at the end of the 20th century by Pearce and Turner (1990), which was introduced to Polish literature in 1993 by Fiedor. According to Kulczycka (2019), by 2019, there were over 200 definitions of a circular economy in scientific literature, with the majority being refined in the last five years.

Generally, it can be assumed that the circular economy encompasses all actions in the sphere of production and consumption that correspond to the most efficient use of resources and the minimisation of pollution and waste emissions. A more detailed definition was adopted by Fan (2008),

who indicated that the circular economy refers to a highly regulated market aimed at promoting the use of renewable resources, improving the efficiency of using non-renewable resources, and minimising waste generation. Within this market, there cannot be a free play of supply and demand, as the prices of primary resources should reflect their actual costs and negative external effects. The use of the environment cannot be free. Enterprises that implement a closed-loop economy are encouraged and supported by administrative or financial means. According to Fan, the main goal of implementing the closed-loop economy model in the economy is to separate economic growth and the social benefits derived from it from the increase in material and energy flows. A similar stance was later adopted by the European Union, recognizing that the circular economy is a development strategy that involves economic growth without increasing additional resource consumption, a profound transformation of production chains and consumption habits, and the transformation of industrial systems at the macroeconomic level, while emphasising the priorities of this economy in the form of technological, social, and organizational innovation (EC, 2014).

One of the most recognisable definitions of a circular economy was proposed by the Ellen MacArthur Foundation (2015). Founded in 2010, the organization promotes collaboration between business, governments, and academia to facilitate the exchange of knowledge and experiences related to the circular economy concept. The foundation's main goal is to support the transformation of the economy towards a circular model. The proposed definition states that a circular economy is inherently regenerative, aiming to maintain products, components, and materials at the highest utility and value throughout their entire lifecycle. Additionally, this self-regenerating system allows for maintaining at least partial, if not full, material value and utilising renewable energy. The circular economy distinguishes between two cycles: the technical cycle, managing finite or non-renewable resources, and the biological cycle, encompassing flows of renewable materials.

In the 21st century, the concept is one of the most frequently discussed topics among scientists focusing on environmental economics (Geisendorf and Pietrulla, 2017). However, it has also attracted practitioners implementing actions aligned with the related concept of sustainable development (Kirchherr et al., 2017). According to the European Commission [2020], a circular economy encompasses initiatives within product policy frameworks aiming to make sustainable products, services, and business models the norm. The primary assumption of the circular economy concept is to close the life cycle of products through processing in their final stage (in the linear model, this is the end-of-life phase) and returning materials to circulation, ensuring their maximum utility and value (Dudzik, 2018). The circular economy is often interpreted as a new type of business model contributing to creating a sustainable economy and a healthy society (Geisendorf & Pietrulla, 2017). To achieve this, interaction between economic, environmental, technological, and social aspects is necessary (Ghisellini et al., 2016). One definition of a circular economy is the use of the term as the opposite or alternative to a linear economy (Mitchell, 2015). The term ‘linear economy’ was introduced by scientists to create an antonym for a circular economy, reflecting a type of economy considered worse for the environment and resource users. A linear economy is a one-way system where natural resources are transformed into waste during the production process. This leads to environmental deterioration through pollution generated in the form of waste and permanent removal of resources from their natural environment (Murray et al., 2015). A circular economy aims to generate less waste in the production process, promoting resource reuse in a new production cycle and maximising the use of a resource for as long as possible (Mitchell, 2015). This type of economy is expected to close the loop, allowing the separation of prosperity from excessive resource consumption and preventing the disposal of used goods and products in landfills (Suave et al., 2016). A circular economy also requires active participation from producers and consumers in recycling and reusing products, abandoning the passive ‘dispose of’ attitude characteristic of a linear economy (Ghisellini et al., 2016). It has also been demonstrated that businesses adopting the circular economy concept can achieve higher profitability than competitors using traditional economies (Zarębska, 2016). The foundation of the circular economy concept is the reuse of materials to extract their maximum value in subsequent production processes, rather than quickly transforming them into waste. The circular economy

approach involves not only implementing actions in the final phase of the product life cycle, but also innovating throughout the entire product value chain (Blażlak, 2017).

The core of the circular economy, focusing on resources, is considered to be optimal resource utilisation following the 3R principle (reduce, reuse, recycle), meaning reducing, reusing, and recycling resources (Lieder, Rashid, 2016). The European Commission proposed the 4R principle in the Waste Framework Directive of 2008, adding recovery to the existing principles. This concept, as a result of intensified research in recent years, has grown into the 10R formula, supplemented by elements of rethink, repurpose, remanufacturing, refurbish, repair, refuse (Jaworski & Grochowska, 2017). To this group, two other elements should be added: re-shorten, which is crucial in analysing the necessity of shortening supply chains, and regulate (Raftowicz, 2022). The 12R formula should be considered at every stage of the production process, i.e. from raw material acquisition, through product design, its production, distribution, and consumer use, including its maintenance and repair, to its collection after use and reuse in the next production cycle of the same or another product.

The circular economy has become a significant driver of sustainable development and a key element of national policies and business strategies. The focus on developing circular economy concepts is observed in many organizations and countries striving to efficiently use resources and counteract unsustainable consumption and production (Gedam et al., 2021). However, the transformation towards a circular economy is hindered by the existing barriers that often discourage organizational actions towards circularity and limit progress in implementing this concept (Kirchherr et al., 2018). Therefore, it is essential to understand the challenges and barriers faced by organizations, countries, and societies in the process of transitioning to a circular economy (Ritzen and Sandström, 2017).

Based on the literature analysis, it can be concluded that there is not just one main barrier limiting circular economy development, but a number of them. These barriers have been identified and classified into relevant categories: 1. technological, 2. economical, institutional (legal and administrative) 4. socio-cultural (Kirchherr et al., 2017, Grafströmn and Aasma, 2021).

Before commencing the research, the following research hypotheses were formulated:

H1: Both businesses and households perceive barriers to implementing the circular economy in Poland, however, these are not identical for these entities.
H2: Businesses consider technological barriers as the main obstacle to implementing the circular economy, while consumers perceive socio-cultural barriers.

3. Methodology

Research on the barriers to implementing the elements of the CE in Poland was conducted in the Lower Silesia region, located in the south-western part of the country. Lower Silesia scored 51 out of 100 points in the "Eco-index Millennium" ranking in 2022, which assessed the eco-innovation potential of regions in Poland. Therefore, it can be assumed that studying this region, which reflects average ranking values, is representative of the entire country. To achieve the main goal, a survey method was applied using an online questionnaire directed at two target groups. The questions were both open-ended and closed-ended, with a Likert scale. The research was conducted in April 2023 and had a dual nature. The choice of this method was primarily driven by the fact that surveys among consumers and entrepreneurs are often considered the best method for studying the barriers of the circular economy due to access to various perspectives, the possibility of detailed opinion analysis, a high number of respondents, anonymity, and honesty, as well as time and cost efficiency (see: Liakos et al., 2019; Rakowska, 2023).

On the one hand, the respondents were businesses engaged in environmental protection/waste-related activities in the Lower Silesia region (eight entities). Among the surveyed businesses, there

were two micro-enterprises and six small enterprises. The majority of the surveyed companies were service-oriented enterprises (six), with the remaining being project-service enterprises (two). Five of the surveyed businesses were involved in recycling activities, while half of them were engaged in the production and acquisition of renewable resources. Three enterprises were implementing new CE business models, collaborating with other entities for CE, or engaging in sustainable distribution and logistics. A remarkable 75% of the surveyed businesses believe that the importance of CE activities in their enterprises will greatly or moderately increase over the next five years. The development of CE in their enterprises will focus on: product and service design, implementing new business models, closing loops in the production process, product reuse, and recycling. Motivating factors for the surveyed businesses to implement CE solutions included a desire for business development, legal requirements, seeking new sources of income, and image-related issues.

On the other hand, the study was conducted among households selected non-randomly (73 respondents). The socio-demographic structure of the surveyed household participants is presented in Table 1.

Table 1. Socio-demographic structure of surveyed households

Categories		% of respondents
Gender	female	67.1
	male	32.9
Age	18-29	82.2
	30-39	5.5
	40-49	4.1
	50-59	5.5
	60 and over	2.7
Place of residence	city with over 500.000 inhabitants	43.8
	city with 100.000 to 500.000 inhabitants	13.7
	city with 50.000 to 100.000 inhabitants	8.2
	city with up to 50.000 inhabitants	19.2
	countryside	15.1
Education	doctorate and higher	1.4
	higher (Bachelor's/Engineer's/Master's)	71.2
	secondary	24.7
	vocational	1.4
	primary	1.4
Employment status	I am learning/studying	47.9
	I work full-time	27.4
	I work part-time or on a contract basis	8.2
	I run my own business	8.2
	I study and work	4.2
	I am a farmer	1.4
	I am retired/pensioner	1.4

Source: own elaboration.

The majority of the respondents (62%) declared that they segregate waste at home. A remarkable 45% believe that they waste less than 10% of food. The respondents clearly indicated renewable energy development as definitely necessary (80.9%) or rather necessary (16.4%). Over half of the surveyed use recycled items or so-called ‘second-hand’ items.

4. Results

In reference to the analysed literature, four categories of barriers were identified: 1. Legal-administrative, 2. Technological, 3. Economic, 4. Socio-cultural. Both businesses and households perceived barriers to implementing GOZ in Poland, however, these were not identical for these entities. This is succinctly represented in Figure 1.

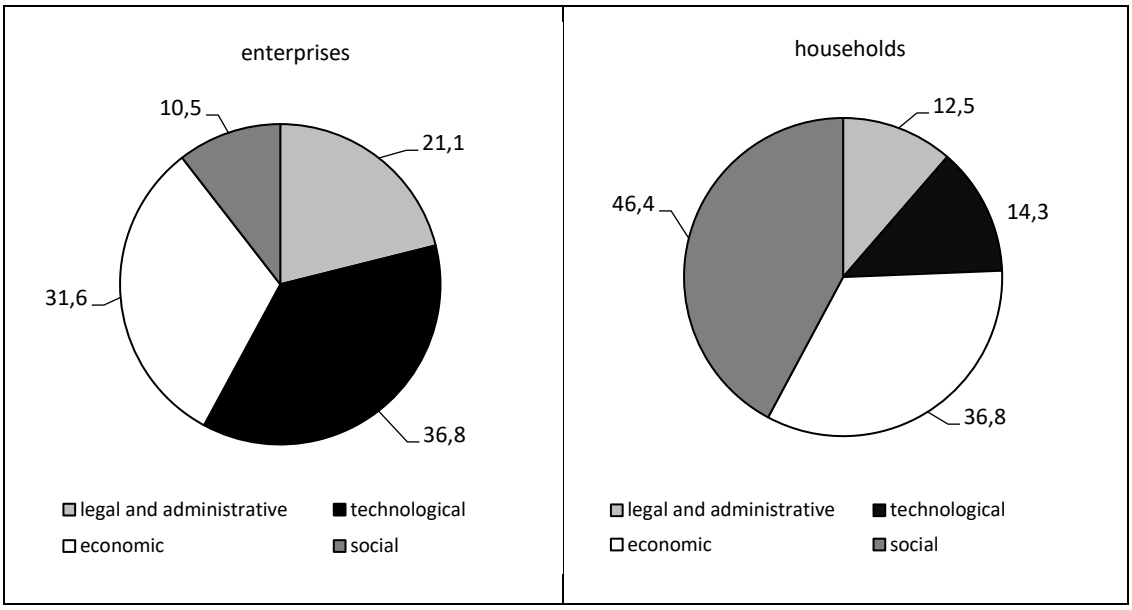

Figure 1. Main barriers to implementing GOZ according to businesses and households in %

Source: own elaboration.

The research results presented in Figure 1 showed that for businesses, the main barrier to the implementation of CE principles is technological (36.8%), followed closely by economic (31.6%). However, for households, the primary barrier is socio-cultural (46.4%), followed by economic ones (26.8%). A detailed analysis of the barriers is as follows:

4.1. Legal and Administrative Barriers

4.1.1. Enterprises

Due to legal and administrative obstacles, businesses understand, among other things, the lengthy process of going through executive procedures, which delays the implementation of CE. Companies seeking to introduce recovery and recycling processes into their business operations often need to obtain integrated permits, and the process leading to the final permit is time-consuming, requiring extensive preparation and oversight by the relevant institutions. The waiting time for the consideration of the necessary applications for such permits is lengthy. In this group of barriers, over half of the companies (62.5%) considered restrictive legal regulations regarding waste management to be a significant barrier to implementing CE. The profile of the surveyed companies (sector of waste management and environmental protection industry) indicated that these companies are familiar with and obligated to comply with current legal regulations concerning waste management. According to entrepreneurs working in the waste management industry, regulations often hinder the reuse of resources because materials are classified as waste too quickly, despite the potential for reuse. The lack of supportive policy frameworks thus hinders the conduct of waste recovery and recycling processes. Another barrier noted by surveyed companies was the lack of appropriate legislative solutions that would allow for a smooth transition of the economy towards a closed-loop system

(37.5%). The lack of adequate regulations was also associated with varying rates of legislative changes and the lack of rapid updates to strategies regarding new regulations introduced at EU level. According to half of the surveyed respondents, legal requirements regarding CE, applicable in Poland and the European Union, significantly or slightly affect business operations. Yet 25% believed that legal requirements do not affect business operations, and 25% were unsure if legal requirements have any impact on their activities. However, over half of the respondents thought that legal requirements encourage entrepreneurs to take action in the field of CE.

Figure 2 presents detailed opinions of companies regarding legal requirements concerning the closed-loop economy applicable in Poland and the European Union.

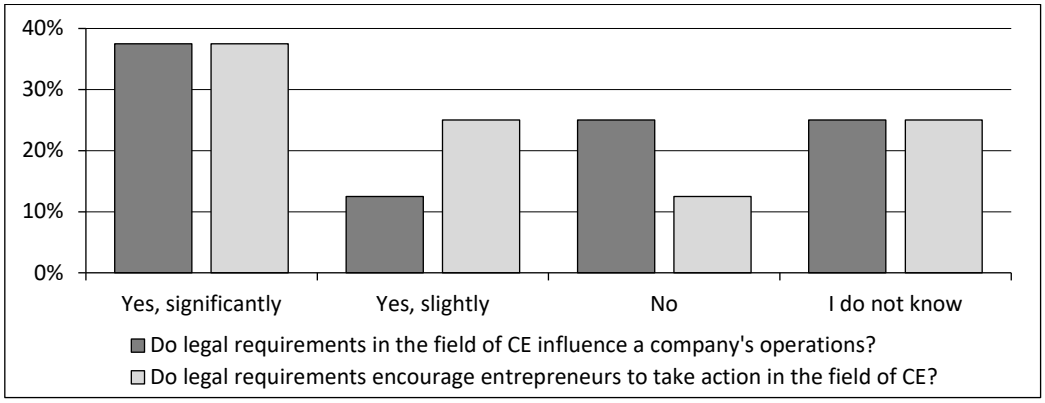

Figure 2. The impact of legal requirements for CE on business activity according to companies' opinions

Source: own elaboration.

Businesses asked about their understanding of legal requirements regarding the circular economy responded diversely: for some, the requirements were unclear, for others, they were clear, and some respondents found it difficult to determine whether legal requirements are understandable or not. The requirements placed on businesses regarding the CE were mostly assessed as difficult to implement in business operations. The responses of the respondents are presented in Figure 3.

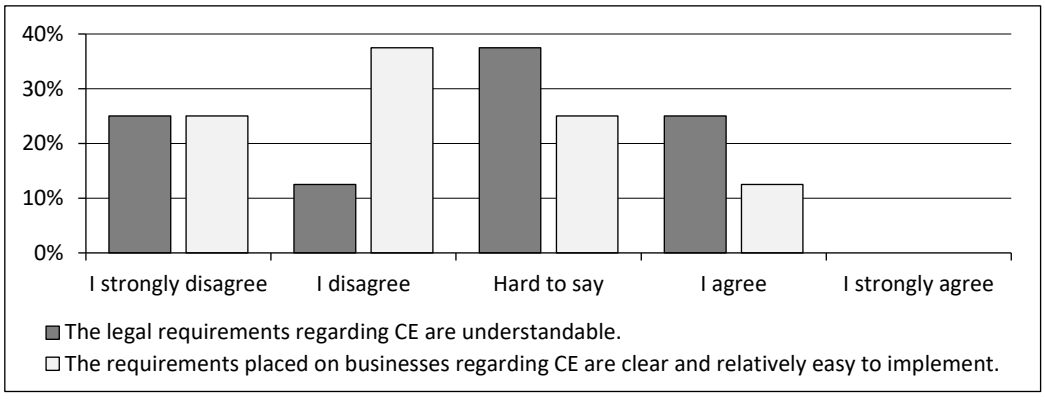

Figure 3. Comprehensibility of legal requirements for CE according to companies' opinions

Source: own elaboration.

The surveyed enterprises were asked about the type of support from public entities that would facilitate the implementation of CE in their activities. Among the responses were: "colossal improvement in the efficiency, timeliness, and expertise of employees in the offices involved in decision-making processes"; "simplification of regulations"; "easier access to specialists – coordinators who would act as liaisons between enterprises, universities, funding and supervisory institutions, and possess knowledge about the entire process of implementing CE in the enterprise."

4.1.2. Households

For households, legal and administrative barriers were the least frequently mentioned group of barriers hindering the implementation of CE. However, the respondents noted a problem in the lack of adequate promotion of the circular economy idea itself (24.7%), which may result in low conviction among enterprises and consumers that actions towards CE are profitable and beneficial. Households also pointed out obstacles of a legal and administrative nature (13.7%), which can be understood as, for example, long processing times through various executive procedures, leading to delays in the implementation of CE.

4.2. Technological Barriers

4.2.1. Enterprises

For the surveyed enterprises, technological challenges may include a low capacity to deliver high-quality secondary products due to the lack of appropriate technologies or the current prolonged waste processing technology. In this group of barriers, a significant portion of surveyed enterprises (37.5%) noted that the collaboration between science and business was insufficient. The lack or restricted access to new technologies was considered a barrier by 25% of the surveyed enterprises. Their opinions regarding new technologies are presented in Figure 4.

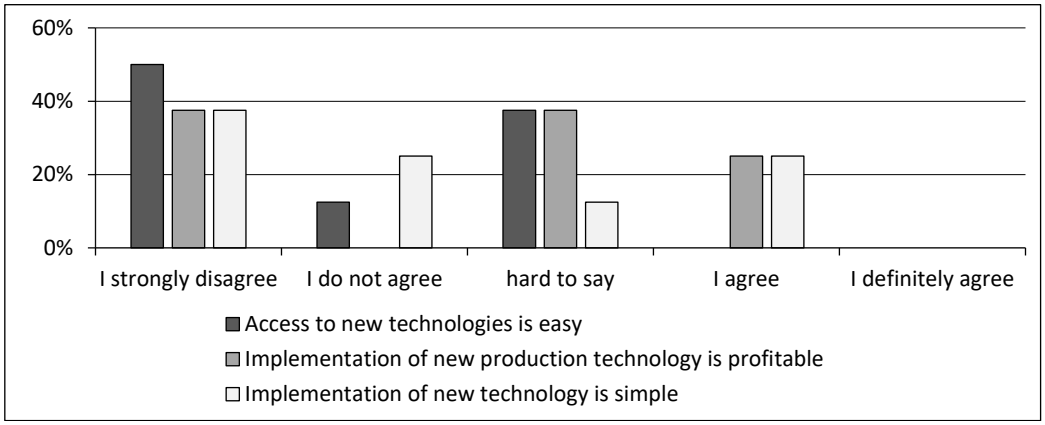

Figure 4. New technologies in the opinion of businesses

Source: own elaboration.

Access to new technologies was mostly assessed as very difficult or difficult. The profitability of implementing new production technology varied – for some, such action was not profitable, for others it was profitable, while the remainder found it difficult to determine the profitability of implementing new production technology. The diversity of responses to this question may result from the fact that new technologies are expensive (as evaluated by half of the respondents). There is a risk of investing significant resources in new technology, which either performs well and generates profits, or fails to meet expectations and yields insufficient profits. Additionally, the majority of the respondents also believed that implementing new technology is difficult. Almost unanimously, when asked for their opinion on the statement "new business models are understandable to entrepreneurs", they responded that they strongly disagree (50%) or disagree (37.5%) with this statement. This means that new business models are either too complicated or not sufficiently explained to entrepreneurs. They do not know how to implement them or what they entail. The majority of the respondents also agreed that implementing CE is hindered by a lack of publicly available information on the topic (75%).

4.2.2. Households

Regarding the results of research among households, the respondents, similarly to the surveyed enterprises, stated that cooperation between the science and business sectors, responsible for the development of the CE concept, was insufficient (32.9%). It is worth noting that the number of consumers who had noticed this problem was high. Moreover, over 10% of the household respondents also believed that access to new technologies was difficult or impossible.

4.3. Economic Barriers

4.3.1. Enterprises

In this group of barriers, the enterprises pointed out that the most significant obstacle was the cost of investing in CE solutions (37.5%). Thus, 25% of the respondents believed that: "financial support from the government and/or the EU is insufficient"; "their companies lack financial resources for the development of CE concepts"; "prices of recycled products are too high"; "contractors lack engagement in the CE implementation process". One respondent also stated that there was a lack of collaboration networks between economic entities. Attention was drawn to the insufficient financial support from the government and the EU. However, when the surveyed enterprises were asked whether the financial support, they can receive for the development of CE strategies from EU or national funds was sufficient, the most common response was that they were not aware of such forms of support (50%). The remaining responses were that they did not know if the available financial support was sufficient (25%), it was sufficient (12.5%), and it was not sufficient (12.5%). As mentioned earlier, the surveyed enterprises highlighted the lack of financial resources for the development of CE concepts. Therefore, it is important for enterprises to know if they can access financial resources for developing concepts in their operations. The role of funding policies implemented by the state and the availability of information on accessing additional funds for implementing new solutions in the production process are crucial. The opinions of enterprises regarding education in the field of CE and interest in training or consultancy in CE are presented in Figure 5.

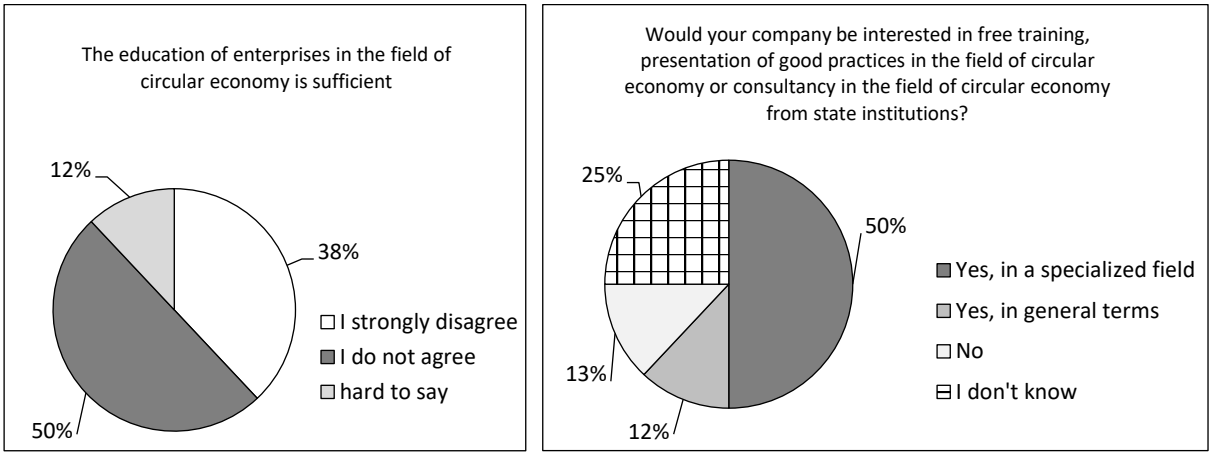

Figure 5. Education and training in the field of circular economy in the opinion of enterprises

Source: own elaboration.

Half of the surveyed enterprises assessed that it was difficult to determine whether the education of businesses in the field of CE was sufficient, while for the other respondents, this education was conducted at an insufficient level. Therefore, when asked about their potential interest in free training or consultancy in the field of CE provided by state institutions, half of the respondents responded positively, showing willingness to participate in such specialised initiatives, while 12.5% would be

interested in general training in this area. The barrier associated with high prices of products derived from recycling, mentioned earlier, resulted in a significant decrease in the competitiveness of these products. Consumers and entrepreneurs prefer to purchase cheaper products or materials produced or sourced from primary rather than secondary sources. This is a serious barrier that limits the development of the market for recycled products. However, high prices are associated with the high costs of technologies enabling material recycling. Attention was also drawn to the lack of engagement of contractors in the CE implementation process. The resistant culture of enterprises that prefer to operate in a linear system hinders widespread change. Collaboration between economic entities is crucial to ensure a smooth transition from a linear economy to a circular one. Entrepreneurs without collaboration face a challenging path to implementing new solutions due to a lack of customers and firms willing to cooperate with them. The opinions of enterprises regarding the implementation of CE are presented in Figure 6.

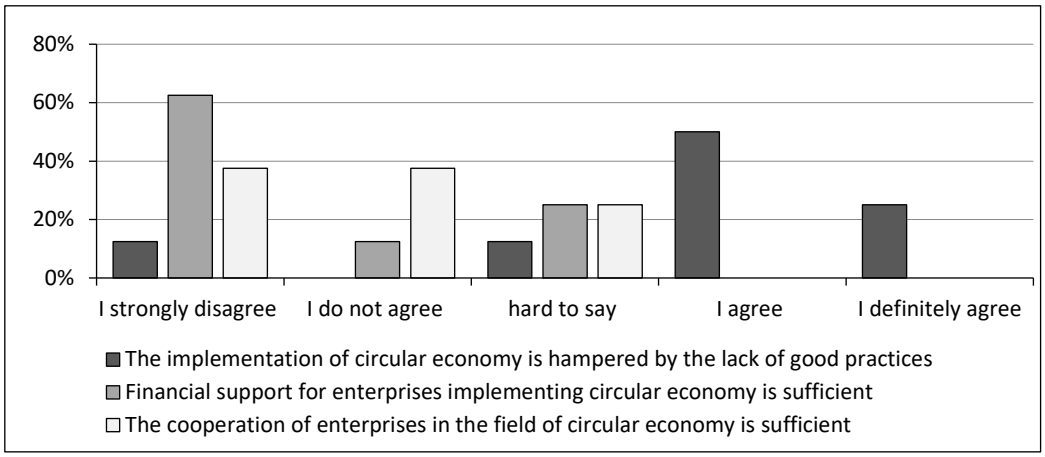

Figure 6. Implementation of circular economy in the opinion of enterprises

Source: own elaboration.

According to the majority of the surveyed enterprises, implementing CE was hindered by the lack of good practices used in companies. Most respondents also claimed that financial support for enterprises implementing CE was insufficient. Collaboration among enterprises in the field of CE was also rated as inadequate by the majority of the respondents.

4.3.2. Households

Household participants placed significant emphasis on obstacles from the economic-market group, considering it the second most important barrier to CE implementation. They shared similar views with the surveyed enterprises, identifying the two most important barriers in this category as high costs (31.5%) and the lack of sufficient financial support (31.5%). In the case of households, high costs may be associated, among other things, with the fact that current consumer solutions produced in a linear economy are mostly cheaper compared to more modern ones produced with a focus on CE. Household respondents also noted the reluctance of enterprises to change and cooperate (19.2%).

4.4. Social and Cultural Barriers

4.4.1. Enterprises

The surveyed enterprises pointed out the low public awareness related to circular economy issues (25%). Among the barriers, they also indicated the lack of individuals responsible for implementing CE strategies in enterprises (12.5%) and insufficient knowledge about CE within enterprises (12.5%). The declared level of awareness regarding CE in enterprises varied, and the results are presented in Figure 7.

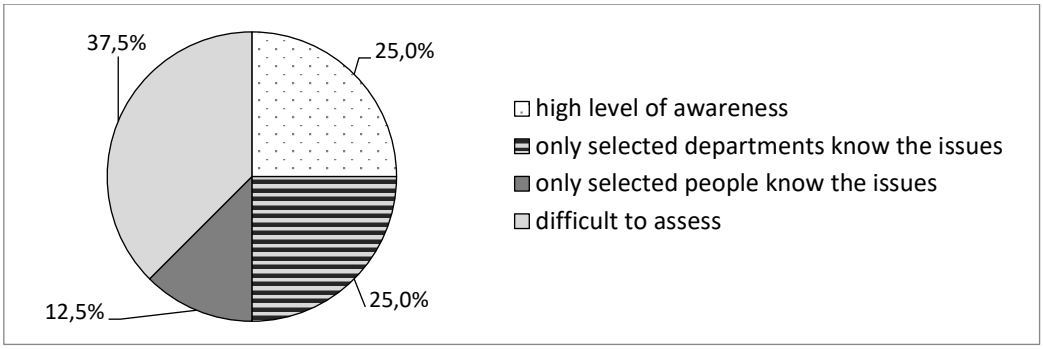

Figure 7. The level of awareness about CE in enterprises

Source: own elaboration.

Only 25% of the surveyed respondents describe this state as high, acknowledging it as common knowledge possessed by all or almost all employees, whilst 25% of respondents stated that only selected departments were familiar with CE-related issues, while 12.5% specified that only certain individuals were knowledgeable about these issues. A significant 37.5% of the respondents were unable to assess the level of awareness regarding CE in their enterprises. This may be related to the identified barrier of the shortage of individuals responsible for implementing CE strategies. The majority, over 60% of the surveyed enterprises, did not have a defined CE strategy or separate CE goals. At the same time, as many as 7 out of 8 enterprises declared that they implement CE activities in their operations – this is, of course, possible because actions can be taken without having a separate strategy. When asked for their opinion on the concept of the circular economy, the majority responded that it is a very important idea that should be developed and implemented (75%), while others considered it an important idea but not the most important (12.5%) or found the idea complicated (12.5%). It was decided to conduct an analysis of the relation between the level of awareness regarding CE, opinions on CE, and the definition of CE goals depending on the definition of CE strategy in surveyed enterprises. The results of the analysis are presented in Table 2.

Table 2. Analysis of the relation between the level of awareness, opinions and definition of circular economy goals on the definition of circular economy strategy in enterprises

Categories	Defined strategy	
	Yes	No
Defined specific goals of CE		
Yes	33%	20%
No	33%	80%
Hard to say	33%	0%
Opinion about CE		
very important idea that should be developed and implemented	100%	60%
important idea, but they are more important than that	0%	20%
complicated idea	0%	20%
Level of awareness about circular economy		
high - common knowledge that all or almost all employees have	67%	0%
only selected departments know issues related to circular economy	33%	20%
only selected people know issues related to circular economy	0%	20%
it is difficult to assess the level of awareness about circular economy	0%	60%

Source: own elaboration.

Defining a CE strategy did not significantly influence the definition of separate CE goals (except for environmental goals). However, enterprises without a CE strategy mostly also lacked CE goals. Nonetheless, having a strategy does impact opinions on the circular economy. In all enterprises where

a CE strategy was defined, the concept is considered very important and one that should be developed and implemented. Some enterprises without a defined CE strategy also considered the concept important, but they perceived other matters as more crucial. There were also those who found the concept complicated. A CE strategy also affected the level of awareness regarding CE in the enterprises. Those with a defined strategy declared a high level of awareness, where it is common knowledge possessed by all or almost all employees, or knowledge held by selected departments. In enterprises without a defined CE strategy, such knowledge is limited to only selected departments or even individuals. However, most of these enterprises found it difficult to assess the level of CE awareness within their company.

4.4.2. Households

Regarding the surveyed households, over half (52.1%) believed that society's interest in the circular economy topic was too low. Attention was also drawn to the lack of adequate education (46.6%) and society's reluctance to change (42.5%). The vast majority of the household respondents believed that implementing a circular economy can bring economic, environmental, or social benefits to society (90.4%). They considered the role of consumers in the CE implementation process to be very significant (69.9%) or somewhat significant (24.6%). Most declared that they were very or somewhat interested in the circular economy topic (58.9%), but a significant portion considered the topic indifferent (35.6%) or had no interest in it at all (5.5%).

The majority of the respondents declared that they were familiar with some principles of the circular economy (CE) and understood them. However, a significant percentage of those surveyed were unfamiliar with these principles or did not understand them. Therefore, education of household participants is crucial, not only in the context of the circular economy concept itself but also regarding CE principles and methods of implementation that consumers can undertake. Knowledge gaps can result in a reluctance to take any action, which is linked to the aforementioned barrier of society's low interest in the circular economy topic. Low interest combined with a lack of educational efforts can lead to a lack of any initiatives undertaken by household participants. However, they are an important part of the market and the economy, so if they do not take action towards CE, the efforts made by enterprises may be wasted.

Among the mentioned barriers, the highest one was the price of eco-friendly and high-quality products, higher than the price of standard products (52.1%), which discouraged over half of the respondents. Another barrier was the existing consumer habits, difficult to change or which the respondents did not wish to change. The shortage of time for conducting pro-environmental actions, the lack of perseverance in committing to change, and insufficient financial resources were also frequently mentioned. For some, a barrier was also the insufficient knowledge about pro-environmental actions and CE, or a lack of incentives to change habits and actions. The respondents also showed little trust in ‘eco’ actions undertaken by businesses. They also did not know what and how they should behave, which is related to gaps in their knowledge about the circular economy. Education of society regarding CE was assessed as insufficient by surveyed enterprises. This means that businesses also saw gaps in knowledge among consumers – for waste management sector businesses, these gaps may concern, for example, waste segregation. The respondents were asked whether they encountered companies or products of companies that operated in accordance with the principles of the circular economy and promoted it in advertising, the social media and TV responded as follows: 39.7% encountered such companies/products, 31.5% found it difficult to say whether they encountered such companies/ products, while 28.8% did not encounter such companies/products. Therefore, it is essential to increase the promotion of actions undertaken within the framework of CE by businesses themselves, which implement such initiatives in their economic activities and deliver products or services to the market. However, the respondents varied in their assessment of who is primarily responsible for shaping pro-environmental attitudes and educating about the circular economy.

The respondents attributed the greatest responsibility for shaping pro-environmental attitudes to the government, local authorities in towns or cities, and schools, in that order. However, the majority (57.5%) believed that the authorities in their city or region undertake pro-environmental education and CE-related actions to a small or medium extent. Yet, a significant section of respondents thought that the authorities in their city or region did not take any actions (13.7%) or were unaware of the actions taken by the authorities (17.8%). Close to 90% believed that the circular economy was part of pro-environmental activities, and most respondents were convinced that CE has the potential to develop in their locality or region, but some of them cannot determine whether CE can develop in their region.

5. Recommendations

The respondents from the surveyed enterprises identified areas that require improvement to facilitate the transition to the CE and mitigate the existing barriers. The most crucial corrective actions highlighted include consumer education, the development of recycling infrastructure networks, enhanced collaboration between academia and businesses, as well as financial support for projects and new technologies. The leading motivating factors for businesses to engage in the CE were identified as the desire for business growth and the necessity to adapt operations in response to dwindling natural resources and environmental degradation. This confirms that entrepreneurs are receptive to change not only due to economic and regulatory incentives, but primarily because of their commitment to enhancing the environment and preventing further degradation. Household participants also recognised the need for changes in the current economy and its transformation into a more closed-loop system. However, they acknowledged deficiencies in education, resistance to change, and insufficient societal interest in the CE concept, hence it is essential to provide appropriate support in financial, technological, legal, and educational aspects, distributed according to the needs of relevant groups within the economic model, to facilitate the transition to a circular economy. Repair actions aimed at minimising the barriers to CE implementation, based on the opinions of surveyed businesses, are presented in Figure 8.

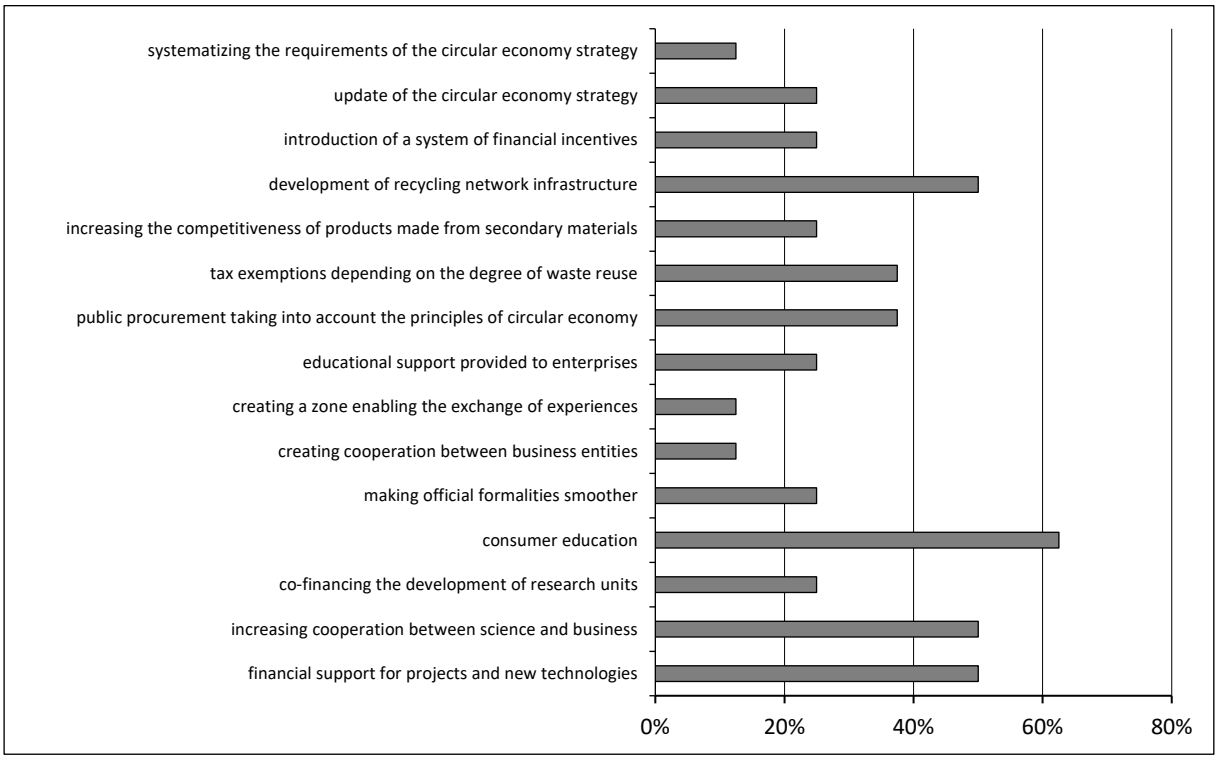

Figure 8. Actions reducing CE barriers from the perspective of entrepreneurs

Source: own elaboration.

Most of the respondents emphasised the importance of consumer education, recognising the significant role of consumers in implementing the circular economy. This indicates a high level of consumer awareness regarding their involvement in the transformation process. However, addressing the challenge posed by the lack of knowledge about the CE concept and its implementation methods is imperative. In addition to consumer education, providing educational support for businesses is crucial. While only 25% of the respondents reported a high familiarity with CE issues, over 60% expressed willingness to participate in free training or advisory services on the CE. This indicates a strong demand for education within businesses. Establishing a platform for sharing experiences and fostering collaboration between businesses would further enhance these efforts. Half of the respondents believed that increasing collaboration between academia and businesses, providing financial support for projects and new technologies, and developing recycling infrastructure networks are vital. The proposed corrective actions suggested by the respondents aligned with the previously identified barriers, such as insufficient collaboration between the academic and business sectors, inadequate financial support, lack of funds for technology development, and challenges associated with high prices of recycled products. Addressing these difficulties is crucial for advancing the implementation of the CE. Some respondents suggested significant actions to improve the implementation of the CE in businesses, including tax exemptions based on the degree of waste reuse, the introduction of financial incentive systems, or funding for research unit development. Updating CE strategies and systemising CE strategy requirements are also essential, particularly in addressing legal-administrative and socio-cultural barriers. Simplifying CE requirements and minimising the number of CE-related documents will facilitate the implementation of the concept in businesses.

6. Conclusions

A circular economy is a concept evolving in response to advancing environmental changes and economic development. It enables a more rational use of resources by employing processes such as reuse, repair, or resource recovery, thus facilitating economic activities to be conducted in a more sustainable manner. The closed-loop economy is evolving at various levels and encompasses a wide range of issues, from sourcing primary resources through the entire product lifecycle to recovering resources from generated waste.

However, there are barriers that further hinder or slow down the development of the circular economy concept. The literature analysis revealed the presence of many obstacles observed across various economic sectors. Studies conducted within the framework of this work confirmed the existence of obstacles to the implementation of the closed-loop economy in Poland across various categories, including technological, legal, and socio-cultural barriers. Furthermore, it can be stated that the challenges encountered are often similar or identical to those described in the analysed studies. In the case of surveyed companies, the most significant barriers hindering the development of the closed-loop economy concept were technological issues, such as technological challenges and insufficient cooperation between science and business. Additionally, attention was drawn to the high cost of closed-loop economy investments and the lack of financial resources for the development of the concept in enterprises. Barriers were also identified within the legal domain, mainly stemming from misunderstandings of legal requirements and restrictive regulations regarding waste management. Socio-cultural barriers were considered the least important by enterprises, but they were also noticed in the form of the lack of knowledge about the closed-loop economy within the enterprise and low social awareness. The respondents from households mainly noticed barriers in the socio-cultural category, such as insufficient education, limited societal interest, and resistance to change, however they also identified barriers in the legal, economic, and technological domains, including the lack of sufficient financial support, high costs, legal and administrative obstacles, and lack of access to new technologies. The respondents themselves identified difficulties when undertaking actions within their own scope, the most important being the prices of ecological products, entrenched habits, lack of perseverance in making changes, and lack of knowledge about pro-environmental actions and the closed-loop economy.

The conclusions drawn from this analysis can be summarised in a general conclusion, corresponding to the first and second hypotheses posed. Both companies and households reported barriers to the implementation of the circular economy in Poland, however, the specific barriers identified differ among these groups.

Despite thorough analysis and meticulous data collection, this study has its constraints that warrant attention when interpreting the findings. One such limitation is the comparatively modest sample size, encompassing respondents from both enterprises and households. Regarding household surveys, it is noteworthy that the study exhibited a skewed gender representation, with women making up the majority (67.1%) over men (32.9%), along with a notable predominance of the respondents aged 18-29 years (82.2%). Moreover, the decision to focus the research solely on the area of Lower Silesia further narrowed the generalisability of the findings. However, this regional focus was a deliberate choice made by the researchers to gain in-depth insights into a specific geographical context.

Future research on the barriers related to the circular economy could explore several avenues to further our understanding and address existing gaps in knowledge, such as cross-regional comparison or longitudinal studies.

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Bariery implementacji gospodarki o obiegu zamkniętym w Polsce

Streszczenie

Cel: Głównym celem badań jest identyfikacja barier dotyczących wdrożenia gospodarki o obiegu zamkniętym w Polsce oraz zaproponowanie rozwiązań pozwalających na zmniejszenie tychże barier.

Metodyka: Badania zostały przeprowadzone na podstawie krytycznej analizy literatury przedmiotu oraz badań ankietowych wśród przedsiębiorstw o profilu działalności związanym z ochroną środowiska/odpadami oraz wśród gospodarstw domowych.

Wyniki: Wyniki badań wykazały odmienność podejścia przedsiębiorstw oraz gospodarstw domowych do kwestii barier implementacji GOZ.

Implikacje i rekomendacje: Praktycznym aspektem omawianych kwestii jest możliwość wykorzystania wyników badań przez Ministerstwo Klimatu i Środowiska do kształtowania polityki zgodnej z Europejskim Zielonym Ładem. Aby przezwyciężyć te bariery, niezbędne jest wsparcie instytucjonalne – w zakresie zarówno finansowym, technologicznym, prawnym, jak i edukacyjnym.

Oryginalność/wartość: Wypełnianie luki badawczej w literaturze dotyczącej identyfikacji barier występujących na drodze do wdrażania gospodarki o obiegu zamkniętym na przykładzie Polski.

Słowa kluczowe: gospodarka w obiegu zamkniętym, bariery, Polska