UNIVERSITY OF PIRAEUS
SCHOOL OF ECONOMICS, BUSINESS AND INTERNATIONAL STUDIES
DEPARTMENT OF ECONOMICS

MSc. in Bioeconomy, Circular Economy & Sustainable Development

Consumer Engagement in the Circular Economy: A Response to Climate Change

Nikoletta Karystinou

Supervisor: Dr. Michael Polemis

Piraeus, Greece, October 2024

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ
ΣΧΟΛΗ ΟΙΚΟΝΟΜΙΚΩΝ, ΕΠΙΧΕΙΡΗΜΑΤΙΚΩΝ & ΔΙΕΘΝΩΝ ΣΠΟΥΔΩΝ
ΤΜΗΜΑ ΟΙΚΟΝΟΜΙΚΗΣ ΕΠΙΣΤΗΜΗΣ

ΠΜΣ. «Βιοοικονομία, Κυκλική Οικονομία και Βιώσιμη Ανάπτυξη»

Εμπλοκή των καταναλωτών στην Κυκλική Οικονομία: Αντιμετώπιση της Κλιματικής Κρίσης

Νικολέττα Καρυστινού

Επιβλέπων Καθηγητής: Δρ. Μιχαήλ Πολέμης

Πειραιάς, Ελλάδα, Οκτώβριος 2024

ΤΜΗΜΑ
ΟΙΚΟΝΟΜΙΚΗΣ ΕΠΙΣΤΗΜΗΣ
ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ

ΒΕΒΑΙΩΣΗ ΕΚΠΟΝΗΣΗΣ ΔΙΠΛΩΜΑΤΙΚΗΣ ΕΡΓΑΣΙΑΣ

«Δηλώνω υπεύθυνα ότι το έργο που εκπονήθηκε και παρουσιάζεται στην υποβαλλόμενη διπλωματική εργασία, για τη λήψη του μεταπτυχιακού τίτλου σπουδών, στη «*Βιοοικονομία, Κυκλική Οικονομία και Βιώσιμη Ανάπτυξη*» με τίτλο:

"Consumer Engagement in the Circular Economy: A Response to Climate Change"

έχει γραφτεί από εμένα αποκλειστικά στο σύνολό της. Δεν έχει υποβληθεί ούτε εγκριθεί στο πλαίσιο κάποιου άλλου μεταπτυχιακού προγράμματος ή προπτυχιακού τίτλου σπουδών στην Ελλάδα ή στο εξωτερικό, ούτε είναι εργασία ή τμήμα εργασίας ακαδημαϊκού ή επαγγελματικού χαρακτήρα.

Δηλώνω επίσης υπεύθυνα ότι οι πηγές στις οποίες ανέτρεξα για την εκπόνηση της συγκεκριμένης εργασίας αναφέρονται στο σύνολό τους, κάνοντάς πλήρη αναφορά στους συγγραφείς, τον εκδοτικό οίκο ή το περιοδικό, συμπεριλαμβανομένων και των πηγών που ενδεχομένως χρησιμοποιήθηκαν από το διαδίκτυο. Παράβαση της ανωτέρω ακαδημαϊκής μου ευθύνης αποτελεί ουσιώδη λόγο για την ανάκληση του πτυχίου μου.»

Υπογραφή Μεταπτυχιακού Φοιτητή

ΝΙΚΟΛΕΤΤΑ ΚΑΡΥΣΤΙΝΟΥ

Abstract

This thesis aims to examine the role of consumers in the transition to a circular economy to address the climate crisis. The research focuses on understanding consumer behavior and how their preferences and choices can promote sustainable development. The research examines consumers' views and attitudes towards good practices such as recycling, product reuse, and preferences for products with a low environmental footprint. A structured questionnaire was used to collect data exploring various aspects of consumer behavior, including information, perceptions, motivations, barriers, and consumers' willingness to adopt circular practices in the future. The survey findings revealed that while consumers understand the importance of the circular economy, there are significant barriers to implementing these practices, such as lack of information, perceived higher costs, difficulty in changing habits, and limited access to circular products. The results emphasize the importance of consumer habits and the need to improve consumer information and education, as well as to strengthen supportive public policies to achieve an effective and widespread transition to the circular economy.

Keywords: Circular Economy, Climate Change, Consumer Engagement, Consumer Behavior, Waste Minimization

Περίληψη

Η διπλωματική εργασία έχει ως στόχο να εξετάσει το ρόλο των καταναλωτών στη μετάβαση σε μια κυκλική οικονομία για την αντιμετώπιση της κλιματικής κρίσης. Η έρευνα επικεντρώνεται στην κατανόηση της συμπεριφοράς των καταναλωτών και του τρόπου με τον οποίο οι προτιμήσεις και οι επιλογές τους μπορούν να προωθήσουν τη βιώσιμη ανάπτυξη. Εξετάζονται οι απόψεις και οι στάσεις των καταναλωτών απέναντι σε καλές πρακτικές όπως η ανακύκλωση, η επαναχρησιμοποίηση προϊόντων και οι προτιμήσεις για προϊόντα με χαμηλό περιβαλλοντικό αποτύπωμα. Ένα δομημένο ερωτηματολόγιο χρησιμοποιήθηκε για τη συλλογή δεδομένων που διερευνούν διάφορες πτυχές της συμπεριφοράς των καταναλωτών, συμπεριλαμβανομένων των πληροφοριών, των αντιλήψεων, των κινήτρων, των εμποδίων και της προθυμίας των καταναλωτών να υιοθετήσουν κυκλικές πρακτικές στο μέλλον. Τα ευρήματα της έρευνας έδειξαν ότι ενώ οι καταναλωτές κατανοούν τη σημασία της κυκλικής οικονομίας, υπάρχουν σημαντικά εμπόδια στην εφαρμογή αυτών των πρακτικών, όπως η έλλειψη πληροφόρησης, το αντιληπτό υψηλότερο κόστος, η δυσκολία αλλαγής συνηθειών και η περιορισμένη πρόσβαση σε κυκλικά προϊόντα. Τα αποτελέσματα υπογραμμίζουν τη σημασία των καταναλωτικών συνηθειών και την ανάγκη βελτίωσης της ενημέρωσης και της εκπαίδευσης των καταναλωτών, καθώς και της ενίσχυσης των υποστηρικτικών δημόσιων πολιτικών για την επίτευξη μιας αποτελεσματικής και ευρείας μετάβασης στην κυκλική οικονομία.

Λέξεις-κλειδιά: Κυκλική οικονομία, κλιματική αλλαγή, καταναλωτική δέσμευση, καταναλωτική συμπεριφορά, ελαχιστοποίηση αποβλήτων

Contents

List of Figures

List of Tables

List of Diagrams

Abbreviations

CE: Circular economy

ERE: Environmental Rebound Effect

PSS: Product-Service Systems

EoL: End-of-Life

EC: European Commission

Introduction

In the past two decades, material consumption has risen by over 65 percent globally, reaching 95.1 billion metric tons in 2019. By the same year, an estimated 13 percent of the food destined for human consumption was lost after harvesting, and another 17 percent was wasted at the household, food service, and retail levels. The amount of electronic waste reached 7.3 kilograms per capita in 2019, and the majority is not managed soundly, harming the environment and our health.

Our planet is running out of resources, yet populations continue to grow. If the global population reaches 9.8 billion by 2050, it is estimated that the equivalent of almost three planets will be required to provide the natural resources needed to sustain current lifestyles.

For the survival and well-being of people and the planet, these statistics highlight the importance of transforming the way we use and respect our finite resources. Studies show that to return to safe limits of consumption, we need to reduce global material extraction and consumption by a third. Transitioning to a circular economy will be instrumental in achieving this goal. The circular economy (CE) refers to an economic model that promotes the efficient use of resources by reducing waste, preserving the value of products for a longer period, and reusing materials. This approach can lead to sustainable development by decoupling economic progress from the waste of natural resources and environmental damage. Transitioning to a circular economy involves designing products for longevity, repairability, and recyclability. It also promotes practices such as reusing, refurbishing, and recycling products to minimize waste and resource depletion. Individuals can also adopt more sustainable lifestyles by consuming less, choosing products with lower environmental impacts, and reducing the carbon footprint of their daily activities.

This paper examines the participation of consumers in the process of transition to a circular economy and analyses how their behavior and choices can contribute to sustainable development and climate change mitigation. Through the analysis of consumer behavior, it is sought to understand better the barriers and opportunities for promoting circular practices, as well as the importance of empowering consumers through education and policy support.

This paper is structured in six chapters. The first chapter analyses climate change, presenting the human factor and its consequences. Then, the concept of the Circular Economy is discussed and its benefits, such as environmental protection, reduction of dependence on raw materials, job creation, and resource savings.

In the second and third chapters, a review of the existing literature is carried out. In particular, several relevant studies are presented that analyze how consumer behavior influences the adoption of circular economy strategies. The paper examines the three-dimensional role of consumers as buyers, users and discarders of products at the end of their life cycle. It also presents the challenges consumers face in adopting these practices, such as the difference between intention and action. Overall, the importance of understanding consumer behavior and

encouraging them to adopt more sustainable practices to reduce emissions and achieve the goals of the Circular Economy is highlighted.

Subsequently, chapter four constitutes the empirical part of this research and presents the purpose of the research, the research question, the research methodology applied, the description of the research sample, the research tool used and the method of data collection.

In chapter five, the results of the findings obtained from the data analysis are presented in detail in the form of tables and charts. Finally, in chapter six, the conclusions of the research are presented, and an attempt is made to interpret the data and link them to the literature review.

1. Understanding the Circular Economy and Climate Change

1.1 What is climate change?

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as: "A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable periods." This definition underscores the human influence on climate change, particularly through activities that lead to the release of greenhouse gases into the atmosphere, resulting in alterations in the Earth's climate patterns. In 2018, the US National Climate Assessment concluded that the “earth's climate is now changing faster than at any point in the history of modern civilization, primarily as a result of human activities” (Jay et al. 2018, p. 34).

By 2017, Earth's average temperature had increased by 1°C above preindustrial levels as a result of GHG emissions and changes in albedo (IPCC 2018, p. 51). It will be difficult to limit total warming to less than 2°C, and extremely difficult to reach the goal of 1.5°C, regarded as an upper bound to avoid great risk of harm to the economy, human health and well-being, and Earth's ecosystems. As the Intergovernmental Panel on Climate Change (IPCC 2018, p. 15) puts it: “Pathways limiting global warming to 1.5°C with no or limited overshoot would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems (high confidence). These systems transitions are unprecedented in terms of scale, but not necessarily in terms of speed.”

The change in average temperature is accompanied by ocean acidification, sea-level rise, and shifts in many aspects of climate in addition to temperature. These processes interact with other global environmental changes (GECs), including biodiversity loss, modification of biogeochemical cycles, and the widespread dispersal of chemicals and materials that adversely impact ecosystems and disrupt services on which humans depend (Steffen et al. 2018).

Contemporary literature highlights the increasing significance of individual actions in addressing societal issues such as climate change. The foremost contributor to global greenhouse gas (GHG) emissions is the production of electricity and heat. Notably, the residential and commercial sectors collectively account for 60% of global electricity demand. The agri-food system, too, exhibits high levels of energy consumption and carbon output, resulting in a significant contribution to GHG emissions. The behaviors of individuals in managing electricity, heat, and food consumption wield considerable influence over GHG emissions, providing compelling opportunities for climate change mitigation among end-users. Hence, it is crucial to recognize the critical role of individual actions and motivate end-users to adopt sustainable practices to help reduce GHG emissions.

It has been estimated that through the realistic implementation of already-known changes in consumer behavior, the European Union (EU) could reduce its carbon footprint by about 25%. The most impactful changes include modifications in consumption patterns (28% of the total), reduced consumption (26%), shifting to goods with a lower carbon footprint in production (17%), and goods with less carbon emission during use (19%). The sectors that contribute the most to the carbon footprint of consumption are transport (39%), buildings (24%), and food (26%).

Recent research has demonstrated that the adoption of proposed consumer behavior modifications could enable the European Union (EU) to reduce its carbon footprint by approximately 25%. The most influential changes include altering consumption patterns, accounting for 28% of the total reduction, reducing overall consumption (26%), transitioning to products with lower carbon footprints during production (17%), and selecting items with reduced carbon emissions during use (19%). The sectors that contribute the most to the carbon footprint of consumption are transport (39%), buildings (24%), and food (26%).

However, the phenomenon of rapid urbanization has resulted in increased consumption, which has led to adverse impacts on climate change. This underscores the criticality of adopting a circular economy model for urban infrastructures. The Sustainable Development Goals (SDGs) and Paris Agreement commitments necessitate that cities worldwide establish creative strategies in urban infrastructure planning and service delivery.

1.1. What is the circular economy?

A circular economy (CE) can be defined as an economic model aimed at the efficient use of resources through waste minimization, long-term value retention, reduction of primary resources, and closed loops of products, product parts, and materials within the boundaries of environmental protection and socioeconomic benefits. A CE has the potential to lead to sustainable development, while decoupling economic growth from the negative consequences of resource depletion and environmental degradation (Murray et al., 2017; Babbitt et al., 2018; Hofmann, 2019).

The concept of the circular economy revolves around a production and consumption framework that prioritizes activities such as sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products for as long as is practically feasible. The primary objective of this approach is to extend the lifespan of products while minimizing waste generation. At the end of their useful life, products are subjected to efforts aimed at retaining their materials within the economy through recycling, thereby enabling their repeated utilization and the creation of additional value. This marks a deviation from the conventional linear economic model characterized by the take-make-consume-dispose pattern, which heavily relies on large amounts of inexpensive and readily available materials and energy sources.

Figure 1. CE strategies, from Potting et al. (2017)

Smarter product use and manufacture	**R0**	**Refuse**	Make product redundant by abandoning its function or by offering the same function with a radically different product
	R1	**Rethink**	Make product use more intensive (e.g. through sharing products or by putting multi-functional products on market).
	R2	**Reduce**	Increase efficiency in product manufacture or use by consuming fewer natural resources
Extend lifespan of product and its parts	**R3**	**Reuse**	Re-use by another consumer of discarded product which is still in good condition and fulfils its original function
	R4	**Repair**	Repair and maintenance of defective product so it can be used with its original function
	R5	**Refurbish**	Restore an old product and bring it up to date
	R6	**Remanufacture**	Use parts of discarded product in a new product with the same function
	R7	**Repurpose**	Use discarded products or its part in a new product with a different function
Useful application of materials	**R8**	**Recycle**	Process materials to obtain the same (high grade) or lower (low grade) quality
	R9	**Recovery**	Incineration of material with energy recovery

Source: http://www.researchgate.net/publication/337720193_Targets_for_a_circular_economy

1.2. Benefits: why do we need to switch to a circular economy?

1.2.1. To protect the environment

Efficient utilization and repurposing of products have the potential to decelerate the depletion of natural reserves, diminish disturbances to landscapes and habitats, and limit biodiversity loss. Adopting the principles of the circular economy can also lead to a decrease in the overall annual greenhouse gas emissions. The European Environment Agency reports that industrial processes and product utilization account for 9.10% of greenhouse gas emissions in the EU, while waste management accounts for 3.32%.

Designing sustainable and efficient products from the outset can significantly reduce energy and resource utilization. Research has demonstrated that over 80% of a product's environmental impact is determined during the design phase.

Transitioning towards more durable products that are easily reusable, upgradable, and repairable can substantially reduce waste generation. Packaging poses a significant challenge, with the average European producing approximately 180 kilograms of packaging waste annually. The objective is to address the issue of excessive packaging and improve its design to encourage reuse and recycling.

1.2.2. Reduce raw material dependence

As the global population continues to increase, so does the demand for essential raw materials. However, the availability of these resources is limited.

This scarcity of resources has led to some European Union (EU) countries relying on other nations for their raw material supply. Eurostat reports that the EU imports approximately half of the raw materials it consumes.

The value of raw material trade between the EU and the rest of the world has nearly tripled since 2002, with exports growing at a faster rate than imports. Nevertheless, the EU still maintains a trade deficit, importing more than it exports. In 2021, this deficit amounted to €35.5 billion.

Recycling raw materials helps to alleviate the risks associated with supply, such as price fluctuations, availability challenges, and dependency on imports. This is particularly crucial for critical raw materials essential for producing technologies vital for meeting climate objectives, such as batteries and electric engines.

1.1.3. Create jobs and save consumers money

The adoption of a circular economy has the potential to significantly enhance competitiveness, drive innovation, foster economic growth, and generate substantial employment opportunities across different sectors of the economy. The transition to a circular economy is a catalyst for economic growth, as it opens up new markets, drives investment in sustainable infrastructure, and stimulates demand for eco-friendly products and services. Projections indicate that the European Union alone could see the creation of approximately 700,000 jobs by 2030 as a result of embracing circular principles. These jobs span a wide range of sectors, including manufacturing, construction, waste management, and renewable energy. Furthermore, the circular economy creates opportunities for entrepreneurship and small businesses, particularly in areas such as repair, refurbishment, and remanufacturing.

This transition would entail the redesign of materials and products to fit into circular systems, thereby spurring innovation across various sectors and fueling advancements in technology and processes. In addition to the above, consumers are also poised to benefit significantly from the shift to a circular economy. They would have access to more resilient and inventive products, which would not only improve their quality of life but also deliver long-term cost savings. It is crucial to note that the transition to a circular economy is not only beneficial to businesses but is also vital to addressing environmental challenges and achieving long-term sustainability goals.

2. The concept of consumer engagement and its role in driving circular economy practices

Within a circular economy (CE), whose aim is the optimization of product and material cycles by keeping them at their highest utility (Ellen MacArthur Foundation, 2013), consumer behavior plays a critical role in the long-term success of businesses and infrastructures that integrate circular initiatives (Parajuly et al., 2020). The end-user engagement, a core enabler of the CE transition, determines the demand for CE-related products, such as those with long lifespans (high quality, adjustable, repairable, etc.) that slow down cycles (Shi et al., 2022; Wieser, 2016), reusable and recyclable products (Vadde et al., 2007; Weelden et al., 2016), refurbished and remanufactured products (Abbey et al., 2015; Piscicelli et al., 2018), recycled products (Mahmoodi and Heydari, 2021; Wong and Mo, 2013), repaired and second-hand products (Edbring et al., 2016; Nazli, 2021), and shared products (Camacho-Otero et al., 2018; Godelnik, 2017). Furthermore, the proactive role of consumers in properly discarding worn-out products at their end-of-life (EoL) can contribute immensely to the CE establishment and capitalization of residual products and materials.

2.1. The impact of consumer behavior on the circular economy

To benefit from the positive effects of a circular economy, consumer behavior plays a key role. More specifically, consumers are responsible for activating the circular economy mechanism

and for tightening the goods and consumer products supply chain. The role of consumers in the development of circular economy strategies has been approached from a variety of perspectives, including green consumer behavior, circular packaging purchases, consumer understanding of product circularity, the impact of consumer behavior on waste in such an economy, and consumer barriers to the circular economy. (Shevchenko et al., 2023). Therefore, consumer behaviors that prioritize buying durable, repairable, and recyclable products are more likely to support such an economy. On the other hand, consumer behaviors that prioritize buying cheap, disposable products are less likely to support a circular economy.

It summarizes the key insights related to consumer activities and behaviors based on their potential contributions to the implementation of the CE:

• Consumer activities contributing to the CE model involve several phases in the consumption stage of the product lifecycle: purchasing, usage, and EoL product discarding. In terms of operationalizing circular strategies, the consumption stage of the product lifecycle should be defined as a three-phase process, "to buy–to use–to return," where activities related to one phase influence those in the following phases.

• In terms of the acceptance of circular strategy-oriented products, consumer behavior deals with a variety of circular products, such as reusable and recyclable products, remanufactured and refurbished products, recycled products, up-cycled products, shared products, and second-hand products. Noteworthy, reducing, rethinking, and reconsidering the need to purchase a new product or one from a CE loop while sharing, renting, or leasing (e.g., through new product-service systems or circular business models) could be seen as additional opportunities for customers, both environmentally and economically.

• The "attitude–behavior" or "intention–behavior" gap remains a major issue in the CE transition and needs to be considered in tackling CE-related product acceptance by policymakers and CE stakeholders. In the CE framework, this gap involves consumers reporting that they are concerned about environmental issues and plan to acquire circular materials and products (i.e., self-reported intention). However, they are struggling to translate this into purchases (Young et al., 2010), often leading to potentially contradictory actions (i.e., actual behavior).

• Once a product is purchased, its lifetime can be extended through appropriate use, maintenance, repair, and reuse steps, thus securing progress toward more circular consumption, that is, slowing the loop and avoiding wastage. A product can have many users since it can be rented, sold, or donated for further use.

• Proper EoL product discarding is a crucial consumer contribution to the CE since it can better create the preconditions for reuse and recycling strategies and support the required operationalization. Consumer recycling behavior is determined by the available infrastructure as well as individual consumer characteristics such as attitudes to recycling, income, age, environmental awareness, etc.

2.2. The tri-dimensional role of the consumer in the CE model

In line with the objectives of the Circular Economy (CE), as outlined by Den Hollander et al. and Webster (Den Hollander et al., 2017; Webster, 2017), any action taken by consumers that helps to slow down or eliminate the wasteful use of materials can be categorized as a Circular Economy-oriented consumer activity. Figure 2 illustrates the multifaceted role of consumer behavior in the Circular Economy framework. We propose that this behavior comprises a continuous cycle of actions, including purchasing, using, and disposing of products, forming a structured triad or dynamic three-phase process. Figure 2 outlines the specific activities that consumers undertake, including their roles as purchasers, users, and holders of End-of-Life (EoL) products. Activities such as selling and donating are categorized under users, as these products are still functional and are being passed on to another user, rather than being disposed of as EoL products.

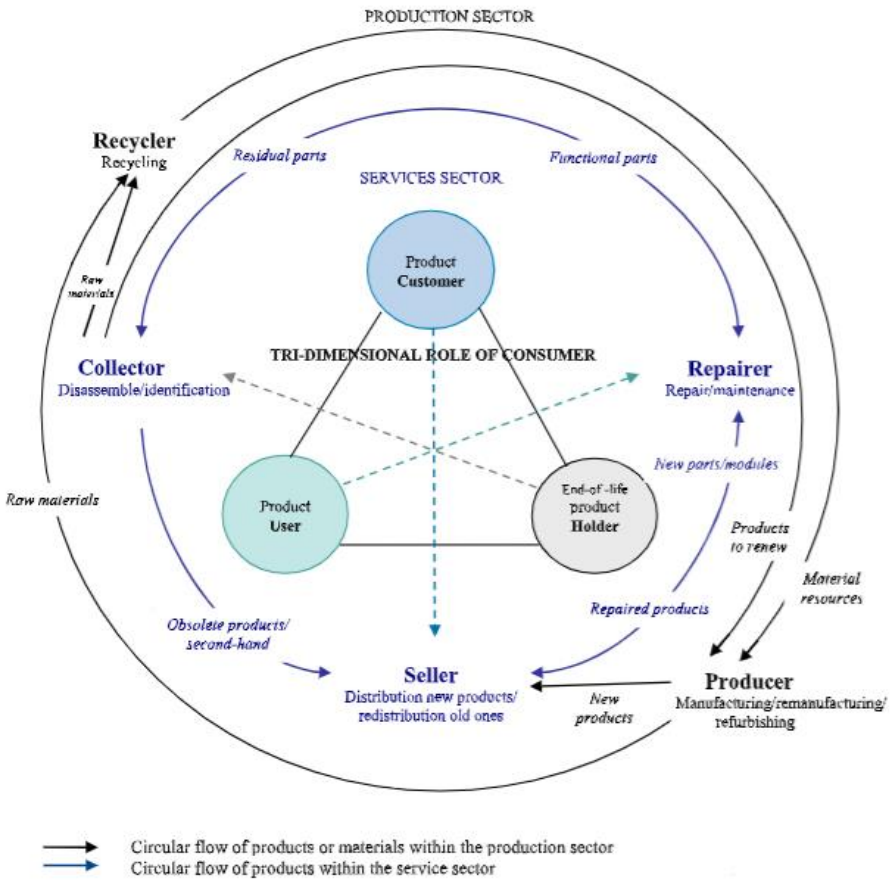
Sharing, gifting, renting, bartering, swapping, lending, and borrowing are alternative ways of consuming (Bocker ¨ and Meelen, 2017;) geared towards maximizing the utilization of underutilized assets, reducing the need for new purchases, and encouraging the reuse of possessions. Collaborative consumption has been integrated into the framework, encompassing both consumer behavior as purchasers, such as opting for a shared item over a new one they own, and as users, engaging in activities that align with Circular Economy principles, like conscientious product usage.

Figure 2 Tri-dimensional role of the consumer in the CE.

Source: https://www.sciencedirect.com/science/article/pii/S0959652622051423

According to Shevchenko et al. (2023), Fig. 3 illustrates the three-phase process of consumer activity that fosters the operationalization of CE strategies. The figure illustrates distinct material and/or product flows between the production and service sectors. While activities like production, recycling, repair, and distribution are typically economically driven on the part of producers, consumer behavior impacting circularity is influenced by various subjective factors. In fact, due to individual attitudes, consumer actions within the Circular Economy (CE) should be viewed as a unique effort to prolong the value of materials and products within the economic system. This effort involves accepting, using appropriately, and properly disposing of CE-related products or services. Additionally, the diagram highlights connections to other actors within the economic system, underscoring the importance of consumer activities in shaping circular business models that leverage residual materials and products.

Figure 3 The three-phase process of consumer activities in the CE.



Source: https://www.sciencedirect.com/science/article/pii/S0959652622051423

The consumer, as the individual utilizing a product, acts as the initial catalyst in the consumption phase. Their role in furthering the Circular Economy (CE) hinges on their selection of products or services crafted with CE principles, as opposed to those following the linear economy (LE) model. The level of circularity embedded in a product directly correlates with the consumer's CE contribution at this stage. Opting for a product aligned with the LE would result in zero contribution to the CE. Additionally, subsequent actions as a user and End-of-Life (EoL) product handler would have limited impact on the CE if the product lacks a history of CE practices. The circularity potential of a product, particularly its use of recycled and reused materials, dictates its ability to slow and eventually close the loop. Repairability is essential for extending a product's lifespan. Conversely, products incapable of reuse or recycling hold no promise for future loop closure. Thus, the consumer's role as a customer serves as a linchpin for the CE, with their contribution directly linked to the acceptance of CE-aligned products.

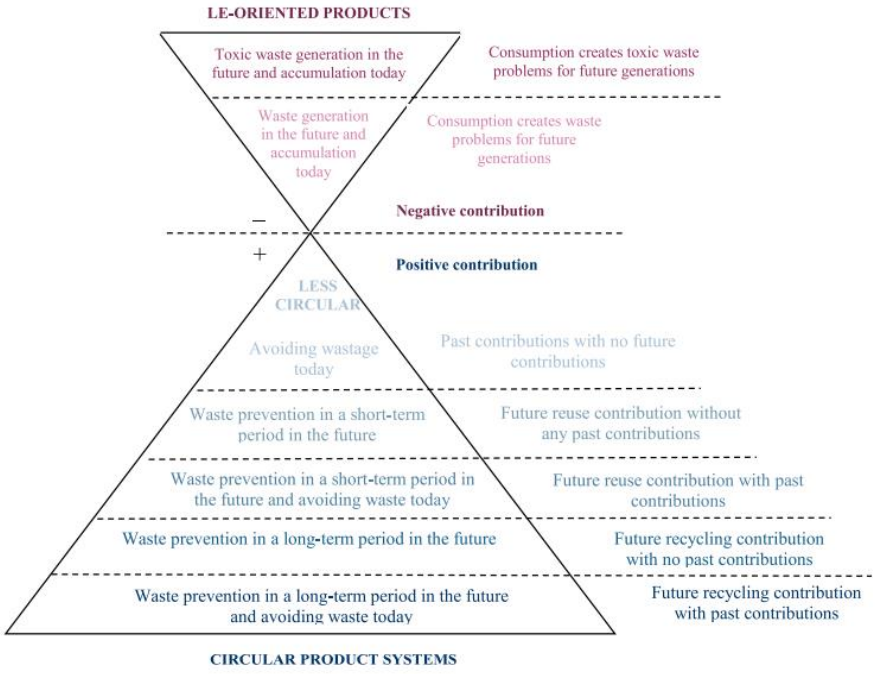
2.3. Measuring consumer contributions to the CE

The environmental benefits of the CE are in the input phase related to the reduced need for virgin materials and energy inputs as well as the use of renewable ecosystems; in the output phase, they relate to reduced waste and emissions, multiple uses of resources, and waste becoming nutrients for future use (Korhonen et al., 2018).

According to Shevchenko et al. (2023), Figure 4 illustrates the transition from a linear to a circular system, showcasing a spectrum of consumer engagements in the Circular Economy (CE) ranging from detrimental to beneficial. The degree of consumer negativity correlates with the linearity of the system, whereas positive consumer contributions enhance circularity. In the upper triangle of the diagram, adverse consumer actions such as waste accumulation and subsequent environmental challenges lead to a linear system. The pinnacle of linearity is reached with the production of hazardous waste, signifying a significant negative impact on the CE and posing severe future repercussions. Conversely, positive consumer involvement, particularly as active purchasers, drives the system towards circularity across varying levels.

The most significant way consumers contribute to the Circular Economy (CE) is by selecting products aligned with the fifth level of contribution, situated at the bottom of the lower triangle. This signifies the highest level of circularity in the system and the most impactful positive consumer engagement. At this level, consumer choices not only reduce the demand for new materials and energy but also prevent waste generation and promote future recycling efforts. On the contrary, the least substantial positive contribution occurs when consumers choose products corresponding to the first level at the top of the lower triangle. Here, consumers solely address immediate waste without considering future implications. Between these extremes lie three additional levels of consumer contribution, each varying in circularity from more to less circular, spanning from the fourth to the second level.

Figure 4 The hierarchy of consumer contribution to the CE.



Source: https://www.sciencedirect.com/science/article/pii/S0959652622051423

2.3.1. Avoiding wastage today

This level of consumer contribution to the Circular Economy (CE) entails purchasing particular products that extend the usefulness of them and/or their materials today, thereby minimizing waste, without considering future contributions from a long-term standpoint. Essentially, consumers at this level focus on products designed to slow down or close loops in terms of circular product categories, which reflects a historical perspective on product design and usage patterns.

Positioned at the uppermost part of the lower triangle in the hierarchy depicted in Figure 4, this level results in fewer circular systems and entails a minimal contribution from consumers as customers. Such consumer behavior tends to prioritize immediate benefits without considering the broader implications for resource conservation and environmental sustainability. Consequently, while it may address short-term waste reduction, it lacks the forward-thinking approach necessary to achieve lasting circularity within the CE framework.

2.3.2. Waste prevention in a short-term period in the future

This level denotes buying products of a specific category that contribute to prolonging their useful lifetime in the future. This can be mapped to the slowing loop-based products from the viewpoint of the circular product category. The consumer contribution to the CE at this level is lower-middle, corresponding to the second top level in the lower triangle of the hierarchy in Figure 4, which involves more circularity compared with the top of the triangle.

This level represents purchasing products that aim at extending their usefulness in the future. These products are designed to slow down the depletion of resources, thus contributing to waste prevention over time. This category aligns with the concept of slowing loop-based products within the circular product framework.

2.3.3. Waste prevention in a short-term period in the future and avoiding waste today

This level signifies purchasing products aimed at extending their usefulness today to prevent waste, thereby also extending their usefulness and/or that of their materials in the future. This moderate level of consumer engagement in the Circular Economy (CE) aligns with three circular product categories: products designed to slow down resource depletion in the future, those geared towards closing loops based on past practices, and those intended to slow down the depletion of resources.

This consumer contribution level falls within the lower triangle of the hierarchy illustrated in Figure 4. It reflects a balanced approach, acknowledging the importance of immediate waste reduction while also considering the long-term implications for resource conservation and sustainability. By opting for products designed to prolong lifespan and material utility, consumers play a crucial role in fostering circularity within the CE framework, albeit at a level that is intermediate in terms of its impact.

2.3.4. Waste prevention in a long-term period in the future

Advancing toward a more circular system in comparison to preceding levels, this stage reflects a higher-middle level of consumer engagement in the Circular Economy (CE). At this level, the emphasis lies on purchasing products from specific categories geared towards extending the useful lifespan of materials in the future. These products are akin to future closing loop-based products, designed to contribute to waste prevention and resource conservation over time.

Additionally, they are mapped to products intended to extend the useful lifespan of both products and materials in the future, aligning with the principles of future closing and slowing loop-based products within the circular product spectrum.

Consumers at this level demonstrate a proactive stance towards sustainability, opting for products designed to minimize waste and promote resource longevity. This level represents a notable step forward in fostering circularity within the CE framework, marking a higher degree of consumer involvement and commitment to long-term environmental stewardship.

2.3.5. Waste prevention in a long-term period in the future and avoiding waste today

This level represents a significant step towards waste prevention and circularity within the Circular Economy (CE), harnessing the considerable impact of consumer choices. Positioned at the bottom of the consumer contribution hierarchy in Figure 4, it epitomizes the pinnacle of circularity. Here, purchasing products is seen as a direct contribution to extending their lifespan today, thereby avoiding waste and promoting the longevity of both the products and their materials into the future.

Consumers at this level play a crucial role in driving sustainability by opting for products designed for longevity and resource conservation. By prioritizing waste prevention in the present, they effectively contribute to reducing environmental impact and fostering a more sustainable future. This level underscores the profound influence of consumer behavior on advancing circular principles within the CE framework.

3. The limitations of current approaches to the CE consumer embeddedness

According to Greene et al. (2024), little policy and research attention has been paid to the complexities of achieving necessary transformations in everyday cultures of consumption and the possible challenges faced by citizens and householders in achieving a circular economy. According to their article, it is presented several critical elements, including the examination of routine and habitual aspects of social life, dynamics of rebound and spillover effects within interconnected practices, and the impact of institutional-material arrangements and provisioning systems on how consumers use services and products in the performance of social practices.

3.1. Sufficiency and higher ‘R’ strategies.

The European Commission introduced its updated Circular Economy Action Plan (CEAP) in 2020, a pivotal element of its strategy towards achieving climate neutrality by 2050. Among its 35 comprehensive initiatives, significant attention is directed towards enhancing specific production methods and materials, particularly in sectors like plastics and batteries. However, the plan also introduces a novel emphasis on end-users and consumers, highlighting the importance of empowering consumers to make informed sustainable decisions through labeling and the availability of more efficient and circular products (European Commission, 2022: 2).

Nevertheless, while the focus on efficiency and consumer empowerment, particularly at the point of sale, is crucial, it is also somewhat limited. As extensively debated in social research, the concept of consumer choice is deeply entrenched in rational-economic and psychological models of behavior change, assuming that the provision of information and psychological factors such as intentions are the primary drivers of action (Shove, 2010). The CE policies of

the EC and those implemented at national levels across Europe often operate under the assumption that offering sustainable or more efficient goods and services will naturally lead to consumers making 'better' purchases. However, these policies frequently overlook the significant impacts of consumer behavior post-purchase, including usage and disposal, which are vital according to life cycle analyses (Cooper, 2020; Suckling and Lee, 2015) and influenced by prior experiences and complex domestic and social factors, as demonstrated by studies on consumer practices (Hipp and Jaeger-Erben, 2021).

The European Commission's initiative on 'eco-labeling' is constrained in its ability to induce important shifts in consumer behavior, such as reducing consumption or reevaluating the necessity of purchases. While labeling policies may prompt consumers to reassess the brand or category of product they purchase, despite their potential to heighten awareness and intentions, they frequently fall short of translating into substantial alterations in consumer buying patterns. Studies suggest that labeling programs have limited efficacy in driving behavioral change on a scale and pace requisite for substantial societal and environmental impact (Meis-Harris et al., 2021). This underscores the presence of the so-called 'value-action' gap, wherein predominantly survey-based research consistently reveals a disparity between self-reported individual attitudes or intentions and actual behavior, impeded by diverse personal and contextual factors.

There are new initiatives in Europe that aim to establish a 'right to repair' for consumers. These initiatives are designed to tackle issues like "greenwashing" and premature product obsolescence. However, they do not take into account the considerable challenges associated with encouraging consumers to adopt repair and reuse practices in their daily lives. Despite the emergence of Repair Cafes and online platforms for second-hand goods such as Vinted, participation in Circular Economy behaviors like repairing and sharing remains consistently low across Europe (Jaeger-Erben et al., 2021; Koch and Vringer, 2023; Moalem and Mosgaard, 2021).

Contrary to initial expectations that the Covid-19 pandemic might foster sustainable lifestyles, there has been a 'rapid rebound' in greenhouse gas emissions instead (Tollefson, 2021). The concept of the 'green,' 'circular,' or 'eco' consumer, who exhibits a preference for green labeling and energy-efficient products, has not yet gained widespread acceptance among the majority of consumers, despite being a theoretical construct.

When considering higher R strategies, the emphasis is often placed on their use in production-related and business-to-business transactions, while disregarding their potential application in the daily consumption of citizen-consumers. However, higher R practices, such as sharing, repairing, reducing, and reusing consumer goods, are crucial to achieving the circular economy's objectives and require active citizen-consumer involvement. Scholars in the field of sustainability have long maintained that sufficiency-based approaches, including higher R strategies, are imperative to achieving significant reductions in consumption. Sufficiency involves both individual efforts to reduce material consumption and systemic transformations toward cultures that prioritize reduced consumption as a political strategy. The goal is to create

a culture that values sufficiency, recognizes the benefits of reduced consumption, and promotes sustainability.

3.2. Consumption as routinized and coordinated social practice

Many current strategies aimed at implementing the Circular Economy (CE), such as eco-labelling, are based on the assumption that consumption is comprised of isolated, somewhat rational decisions driven by individual optimization of factors like cost, convenience, and personal preference. This implies that consumers make choices based on a rational evaluation of the relevant factors while being unaffected by external factors and social norms. This perspective is rooted in utilitarian perspectives on behavior that regard consumers as passive and rational actors who will follow labels and production-side signals when making decisions. This viewpoint is reflected in both the Circular Economy Action Plan (CEAP) and national CE policies across Europe, where economic incentives and informational labeling are highlighted as the primary methods for engaging consumers. However, consumption is a complex phenomenon intertwined with social dynamics and established routines, as revealed by social science research.

Using resources involves more than just obtaining the 'right' goods and disposing of waste properly; it's deeply entwined with the intricate practices that constitute daily life. On one hand, everyday consumption often occurs automatically, becoming part of habitual routines that require little thought. Effecting change in these practices necessitates bringing them into conscious deliberation or ‘discursive awareness' (Giddens, 1984; Greene and Royston, 2021), even if only momentarily (Hobson, 2003). However, such moments of awareness are rare unless established routines are somehow disrupted. On the other hand, conscious processes are at play within shared households, where negotiations and decision-making are shaped by the context of 'doing family' and everyday life (Jaeger-Erben and Offenberger, 2014).

This implies that to encourage consumers in the Circular Economy (CE) to adopt more sustainable behaviors in their daily lives, recommendations should go beyond simply targeting individual consumption habits. Instead, we need to consider the intricate social practices where resource use occurs. For example, studies on sustainable product service systems demonstrate how embracing new practices like car sharing instead of individual car ownership can have widespread impacts on people's lives. These impacts affect how daily routines are organized, such as when outings occur, how shopping is done, and the overall spatial distribution of daily activities.

Policy and academic discourse typically suggest addressing these challenges by enhancing the convenience and affordability of offers for consumers (Hobson, 2021). Nevertheless, this approach overlooks the importance of considering consumers' perspectives, as argued by social science researchers, who emphasize the integration of new consumption practices into individuals' daily routines amidst various competing demands on their time and resources (Akbar and Hoffmann, 2018).

Therefore, a comprehensive understanding of how higher R practices—such as reducing, sharing, and repairing—can be implemented across various everyday contexts is essential to facilitate the broad integration of the Circular Economy (CE) into society. It is strongly argued that achieving this necessitates a shift in policy and research priorities. Instead of solely concentrating on individual consumer behaviors, there needs to be an acknowledgment that the success of reducing, reusing, and repairing consumer goods hinges on their seamless integration into numerous daily activities, such as commuting, working, shopping, child care, home maintenance, and cleaning.

In this regard, the effectiveness of Circular Economy (CE) policy initiatives is likely to be enhanced by transitioning from simply informing consumers to targeting the dynamics of social practices (Spurling and McMeekin, 2015). This entails developing policies that go beyond individual decision-making to address the elements and connections within practices. It also involves directing attention toward social, material, and institutional structures that can facilitate the adoption and integration of circular practices while phasing out wasteful linear ones. An agenda for a policy that is deeply rooted in the social context, bolstered by thorough qualitative research and broader practice-based methodologies, can enhance the comprehension of the varied paths of circular practices. This involves analyzing how these practices evolve across diverse everyday situations and devising strategies for expanding them, taking into account how individuals embrace and incorporate sharing and repairing into their daily lives.

3.3. Understanding rebounds and spillovers at the nexus of daily practices

Makov and Font Vivanco (2018) posit that the Environmental Rebound Effect (ERE) is highly influenced by consumer actions. Kjaer et al. (2018) identify three consumption factors contributing to the rebound effect in Product-Service Systems (PSS): money, time, and access. These factors can be interpreted as the income effect, where consumers, benefiting from cost savings through Circular Economy (CE) strategies, opt for lower-priced, less time-consuming, or more readily available alternatives, thereby altering demand. As a result, the user can consume other products and spend time doing non-efficient and higher environmental impact activities (Laurenti et al., 2016). Therefore, consumer behavior may ultimately lead to increased consumption, even when choosing sustainable options, and a shift in habits.

In the realm of consumption and resource utilization, rebound effects are grounded in the concept known as the Jevons paradox: the observation that improvements in energy and resource efficiency are often connected with rising, not falling, consumption (Ruzzenenti et al., 2019; York et al., 2022). These rebound effects can occur in different ways and at different levels of society. Direct rebound effects might involve individuals or organizations using more of a resource because it has become cheaper or more accessible due to efficiency improvements. Indirect rebound effects might involve broader societal changes, such as economic growth leading to overall increased consumption at the national level, or changes in consumption patterns within specific regions or households. In essence, rebound effects can

impact consumption behaviors at different levels of society, ranging from large-scale national economies down to individual households.

At the household level, insights from psychology and economics underscore the possibility of direct rebound effects occurring when improvements in resource efficiency or cost savings in one realm lead to increased consumption of the same resource or product. For instance, if energy-efficient appliances lower electricity bills, consumers might choose to utilize those savings by using the appliances more frequently, thus nullifying the initial energy conservation. On the other hand, indirect rebound effects manifest when efficiency gains or cost reductions in one area of consumption spill over into related consumption domains. For example, an individual upgrading to a more fuel-efficient vehicle might opt to take long-distance flights for vacations or splurge on additional clothing with the money saved on fuel costs. In this context, the efficiency gains from the new car indirectly result in heightened resource consumption in air travel or consumer goods, highlighting how changes in one aspect of consumption can trigger rebound effects in entirely different spheres.

The importance of rebound effects in circular consumption cannot be overstated. The few studies that examine household-level rebound effects demonstrate, using economic and material Life Cycle Assessment methods, that they can completely undermine any environmental gains resulting from behavioral changes (Yu et al., 2013; Hediger et al., 2018). For instance, Ottelin et al. (2020) discovered that due to rebound effects, exacerbated by unfavorable conditions in political-economic systems, circular consumption behaviors have little impact on reducing material footprints. Other studies support this, showing that efficiency enhancements in households result in lower-than-anticipated energy savings because of both direct and indirect rebounds (Hediger et al., 2018; Greening et al., 2000; Sorrell et al., 2020). Researchers have identified rebound effects of up to 626% for common appliances like air conditioners, microwaves, cars, and washing machines, attributed to "improper use" and consumer materialism (Yu et al., 2013). Despite these findings, there is a noticeable lack of comprehensive understanding regarding the contexts, patterns, and mechanisms that embed rebound effects in daily life.

By advocating for research exploring rebound effects within the framework of social practices, we emphasize the opportunity to enhance our comprehension of the diverse contexts and mechanisms that give rise to both direct and indirect rebounds in everyday life. Viewing these phenomena through this perspective allows us to examine how shifts in consumption behaviors, stemming from the adoption and normalization of circular practices, might inadvertently trigger direct or indirect influences on related practices, potentially undermining or complicating the expected positive environmental outcomes of circular systems. For instance, opting out of single-use plastics could result in increased driving to plastic-free markets or more frequent dining out (Rabiu and Jaeger-Erben, 2023), which, although not conventionally labeled as rebound effects in terms of resource reinvestment, still warrant consideration for their interconnected effects. Moreover, our present comprehension of how social diversity affects rebound effects is restricted (Shojaeddini and Gilbert, 2023). This limitation is particularly evident concerning how various everyday life contexts - such as work setups,

household size and composition, life stages, income, social standing, and various daily routines - impact the occurrence and patterns of rebound effects across different societal segments.

3.4. Consumption work, care work, and uneven capabilities

In the realm of social science research on domestic chores, the notion of 'consumption work' represents a crucial yet frequently disregarded aspect of citizen engagement in the Circular Economy (CE) (Hobson et al., 2021). 'Consumption work' refers to the informal and unpaid labor regularly undertaken by consumers, playing a vital role in both consumption and production processes. For instance, consider the labor involved in recycling, which encompasses tasks like cleaning, sorting, and properly disposing of items—essential everyday activities for the efficient operation of modern waste management systems. Although these practices have become routine in many developed nations, their establishment requires intricate institutional and material interventions, and ensuring their proper execution by households remains an ongoing challenge for the waste management sector. Other pertinent examples include the time and effort invested in having a product repaired or in engaging in goods exchange through sharing platforms.

The significance of consumption work in the Circular Economy lies in the fact that many consumer practices crucial to its operation rely heavily on substantial and often unnoticed physical and emotional labor from consumers. For instance, research indicates that activities like sharing, renting, repairing, reusing, and borrowing require considerable time, planning, logistical coordination, and emotional investment, all of which can clash with the demands of modern lifestyles. The extent of this consumption work is closely tied to the accessibility of essential resources, spaces, social networks, and institutional frameworks necessary for engaging in these practices. Advancing "repair cultures" would entail legal and institutional adjustments, such as mandating manufacturers to provide technical details and spare parts, which are presently not obligatory. It also involves ensuring that the requisite time, space, and skills for repair are accessible to the general populace. This presents a significant challenge, given the increasing technical complexity of many everyday products and the time constraints inherent in contemporary work and daily routines within modern societies.

Furthermore, certain empirical investigations uncover reported concerns and adverse encounters associated with organizing, coordinating, and managing relationships with others when engaging in borrowing and sharing goods. Individuals express unease regarding the potential new dynamics of care that might emerge when product ownership remains with service providers, as this entails the necessity of more frequent cleaning or repair compared to privately owned items. This aspect of "care work" is a pivotal component of consumer practices within the Circular Economy, leading many individuals to prefer impersonal transactions.

3.5. Systems of provision and institutional-material arrangements

The dominant individualistic and utilitarian perspectives in the Circular Economy (CE) overlook broader political and economic frameworks shaping meaningful change. Discussions

often neglect the underlying structures influencing everyday consumption practices, termed "systems of provision." These structures, affecting production, consumption, power dynamics, and cultural contexts, require attention (Fine et al., 2018; Fine and Bayliss, 2021).

Adopting socio-technical systems of provision perspective necessitates reevaluating contemporary political-economic cultures driven by capitalist markets. These cultures elevate consumer desires, turning consumption into a central societal force, and shaping social order and norms (Bauman, 2007). Ignoring fundamental principles of capitalist economic growth undermines efforts to address rebound effects and reduce resource consumption (Schroder et al., 2019; Deutz, 2023).

When examining the interaction between provisioning contexts and circularity in daily life, it becomes valuable to differentiate between market and non-market activities that support sufficiency-based circular economy practices. Market activities involve transactions using money for goods and services, while non-market sufficiency activities encompass actions occurring outside of markets, such as do-it-yourself endeavors (e.g., repairing items), voluntary work, swapping, and refraining from purchasing. These "socially innovative" practices hold significance beyond monetary value, contributing to alternative economies characterized by care, longevity, and communal values (Jaeger-Erben et al., 2015).

In contemporary Circular Economy (CE) models, non-market activities play a pivotal role. For instance, the CE strategies of Welsh and Irish governments prioritize civic and community efforts, often reliant on short-term charitable funding, to promote re-use, repair, and remanufacture. Conversely, in countries like the Netherlands, market-based CE activities are integrated into broader governance frameworks. However, the impact of these governance approaches on everyday circular practices remains largely unexplored.

Policy makers have various options to strengthen and establish missing markets, institutional support, and services crucial for promoting the expansion of circular practices in society. When scrutinizing the underlying principles of provisioning systems and examining production and consumption behaviors, it's important to acknowledge the significant impact of institutional and social environments in daily life. Encouraging practices such as sharing and repairing requires tailored strategies that consider diverse societal contexts. Urban social networks and institutional settings such as workplaces, schools, universities, neighborhoods, and community groups provide opportunities for co-designing and expanding circular consumption practices. However, these everyday spaces often present challenges to circular consumption. For example, workplaces, acting as "time-ordering institutions," can influence home consumption practices, making it difficult to adopt time-intensive circular or sustainable consumption behaviors (Greene et al., 2022). To promote the widespread adoption of circular consumption practices, it's crucial to understand and address the challenges and opportunities within these everyday spaces.

Circular Economy policies are often developed through top-down approaches. However, supporting bottom-up processes of change and nurturing grassroots innovations is crucial. Many community-driven circular innovations have emerged across Europe and beyond, from

volunteer-run repair cafes to digital sharing platforms, workplace endeavors, and municipal Circular Craft Centers. Acknowledging and supporting these initiatives as important centers where circular practices originate is vital for their expansion and success.

In summary, moving consumer research from isolated behaviors to broader interconnected practices requires examining supply system structures and daily institutional-material setups. This shift is crucial for understanding the relationship between consumption and socio-technical frameworks, and for finding ways to reshape systems to support circular behaviors. It's important to recognize how capitalist values influence consumer societies and align them with circular principles.

4. Methodology

4.1. Research purpose and research questions

The research purpose of this paper is to investigate the attitudes, perceptions, and practices of consumers regarding the circular economy. Investigated how consumers behave, what habits they have that have a low ecological footprint, what practices they use to make decisions about the purchases they make and manage their waste, and how much they value and want to be informed and change their way of consumption to contribute to the consolidation of the circular economy.

The research questions that the research results and the statistical analysis of the collected data are intended to answer are the following:

1) What is the level of consumer awareness of the principles of the circular economy and the fight against climate change?

2) To what extent do they think it is personal responsibility, or the responsibility of companies and the government to reduce climate change?

3) To what extent do they apply good practices for purchasing products and services and managing their waste?

4) What are the obstacles they have to face and what motivations would encourage them to a more sustainable way of life?

4.2. Research methodology

Initially, the research objective was defined and the research questions were formulated. It was decided that the best way to answer the research questions was through quantitative research using a questionnaire. The questionnaire, listed in Annex I, was created to answer the research questions. The questionnaire was then distributed online through the Google platform Forms, to collect 100-150 completed questionnaires. As soon as the required number of completed

questionnaires was collected, the process of collecting answers was stopped and coding followed, i.e. the conversion of verbal answers into quantitative ones so that the statistical analysis could follow through the SPSS statistical package. The statistical analysis was done on the one hand by applying the approach of descriptive statistics and on the other hand by applying correlation analysis. As part of the correlation analysis, it was investigated whether the knowledge of consumers about the circular economy contributes to its implementation.

4.3. Research sample

The research sample consists of a total of 133 Greek consumers. No restrictive demographic criteria were set for the collection of the research sample. For this reason, after all, the research sample consists of people coming from various age groups, from both sexes, and different educational levels and professional fields. In this way, it was considered that the reliability and validity of the conclusions drawn in this work from the collected research data and the results of their statistical analysis increased. For the collection of the 133 individuals who make up the research sample of the present thesis, the convenience sampling method was followed. The specific sampling method is described and analyzed in Emerson (2015). He classifies convenience sampling as a group of random samples. This means that participants were selected based on their easy accessibility to the researchers and their willingness to participate in the thesis, with no strict criteria for their demographic composition. Emerson (2015) states that this specific sampling method is one of the most effective for researchers to gather the amount of research sample required to complete their research, in a short period (Emerson, 2015). The process of collecting the research data lasted about a week and more specifically from 06/23/2024 to 06/30/2024.

4.4. Research tool

The data was collected by administering a questionnaire to the sample, which was prepared by the researcher. The questionnaire consisted of 6 sections. The first section presents the demographics of the consumers and consists of 4 closed-ended questions. The second section of the questionnaire examines the extent to which consumers are informed and knowledgeable about the circular economy, where this section consists of 3 closed-ended questions. The third section, presents the attitudes and perceptions of consumers about the circular economy and consists of 3 closed-ended questions. The fourth section examines consumer attitudes and practices for the circular economy and consists of 11 closed-ended questions. The fifth section examines the motivations and barriers faced by consumers when practicing the circular economy and consists of 2 closed-ended multiple-choice questions. Finally, the sixth section investigates the future participation of consumers in the circular economy, this section consists of 3 closed questions.

4.5. Data collection and analysis

After it was decided that the data should be collected through a quantitative survey to answer the research questions, the questionnaire was chosen as the most appropriate tool, as explained earlier. The questionnaire was created with the help of Google Forms. The researcher first explained the purpose of the research and assured them of anonymity and confidentiality, handed them the questionnaire along with a cover letter presenting the purpose of the research and asking them to complete it. The data was collected through social media (specifically Facebook), and posted in employee groups.

Since participation in the survey was voluntary, respondents had the right not to participate if they did not wish to do so. In order not to feel pressured in case they wished not to participate, but also to ensure their anonymity and confidentiality in case they decided to participate, the respondents had to consent to their participation in the research.

Data from the questionnaires were entered into SPSS v. 25 to perform the necessary descriptive statistics, ANOVA test and Pearson correlations. The results from the data analyzes are presented in the next chapter.

5. Results

5.1. Descriptive statistics

5.1.1. Section 1: Demographic Information

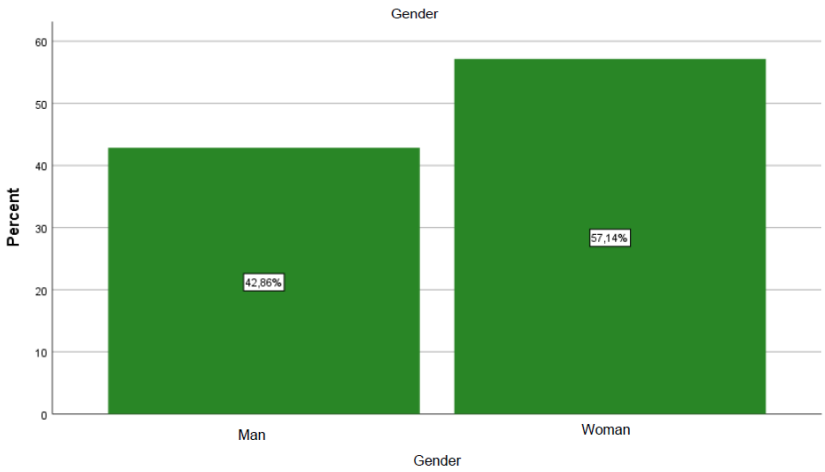


Diagram 1 Gender

133 consumers participated in this research, where most were women (N=76, 57.1%) and 42.9% of them were men.

This gender ratio ensures that the sample is representative, as it includes a fairly even distribution between men and women.

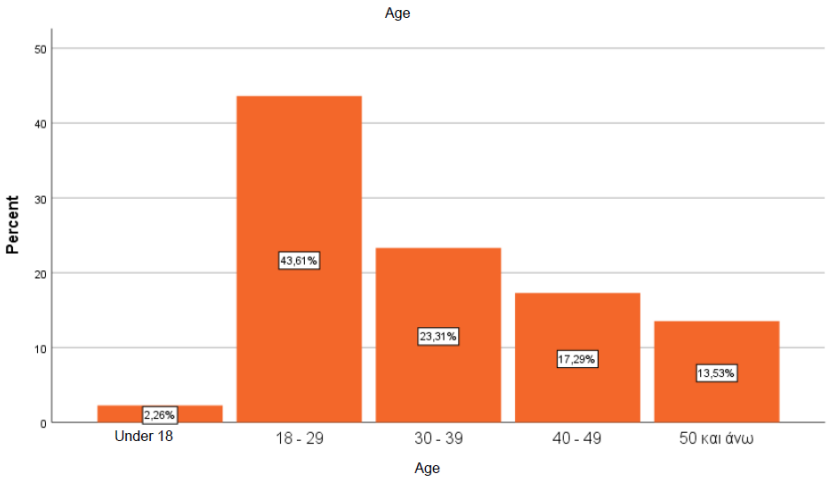


Diagram 2 Age

Diagram 2 shows that most participants were between 18 and 29 years old (N=58, 43.6%). 23.3% of consumers were between 30 – 39 years old, 17.3% of participants were between 40 – 49 years old, 13.5% of them were over 50 years old and 2.3% of them were under 18 years old.

This means that younger age groups are heavily represented in the survey, there are also older participants, but in smaller numbers compared to younger age groups. Lastly, only a small percentage of participants are under 18 years old, likely due to limited access to the survey or less interest in the topic among younger people. This distribution of age groups provides valuable insights into how different generations perceive and embrace circular economy practices, which is important for interpreting the results.

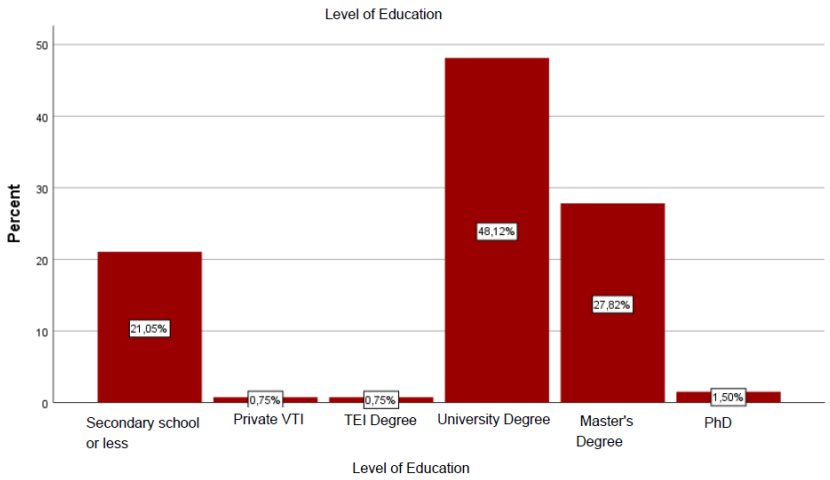


Diagram 3 Level of education

Diagram 3 shows that most consumers had a university degree (N=64, 48.1%). 27.8% of consumers hold a Master's degree, 21.1% of them are Secondary School graduates and 1.5% of them hold a PhD.

The high percentage of higher education among participants suggests a strong familiarity with circular economy principles and environmental issues. However, it's important to note that a significant portion of the sample had a high school diploma or lower education. This indicates that the survey captures the perspectives of individuals with diverse educational backgrounds, not just those with higher education.

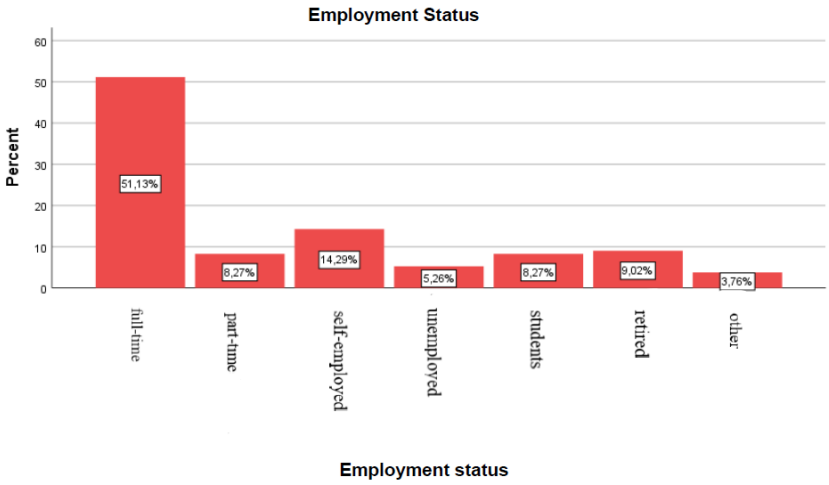


Diagram 4 Employment status

Diagram 4 shows that most participants work full-time (N=68, 51.1%). 14.3% of consumers are self-employed, 9% of them are retired, 8.3% of them work either part-time or are students, 5.3% of them are unemployed and 3.8% of them have another professional status.

The participants' occupational status reveals a diverse range of work situations, this diversity provides a comprehensive understanding of consumption attitudes and perceptions related to the circular economy while considering the varying economic and social circumstances of the participants. Full-time employed may indicate a stable income and potentially limited free time, but more financial flexibility to embrace sustainable consumption practices. Self-employed suggests different financial means and flexibility in their schedules, potentially influencing their consumption habits. Retired participants typically have a stable pension income and more available time, which may shape their priorities and purchasing habits. A portion of the participants are students, who may have limited income but a heightened awareness and interest in environmental issues. The unemployed participants signifying limited income and possible financial challenges, which may affect their ability to adopt sustainable practices.

5.1.2. Section 2: Information and Knowledge

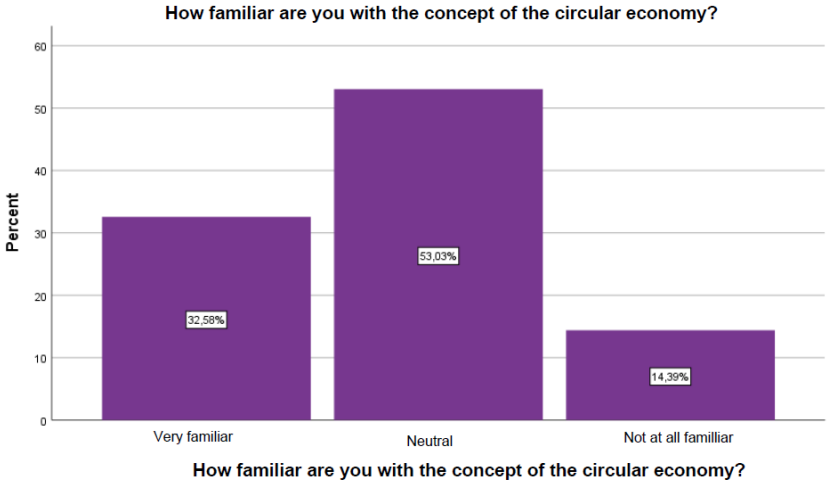


Diagram 5 Familiarity with the concept of circular economy

Diagram 5 shows that most consumers are neutral regarding their familiarity with the concept of circular economy (N=70, 53%). 32.6% of consumers are very familiar with the concept of circular economy and 14.4% of them are not at all familiar with the concept of circular economy.

This means that most of them do not have a clear understanding of the circular economy, possibly only being familiar with the term without fully comprehending its principles and applications. On the other hand, many participants claim to be very familiar with the concept of the circular economy, indicating a good knowledge and understanding of it. This could be due to personal interest, professional experience, or education. Lastly, fewer participants stated that they are not at all familiar with the concept of the circular economy, suggesting they have no information about its principles and practices.

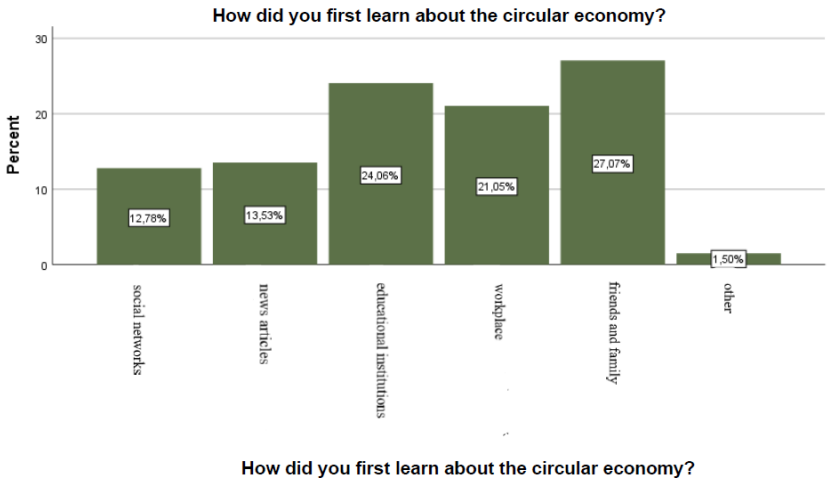


Diagram 6 First update on the circular economy

Diagram 6 shows that most consumers first learned about the circular economy from friends and family (N = 36, 27.1%). 24.1% of consumers first learned about the circular economy from educational institutions, 21.1% of consumers first learned about the circular economy from the workplace, 13.5% of participants first learned about the circular economy from news articles and 12.8% of them first learned about the circular economy from social networks.

It is evident from the results that people derive their knowledge about the circular economy from diverse sources. The most common source is personal communication, particularly from friends and family. This underscores the significant role of personal networks in raising awareness about environmental issues. Educational institutions and professional environments also play a crucial role in disseminating information about the circular economy. Furthermore, social networks and news articles contribute to the spread of information. This diverse range of sources emphasizes the need for a comprehensive approach to educating and informing the public about the circular economy.

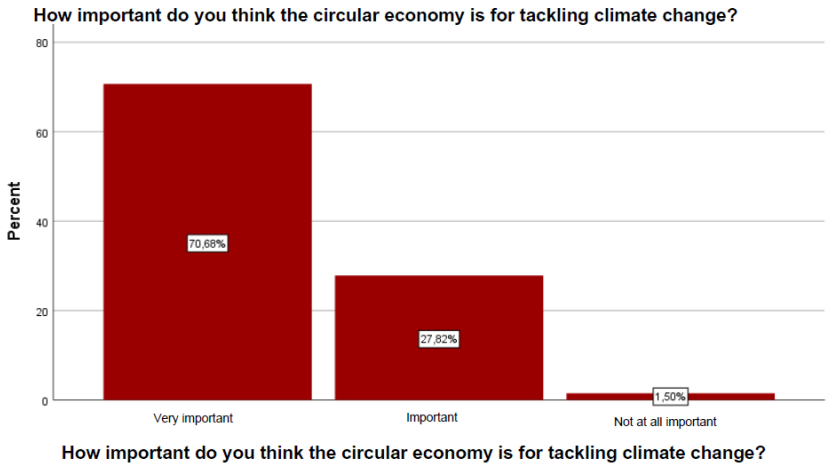


Diagram 7 Importance of the circular economy for tackling climate change

Figure 7 shows that most consumers indicated that the circular economy is very important for dealing with climate change (N = 94, 70.7%). 27.8% of consumers reported that the circular economy is important for dealing with climate change and 1.5% of them do not consider the circular economy important at all for dealing with climate change.

The survey results indicate a widespread understanding of the circular economy's significant contribution to reducing environmental impact and promoting sustainable practices. There is also a very small proportion of participants who do not consider the circular economy to be important at all in addressing climate change, indicating a need for further education and information on its benefits.

5.1.3. Unit 3: Attitudes and Perceptions

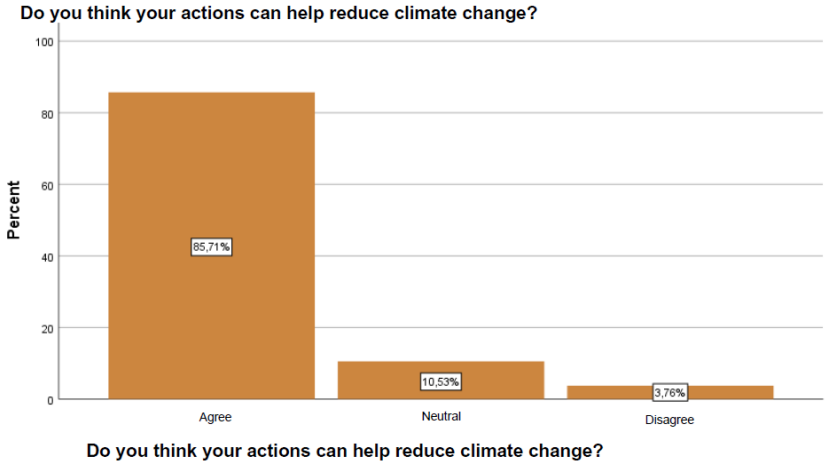


Diagram 8 Their personal actions can help reduce climate change

Diagram 8 shows that most consumers agree that their personal actions can contribute to reducing climate change (N = 114, 85.7%). 10.5% of participants have a neutral opinion regarding whether their actions can contribute to reducing climate change and 3.8% of them disagree that their actions can contribute to reducing climate change.

The survey results indicate that most people feel accountable and believe in the impact of their actions in addressing climate change. They are likely to adopt or are open to adopting more sustainable practices in their daily lives, such as recycling and choosing eco-friendly products. Fewer participants are neutral regarding the effectiveness of their actions in tackling climate change. These individuals may be uncertain about the impact of individual efforts or may believe that initiatives should primarily come from governments and large corporations. A very small percentage of participants do not believe that their actions can make a difference in reducing climate change. These individuals may think that individual efforts are insufficient in comparison to the necessity for widespread, systemic change, or they may be skeptical about the impact of individual actions.

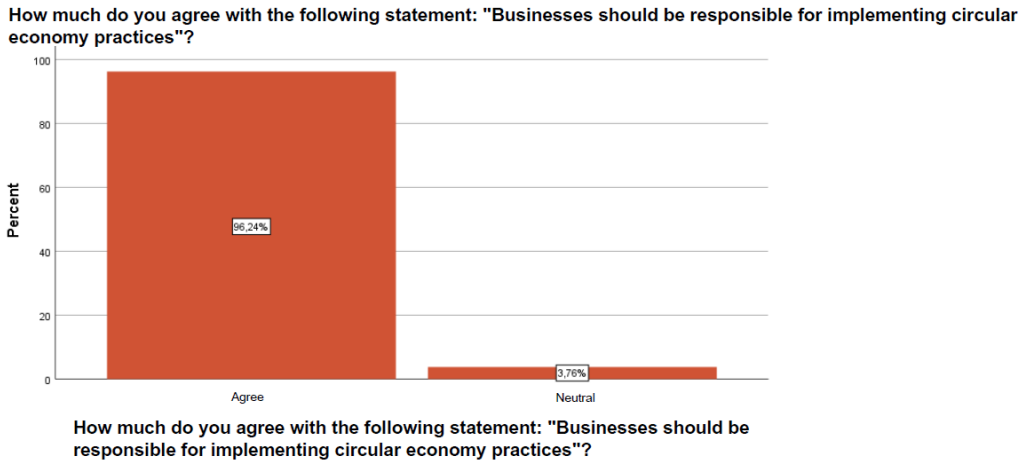


Diagram 9 The businesses must be responsible for implementing circular economy practices

Diagram 9 shows that most participants agree that businesses should be responsible for implementing circular economy practices (N = 128, 96.2%) and 3.8% of them neither agree nor disagree that businesses should be responsible for implementing circular economy practices circular economy.

The survey indicates that most people believe that businesses play an important role and carry a responsibility in promoting the circular economy. Participants believe that businesses should take action to reduce waste, recycle, reuse materials, and engage in other sustainable practices. A very small percentage of participants are neutral on the statement. These participants may not have a clear view or believe that responsibility does not solely lie with businesses, but should be shared among businesses, governments, and consumers. None of the participants disagree with the statement. This suggests a general acceptance of the idea that businesses have a key role in transitioning to a circular economy.

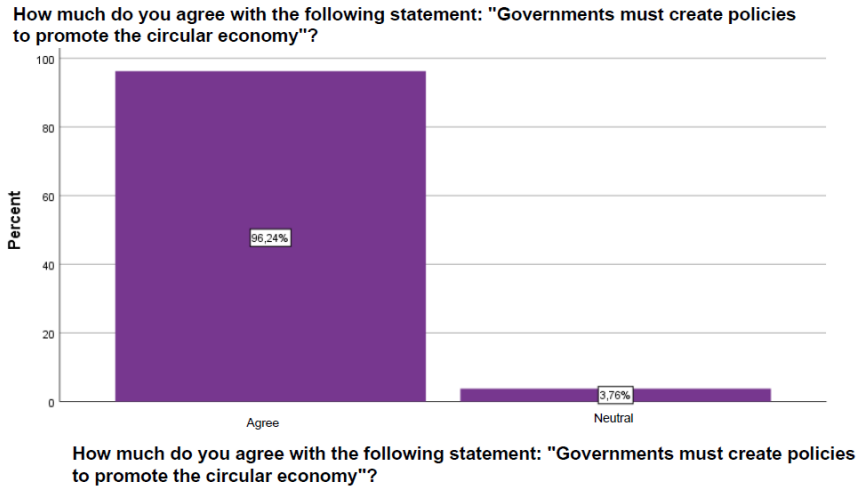


Diagram 10 Governments need to create policies to promote the circular economy

Diagram 10 shows that most participants agree that governments should create policies to promote the circular economy (N=128, 96.2%) and 3.8% of them neither agree nor disagree that governments should create policies to promote the circular economy.

The survey results indicate that the vast majority of participants agree that governments should implement policies to promote the circular economy. This suggests a strong belief in the need for government intervention to support and strengthen the circular economy. Participants recognize the importance of sustainable practices and the need for institutional measures to implement these practices on a larger scale. A small percentage of participants are neutral on the statement. This may indicate a lack of strong views on the role of government in promoting the circular economy, or a belief that responsibility should be shared between governments, businesses, and citizens. It's worth noting that none of the participants disagreed with the statement, indicating broad acceptance of the idea that government action is necessary to support and strengthen the circular economy.

5.1.4. Unit 4: Behaviors and Practices

Table 1 Frequency of activities

	Never		Rarely		Sometimes		Often		Always	
	N	%	N	%	N	%	N	%	N	%
Recycling	3	2.3%	6	4.5%	47	35.3%	46	34.6%	31	23.3%
Composting	55	41.4%	29	21.8%	29	21.8%	14	10.5%	6	4.5%
Use reusable bags, bottles or containers	0	0%	6	4.5%	26	19.5%	70	52.6%	31	23.3%
Buy used or refurbished items	9	6.8%	46	34.6%	39	29.3%	31	23.3%	8	6%
Repair instead of product replacement	5	3.8%	28	21.1%	35	26.3%	45	33.8%	20	15%
Supporting companies with sustainable practices	24	18%	51	38.3%	33	24.8%	18	13.5%	7	5.3%

Table 1 shows that most consumers do not deal with composting at all (N=55, 41.4%). Still, most consumers rarely deal with supporting companies with sustainable practices (N=51, 38.3%) and how to buy used or refurbished items (N=46, 34.6%). Table 1 also shows that most consumers sometimes recycle (N=47, 35.3%). Finally, most consumers often use reusable bags, bottles or containers (N=70, 52.6%) and repair instead of replacing products (N=45, 33.8%).

Based on the survey results, it seems that the most commonly practiced activity is using reusable bags, bottles, or containers, the convenience, wide availability, and affordability of these products likely contribute to their frequent use. Recycling follows closely, it appears that participants are familiar with the process and benefits of recycling, and the availability and accessibility of recycling infrastructure also contribute to the widespread adoption of the practice.

The practice of repairing products instead of replacing them is also very common, potential barriers include a lack of specialized knowledge or repair services and the cost of repair compared to replacement.

In contrast, other activities are not implemented with the same frequency like buying used or refurbished items, possible preconceptions about the quality and reliability of used items may influence the frequency of purchases, as do limited options for finding used items. Also composting unlike recycling remains less widespread. This is probably due to a lack of education and appropriate infrastructure, as not all municipalities have brown bins for organic waste in every neighborhood, in contrast with blue recycling bins. The least implemented activity is supporting companies with sustainable practices, the lack of transparency and information about companies' sustainable practices may contribute to low adoption.

Table 2: Importance of factors

Table 2 Importance of factors

	Not important at all		Little important		Neutral		Quite important		Very important	
	N	%	N	%	N	%	N	%	N	%
Price	0	0%	7	5.3%	9	6.8%	26	19.5%	91	68.4%
Quality	0	0%	1	0.8%	9	6.8%	42	31.6%	81	60.9%
Brand reputation	7	5.3%	30	22.6%	56	42.1%	32	24.1%	11	8.3%
Environmental impact	4	3%	35	26.3%	55	41.4%	28	21.1%	11	8.3%
Product lifetime	0	0%	3	2.3%	36	27.1%	56	42.1%	38	28.6%
Easy to recycle or dispose of	11	8.3%	45	33.8%	42	31.6%	28	21.1%	7	5.3%

Table 2 shows how most participants consider easy recycling or disposal as a minimally important factor (N=45, 33.8%). Still, most participants have a neutral opinion regarding the

importance of brand reputation (N=56, 42.1%) and environmental impact (N=55, 41.4%). In addition, most participants consider product shelf life quite important (N=56, 42.1%). Finally, most consumers consider price (N=91, 68.4%) and quality (N=81, 60.9%) to be very important factors.

The survey results reveal that price is the most important factor for consumers, followed by product quality. This suggests that consumers are highly price-sensitive and seek products that offer good value for money. Additionally, product durability is significant for consumers, this indicates that consumers prefer products with a long shelf life. Also, brand reputation is moderately important to consumers, this suggests that while a brand may influence purchase decisions, it is not as decisive a factor as price or quality.

Environmental impact does not significantly influence consumers. Similarly, ease of recycling or disposal also has less influence on their decisions. This could be due to a lack of information or a direct impact on the cost and quality of the preferred product. Additionally, many consumers may prioritize immediate economic benefits rather than long-term environmental benefits.

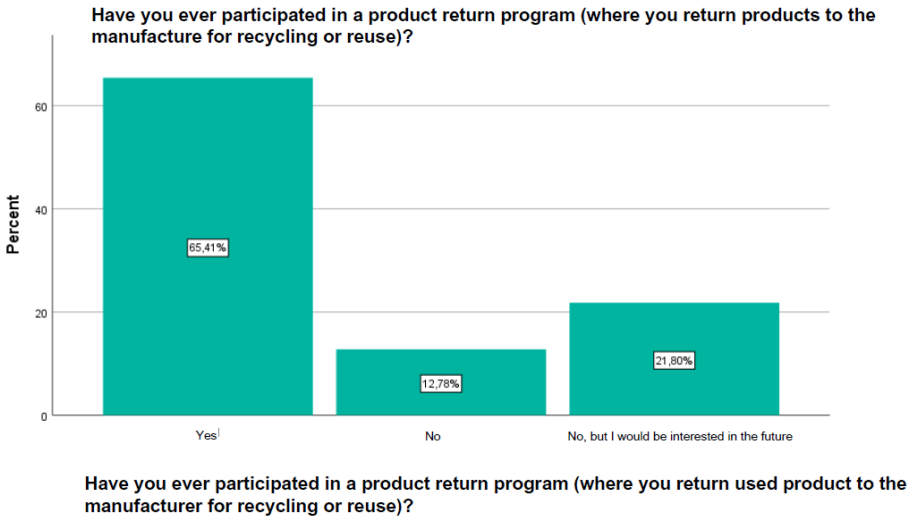


Diagram 11 Participation in a product return program

Diagram 11 shows that most participants have participated in product return programs (N=87, 65.4%). 21.8% of consumers reported that they have not participated in product return programs but would be interested and 12.8% of them have not participated in product return programs.

The survey results reveal that most participants have already taken part in product return programs, or are interested in doing so in the future. This indicates that the majority has a positive attitude towards recycling and reusing products. With proper information campaigns and infrastructure improvements, participation in these programs can be increased. There is a small percentage of participants who have never taken part and are not interested in doing so in the future. Reasons for this may include lack of information, inadequate infrastructure or programs in their area, or indifference towards recycling and reusing products.

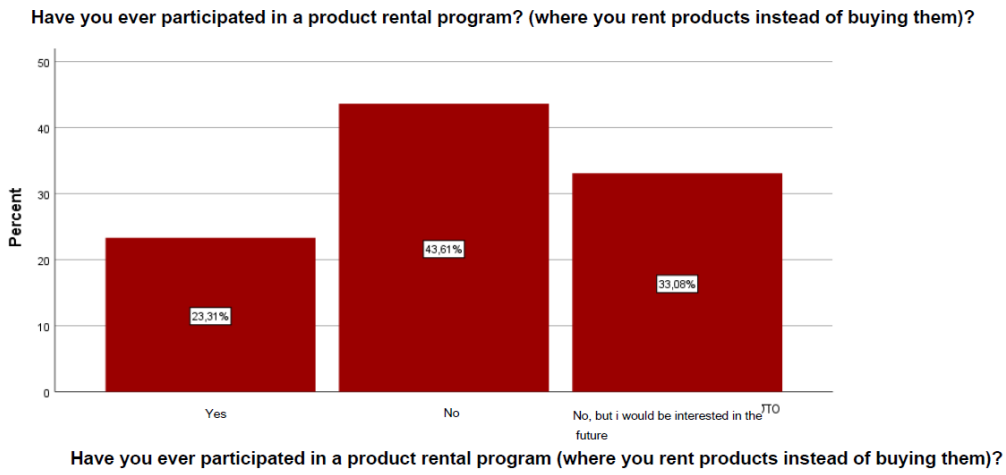


Diagram 12 Participation in a product rental program

Diagram 12 shows that most participants have never participated in a product rental program (N=58, 43.6%). 33.1% of consumers have never participated in a product rental program but would be interested and 23.3% of them have participated in a product rental program.

The survey revealed that most of the participants had never taken part in a product rental program. This could be due to limited access to such services or a preference for purchasing and owning products. A significant number of participants have already engaged in product rental and there are many participants who are interested in doing so in the future. These indicate that there is potential to increase participation in such programs if consumers are properly informed and have access to these services. There is a group of consumers who recognize the benefits of renting, such as cost savings and flexibility.

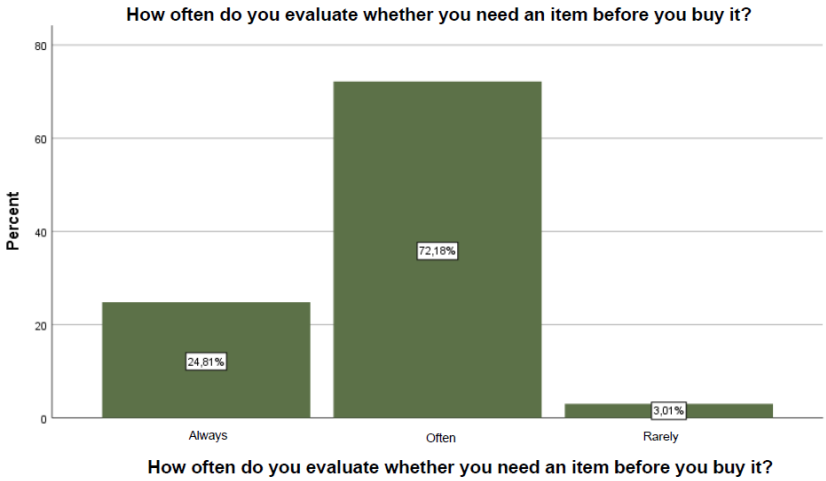


Diagram 13 The frequency with which they consider whether they need an item before buying it

Diagram 13 shows that most consumers often evaluate whether they need an item before purchasing it (N =96, 72.2%). 24.8 % of participants always evaluate whether they need an item before purchasing it and 3% of them rarely evaluate whether they need an item before purchasing it.

The survey reveals that most consumers demonstrate a high level of awareness and responsibility in their purchasing habits, with the majority assessing the need for an item before buying it. This indicates a general trend toward rational and careful purchases. Only a very small percentage of consumers do not follow this practice, and they may benefit from further education and information. These consumers are likely to be more spontaneous or impulsive in their purchases, which may lead to unnecessary spending on items that are not truly necessary.

Diagram 14 Degree of importance to avoid unnecessary purchases

Diagram 14 shows that most participants reported that it is very important for them to avoid unnecessary purchases (N = 105, 78.9%). 20.3% reported that they are neutral about it being important for them to avoid unnecessary purchases and 0.8% of them said that it is not at all important for them to avoid unnecessary purchases.

The survey reveals that more consumers demonstrate a high level of awareness and responsibility in avoiding unnecessary purchases. The majority consider it very important to avoid unnecessary purchases, indicating a careful and rational approach to their shopping habits. A significant proportion of participants are neutral in terms of avoiding unnecessary purchases, suggesting that these consumers may not pay much attention to this factor and may be more prone to impulse buying.

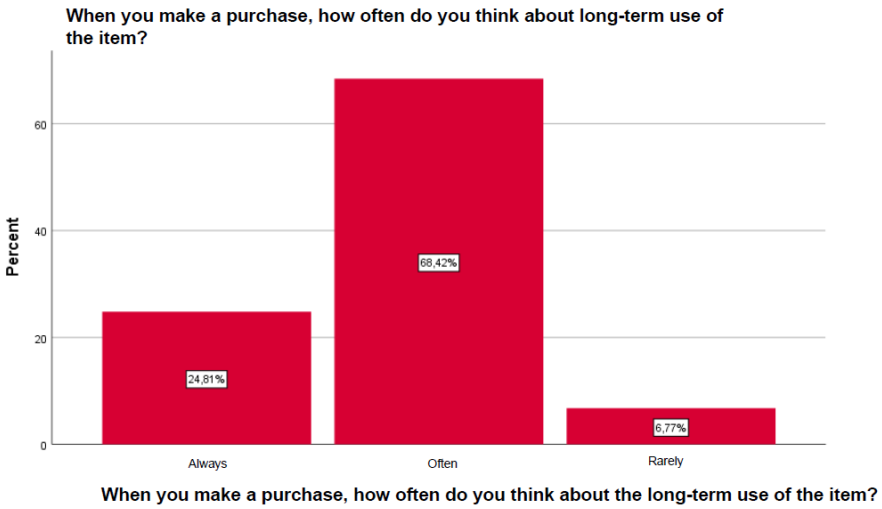


Diagram 15 The frequency with which they think about the long-term use of the item when making a purchase

Diagram 15 shows that most participants often think about the long-term use of the item when making a purchase (N = 91, 68.4%). 24.85 of the participants when making a purchase always think about the long-term use of the item and 6.8% of them when making a purchase rarely think about the long-term use of the item.

The survey reveals that the majority of consumers always or often think about the long-term use of an item before buying it, demonstrating a careful approach and a preference for durable, long-lasting products. A small portion of participants rarely consider the long-term use of an item before buying it, indicating a more impulsive approach to their purchases, focusing more on immediate needs or desires rather than long-term utility.

Table 3 Strategies to make sure they buy only what they need

	Frequency	Rate
Research products before purchasing	102	76.7%
Create a shopping list	87	65.4%
Budget definition	69	51.9%
Assessing whether the item is necessary or desirable	47	35.3%
Waiting a certain period before making a purchase decision	29	21.8%

Table 3 shows that most participants do product research before purchasing to make sure they buy only what they need (N = 102, 76.7%). 65.4% of consumers create a shopping list to make sure they buy only what they need, 51.9% of participants set their budget to make sure they buy only what they need, 35.3% of them evaluate whether the item is necessary or desired and 21.8% of them wait a certain period before making the purchase decision to make sure they only buy what they need.

The most popular strategy is pre-purchase product research, this suggests that consumers are willing to invest time in research to ensure they make the best choices and avoid unnecessary purchases. Creating a shopping list and setting a budget are also the most common strategies in advance to keep control of their spending and ensure they only buy the essentials.

Evaluating whether the item is necessary or simply desirable shows a conscious effort to separate real needs from wants to limit unnecessary purchases. In the same direction, but less common is to wait a certain amount of time before making a purchase decision, this strategy helps consumers avoid impulse buying and consider whether they need the item.

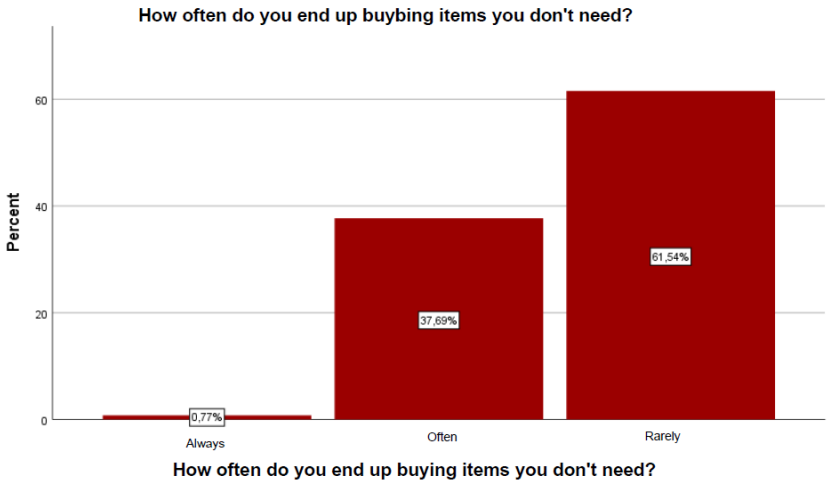


Diagram 16 Frequency they end up buying items they don't need

Diagram 16 shows that most participants rarely end up buying items they don't need (N=80, 61.5%). 37.7% of participants often end up buying items they don't need and 0.8% of them always end up buying items they don't need.

The survey results indicate that the majority of participants often or rarely purchase items they do not need. This suggests that most consumers are cautious in managing their spending and strive to make responsible purchasing decisions, avoiding unnecessary expenses. While a very small number admitted that they always end up making these unnecessary purchases, this points to the possibility that many consumers may succumb to their impulses, leading to purchases that exceed their genuine requirements, which could impact their finances.

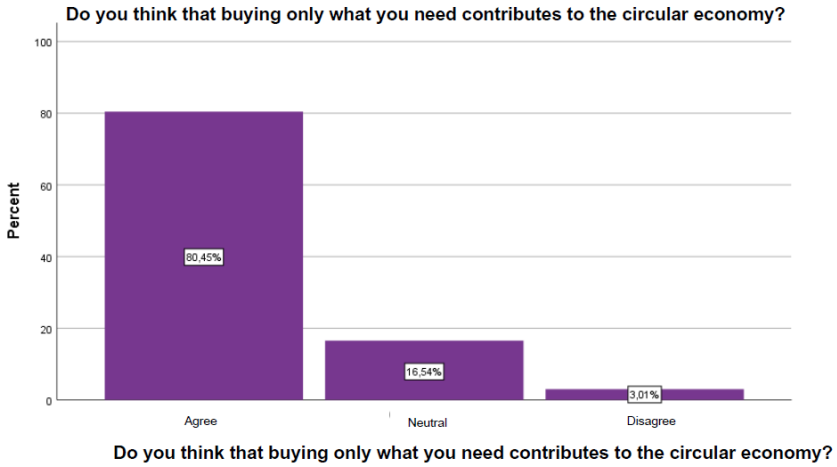


Diagram 17 Buying only what is needed contributes to the circular economy

Diagram 17 shows that most consumers completely agree that buying only what they need contributes to the circular economy (N=107, 80.5%). 16.5% of participants have a neutral opinion regarding how buying only what they need contributes to the circular economy and 3% of them disagree that buying only what they need contributes to the circular economy.

The survey results show that a large majority of participants strongly believe that purchasing only essential items helps the circular economy. This indicates that most consumers understand the importance of reducing consumption to support sustainability and resource efficiency. A significant proportion of participants remain neutral on the impact of buying only essential items on the circular economy, this could suggest a lack of information or uncertainty about the connection between personal purchasing habits and the circular economy. A small percentage of participants disagree with this idea and these consumers may not fully grasp the connection between consumption and the circular economy, or they may have different perceptions of what truly supports the circular economy.

Table 4 Influence of offers and discounts on their purchasing decisions

	Frequency	Rate
They help me save money on essential items	60	45.1%
They often lead me to buy more than I need	46	34.6%
They have little or no effect on my shopping habits	31	23.3%

Table 4 shows that most participants reported that promotions and their impact on purchasing decisions help them save money on essential items (N = 60, 45.1%). 34.6% of consumers reported that offers and influences on their purchase decisions often lead them to buy more than they need and 23.3% of them reported that offers and influences on their purchase decisions have little or no effect on the habits of their purchases.

The survey results reveal that the largest percentage of participants view offers and discounts as an opportunity to save money on essential items and this indicates that they strategically utilize discounts to reduce the cost of their purchases while staying focused on their actual needs. A notable proportion of participants can be influenced by promotions, leading to impulsive and spontaneous purchases that increase unnecessary spending and waste. Fewer participants indicate that promotions and discounts have little or no impact on their shopping habits, these consumers are likely to be more mindful and disciplined in their purchasing decisions, choosing to buy only the essentials regardless of promotions.

5.1.5. Unit 5: Incentives and Barriers

Table 5 Motivations for engaging in circular economy practices

	Frequency	Rate
Environmental concerns	111	83.5%
Cost saving	68	51.1%
Social responsibility	66	49.6%
Influence from friends or the community	60	45.1%
Health benefits	36	27.1%
Incentives from the government	5	3.8%

Table 5 shows that most participants reported that environmental concerns motivate them to engage in circular economy practices (N = 111, 83.5%). 51.1% of consumers reported that cost savings motivate them to engage in circular economy practices, 49.6% of consumers reported that social responsibility motivates them to engage in circular economy practices, 45.1% of them reported that influence from friends or the community motivates them to engage in circular economy practices, 27.1% of them reported that health benefits motivate them to engage in circular economy practices and 3.8% of them reported that government incentives motivate them to engage in circular economy practices.

The largest percentage of participants reported that environmental concerns are the primary factor motivating them to engage in circular economy practices and this indicates that consumers are highly aware of environmental issues and are eager to reduce their ecological footprint. Many participants view cost savings as a significant motivator for adopting circular economy practices, suggesting that economic factors play a crucial role in consumers' decisions to adopt these practices. Another significant percentage of the participants feel a social responsibility to engage in circular economy practices, demonstrating their understanding of their contribution to society and their responsibility to reduce waste and promote sustainability.

Many participants are motivated to engage in circular economy practices by influence from friends or the community, highlighting the important role of social influence and environmental pressures in shaping consumption habits. Some others engage in circular economy practices due to the associated health benefits and this reflects consumers' recognition that sustainable

practices can positively impact their health and well-being. Less participants cited government incentives as a motivation, indicating the need to improve and strengthen these policies.

Table 6 The main barriers preventing them from becoming more involved in the circular economy

	Frequency	Rate
Lack of information or information	90	67.7%
Cost	68	51.1%
Ease	55	41.4%
Lack of confidence in the companies' claims	55	41.4%
Lifestyle habits or preferences	52	39.1%
Limited availability of sustainable products	39	29.3%

Table 6 shows that most participants reported that the main obstacle to engaging more with the circular economy is the lack of information or information (N = 90, 67.7%). 51.1% of consumers reported cost as the main barrier to becoming more circular, 41.4% of consumers said convenience and lack of trust in company claims were the main barriers to becoming a more circular economy, 39.1% of them reported that lifestyle habits or preferences is the main barriers to becoming more involved in the circular economy and 29.3% of them reported that the limited availability of sustainable products is the main barriers to becoming more involved in the circular economy.

The main barrier preventing consumers from adopting circular economy practices is a lack of information, this indicates that consumers need more information and education about sustainable practices and their benefits. Also, many consumers often find sustainable options more expensive, more difficult, or time-consuming compared to conventional practices, and their availability is more limited which may discourage their adoption. Lack of confidence in companies' claims is also a major barrier and consumers may be skeptical about companies' honesty regarding their environmental practices and sustainability claims. Also, consumption habits and lifestyle can be important factors that hinder the adoption of circular economy practices.

To overcome these barriers, better information, financial incentives, strengthening the credibility of companies, improving the availability of sustainable products, and support for changing consumer habits are needed.

5.6. Section 6: Future Participation

Table 7 Encouraging factors for adopting more circular economy practices

	Frequency	Rate
Better access to information and education	97	72.9%
Improved ease and usability of participation	93	69.9%
Financial incentives or subsidies	77	57.9%
Greater availability of sustainable products	66	49.6%
Community programs and initiatives	33	24.8%
Stronger legislation and policies	28	21.1%

Table 7 shows that most participants reported that better access to information and education encouraged them to adopt more circular economy practices (N=97, 72.9%). 69.9% of participants reported that improved ease and usability of participation encouraged them to adopt more circular economy practices, 57.9% of them reported that financial incentives or subsidies encouraged them to adopt more circular economy practices, 49.6% of them reported that the biggest availability of sustainable products encouraged them to adopt more circular economy practices, 24.8% of them said that community programs and initiatives encouraged them to adopt more circular economy practices and 21.1% of them said that stronger legislation and policies encouraged them to adopt more circular economy practices economy.

The survey results reveal that better access to information, training, and improved ease and convenience of participation would encourage most consumers to adopt more circular economy practices. This emphasizes the need for more education, and simpler and easier solutions to enable participation in sustainable practices.

Additionally, more than half of the participants stated that financial incentives or subsidies would encourage them to adopt more circular economy practices. This highlights the significant role of economic factors in their decision-making process. Furthermore, the survey

shows the need for more sustainable options in the market to change consumers' consumption habits. Very important is as well the social influence and community initiatives in promoting sustainable practices and encouraging them to adopt more circular economy practices.

On the other hand, fewer participants believe that stronger legislation and policies would encourage them to adopt more circular economy practices. This indicates that government policies and legislation are not the main influencing factors for most consumers. This may be due to a lack of trust or belief in the effectiveness of these policies and strategies. If previous policies were poorly implemented or not enforced effectively, consumers might doubt the government's ability to execute future policies successfully.

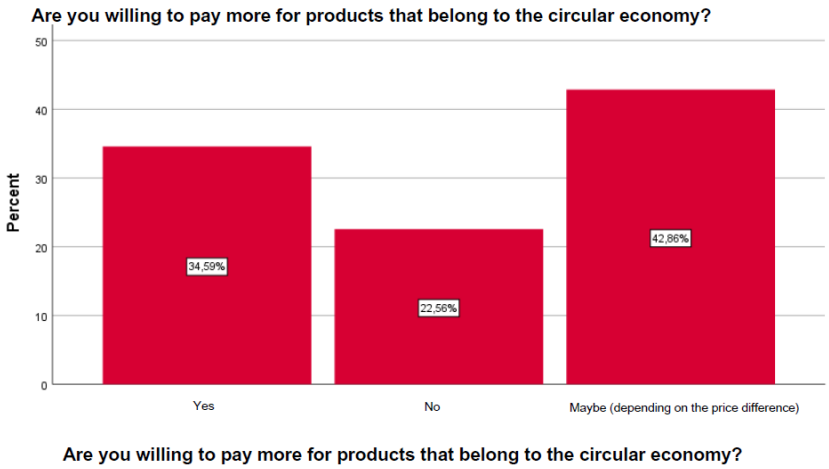


Diagram 18 Willing to pay more for circular economy products

Diagram 18 shows that most consumers may even be willing to pay more for products belonging to the circular economy (N = 57, 42.9%). 34.6% of consumers are willing to pay more for circular economy products and 22.6% of them are not willing to pay more for circular economy products.

The survey reveals that the largest proportion of participants answered 'maybe' and indicated that their willingness to pay more depends on the price difference. This shows that many consumers are open to buying circular products, but their final decision depends on the price difference compared to conventional products. Therefore, sustainable options need to be competitively priced. Approximately one-third of the participants are willing to pay more for products from the circular economy, this indicates that a significant number of consumers recognize the value of sustainable products and are ready to invest more to support sustainability. Meanwhile, few participants are not willing to pay more for circular products. This could be due to financial constraints or the belief that sustainable products should not be more expensive than conventional products, suggesting a need for affordable sustainable options.

Diagram 19 Expression of interest to participate in workshops or programs to learn more about the circular economy and sustainable practices

Diagram 19 shows that most participants are interested in participating in workshops or programs to learn more about the circular economy and sustainable practices (N=85, 63.9%). 30.1% of consumers might be interested in participating in workshops or programs to learn more about circular economy and sustainable practices and 6% of them are not interested in participating in workshops or programs to learn more about circular economy and sustainable practices.

The survey reveals that the majority of participants are interested in participating in workshops or projects on the circular economy and sustainable practices. This shows that there is a strong interest in education and information on sustainability and circular economy. Consumers are willing to learn more and enrich their knowledge so that they can implement sustainable practices in their daily lives. A significant proportion of participants say that they might be interested in participating in such projects. This suggests that these consumers are open to the idea, but may need additional incentives or information to make a final decision. This uncertainty may be due to time, cost, or program constraints. A small percentage of participants are not interested in participating in such programs. This may be due to a variety of reasons, such as lack of time, interest, or belief that they already know enough about the topic.

5.2. Statistical controls

Table 8 shows the ANOVA test between the frequency of carrying out activities that benefit the circular economy and whether they are familiar with the concept of the circular economy. From Table 8 it can be seen that there is a statistically significant difference between the frequency with which they engage in recycling and whether they are familiar with the concept of circular economy ($F_{2,131} = 5.290$, $p < 5\%$), where consumers who are very familiar with the concept of the circular economy are more often engaged in the activity of recycling compared to the rest.

Also from Table 8, it appears that there is a statistically significant difference between the frequency with which they engage in composting and whether they are familiar with the concept of circular economy ($F_{2,131} = 7.101$, $p < 5\%$), where consumers who are very familiar with the concept of the circular economy are more often engaged in the activity of composting compared to the rest.

Table 8 ANOVA tests between the frequency of carrying out activities that benefit the circular economy and whether they are familiar with the concept of the circular economy

		Sum of Squares	df	Mean Square	F	Sig.
Recycling	Between Groups	8,993	2	4,496	5,290	.006
	Within Groups	109,636	129	.850		
	Total	118,629	131			
Composting	Between Groups	18,810	2	9,405	7.101	.001
	Within Groups	170,849	129	1,324		
	Total	189,659	131			
Use reusable bags, bottles or containers	Between Groups	2.139	2	1,069	1,778	.173
	Within Groups	77,589	129	.601		
	Total	79,727	131			
Buy used or refurbished items	Between Groups	.647	2	.323	.295	.745
	Within Groups	141,414	129	1,096		
	Total	142.061	131			
Repair instead of product replacement	Between Groups	2.331	2	1,166	.979	.379
	Within Groups	153,639	129	1.191		
	Total	155,970	131			
Supporting companies with sustainable practices	Between Groups	5,926	2	2,963	2,497	.086
	Within Groups	153,074	129	1,187		
	Total	159,000	131			

Pearson correlation test was then carried out between the degree of consumer agreement that buying only the products they need contributes to the circular economy and the degree of agreement that businesses should be responsible for implementing circular economy practices. Table 9 shows that there is a moderately positive relationship between the degree of agreement of consumers that buying only the products they need contributes to the circular economy and the degree of agreement that companies should be responsible for the implementation of

circular economy practices (r = 0.397, p <5%). That is, as the degree of consumer agreement that buying only what they need contributes to the circular economy increases, the degree of agreement that businesses should be responsible for implementing circular economy practices increases.

Table 9 Pearson correlation test between consumers' degree of agreement that buying only what they need contributes to the circular economy and the degree of agreement that businesses should be responsible for implementing circular economy practices

		Do you think buying only what you need contributes to the circular economy?	How much do you agree with the following statement: "Businesses should be responsible for implementing circular economy practices"
Do you think buying only what you need contributes to the circular economy?	Pearson Correlation	1	,397 **
	Sig . (2-tailed)		,000
	N	133	133
How much do you agree with the following statement: "Businesses should be responsible for implementing circular economy practices"	Pearson Correlation	,397 **	1
	Sig . (2-tailed)	,000	
	N	133	133

**. Correlation is significant at the 0.01 level (2-tailed).

Table 10 shows the correlation test between the degree to which participants believe that buying only what they need contributes to the circular economy and the degree of importance of the circular economy in combating climate change (r = 0.401, p < 1%). That is, as the degree to which participants believe that buying only what they need contributes to the circular economy increases, the degree of importance of the circular economy in tackling climate change increases.

Table 10 Pearson correlation test between the degree to which participants believe that buying only what they need contributes to the circular economy and the degree to which the circular economy is important in addressing climate change

		How important do you think the circular economy is to tackling climate change?	Do you think buying only what you need contributes to the circular economy?
How important do you think the circular economy is to tackling climate change?	Pearson Correlation	1	,401 **
	Sig . (2-tailed)		,000
	N	133	133
Do you think buying only what you need	Pearson Correlation	,401 **	1

contributes to the circular economy?	Sig. (2-tailed)	,000	
	N	133	133

**. Correlation is significant at the 0.01 level (2-tailed).

Table 11 shows the Pearson correlation test between consumers' degree of agreement that businesses should be responsible for implementing circular economy practices and that governments should create policies to promote the circular economy. Table 11 shows that there is a moderate positive relationship between the degree of consumer agreement that businesses should be responsible for implementing circular economy practices and that governments should create policies to promote the circular economy (r = 0.584, p < 5%). That is, as the degree of consumer agreement that businesses should be responsible for implementing circular economy practices increases, and that governments should create policies to promote the circular economy.

Table 11: Pearson correlation test between consumers' degree of agreement that businesses should be responsible for implementing circular economy practices and that governments should create policies to promote the circular economy

		How much do you agree with the following statement: "Businesses should be responsible for implementing circular economy practices"	How much do you agree with the following statement: "Governments should create policies to promote the circular economy"?
How much do you agree with the following statement: "Businesses should be responsible for implementing circular economy practices"	Pearson Correlation	1	.584**
	Sig. (2-tailed)		.000
	N	133	133
How much do you agree with the following statement: "Governments should create policies to promote the circular economy"?	Pearson Correlation	.584**	1
	Sig. (2-tailed)	.000	
	N	133	133

**. Correlation is significant at the 0.01 level (2-tailed).

Table 12 shows the Pearson correlation test between consumers' degree of agreement that businesses should be responsible for implementing circular economy practices and the degree of agreement that buying only what they need contributes to the circular economy. Table 12 shows that there is a moderately positive relationship between the degree of consumer agreement that businesses should be responsible for implementing circular economy practices and the degree of agreement that buying only what they need contributes to the circular economy (r = 0.397, p < 1%). That is, as the degree of consumer agreement that businesses

should be responsible for implementing circular economy practices increases, so does the degree of agreement that buying only what they need contributes to the circular economy.

Table 12 Pearson correlation test between consumers' degree of agreement that businesses should be responsible for implementing circular economy practices and degree of agreement that buying only what they need contributes to the circular economy

		Do you think buying only what you need contributes to the circular economy?	How much do you agree with the following statement: "Businesses should be responsible for implementing circular economy practices"
Do you think buying only what you need contributes to the circular economy?	Pearson Correlation	1	,397 **
	Sig. (2-tailed)		,000
	N	133	133
How much do you agree with the following statement: "Businesses should be responsible for implementing circular economy practices"	Pearson Correlation	,397 **	1
	Sig. (2-tailed)	,000	
	N	133	133

**. Correlation is significant at the 0.01 level (2-tailed).

5.3. Discussion of Results

The purpose of the research was to investigate the attitudes, perceptions and practices of consumers regarding the circular economy. This research looked at how consumers behave, what habits they adopt that have a low ecological footprint, what practices they use to make decisions about their purchases and waste management, and how willing and ready they are to be informed and to change the way they consume, to contribute to the consolidation of the circular economy.

133 consumers participated in this survey, most of whom were women, aged 18-29, had a university degree, and were working full-time.

The first of the four research questions that this thesis aimed to address related to the level of consumer familiarity with the principles of the circular economy and the fight against climate change. The relevant analysis was conducted in section 5.1.2. According to the results, most consumers were neutral regarding their familiarity with the concept of the circular economy, emphasizing the need for more information and awareness raising. Knowledge about the circular economy is obtained from various sources, with personal communication (family and friends) being the most common. Most people acknowledge that the circular economy is very important in dealing with climate change.

The second research question focused on the attitudes and perceptions of consumers about the circular economy. The detailed analysis can be found in section 5.1.3. In general, the results show that the vast majority of consumers believe that both their actions and the actions of businesses and the government are essential to effectively addressing climate change through the circular economy. There is a clear understanding that the cooperation of all stakeholders is crucial to achieving sustainability goals. Most consumers agree that their actions can contribute to reducing climate change, that businesses should be responsible for implementing circular economy practices and that governments should create policies to promote the circular economy.

The third research question focused on consumer attitudes and practices for the circular economy. The analysis for this was in section 5.1.4. According to the results, most consumers often make use of reusable bags, bottles, or containers and prefer to repair rather than replace products. While most consumers recycle, they do not bother with composting at all. Furthermore, most consumers rarely care about supporting companies with sustainable practices or buying used or refurbished items.

Price and quality are considered to be very important factors for most consumers when making a purchase. They also consider the product lifespan to be quite important. However, most participants have a neutral opinion regarding the importance of brand reputation and environmental impact as well as easy recycling or disposal, possibly due to lack of information or a focus on immediate economic benefits.

Although most consumers have participated in product return programs, there is still room for improvement through better information and infrastructure. Participation in product rental programs is low but is increasing as consumers receive more information. Most participants reported that it is very important for them to avoid unnecessary purchases. They often think about the long-term use of the item before making a purchase, do product research, and make shopping lists to ensure they only buy what they need. Finally, most participants rarely end up buying items they don't need. They strongly agree that buying only what they need contributes to the circular economy, and most participants reported that offers and their impact on their purchasing decisions help them save money on essential items.

The fourth research question focuses on understanding consumer motivations and barriers to the circular economy, which is covered in section 5.1.5 of the analysis.

In terms of consumer motivations for engaging in circular economy practices, the top three motivations are environmental concerns, cost savings, and social responsibility. The environmental concerns indicate a growing awareness of environmental issues and a desire to reduce their ecological footprint. More than half of the participants consider cost savings to be an important motivator, suggesting the critical role of economic factors in their decision. Social responsibility and contributing to the wider society are also recognized as responsibilities. Additionally, social influence from friends or the community significantly affects several participants, shaping their consumption habits.

The four main barriers consumers face to becoming more involved in the circular economy are lack of awareness or information, cost, convenience, and lack of trust in companies' claims. Consumers need more education about sustainable practices and their benefits to incorporate them into their daily lives. Cost is a significant barrier, as sustainable options are often more expensive. Cost and ease of use are significant barriers, as many people find that sustainable options are often more expensive, more difficult, or time-consuming than conventional ones which discourages them. Lack of confidence in companies' claims is also a problem, as consumers are often skeptical about the sincerity of environmental practices announced by companies. Finally, established consumption habits and lifestyle preferences are barriers for many because they are difficult to change and affect a lot of people (family, colleagues, friends, etc.)

In addition, the research examined the future participation of consumers in the circular economy. Most participants reported that better access to information and education encouraged them to adopt more circular economy practices and they are interested in participating in workshops or programs to learn more about the circular economy and sustainable practices. Still, most consumers indicated that they might even be willing to pay more for products belonging to the circular economy.

Finally, the research showed that consumers who are very familiar with the concept of the circular economy are more often engaged in the activity of recycling and composting compared to the rest. Also in the research it was presented that as consumers agree that buying only what they need contributes to the circular economy, so does the agreement that businesses should be

responsible for implementing circular economy practices. The survey also found that as the degree to which participants believe that buying only what they need contributes to the circular economy increases, the degree of importance of the circular economy to tackling climate change increases. Also as consumer agreement that businesses should be responsible for implementing circular economy practices increases and that governments should create policies to promote the circular economy. Additionally, as consumers agree that businesses should be responsible for implementing circular economy practices, so does their agreement that buying only what they need contributes to the circular economy.

6. Conclusions

The thesis attempted to examine consumers' engagement in the Circular Economy and how their attitudes, perceptions, and practices can influence sustainable development and climate change mitigation. To achieve this, both theoretical frameworks and empirical data were analyzed, offering a comprehensive understanding of consumer participation in the Circular Economy.

The literature review emphasizes the significant role of consumers in the transition to the Circular Economy. Theoretical approaches consider consumers as key influencers of the demand for circular products and services, and their choices greatly impact the success of circular economy strategies. The literature reports that embracing practices such as reuse, recycling, repair, and preferring longer-lasting products is crucial to preserving resources and reducing waste. The successful establishment of the Circular Economy largely depends on consumers adopting new, more sustainable habits and practices.

However, analysis of the survey results revealed a significant disparity between consumer intentions and actions. While most consumers understand the importance of the Circular Economy, they face challenges in translating this understanding into their daily lives. Factors contributing to this gap include inadequate information, costs, and the difficulty of implementing circular practices, as supported by both literature and empirical findings.

In the literature, the concept of "superior R strategies" (Reduce, Reuse, Recycle) is highlighted as a fundamental principle of the Circular Economy. Research indicates that consumers are more inclined to adopt recycling and reusing practices, but they face difficulties in reducing consumption (Reduce) due to a lack of information and established consumer behaviors. However, the research showed that there are still many consumers who have not fully embraced not even these practices (Recycle, Reuse), instead opting for disposable or inexpensive alternatives. This suggests that circular behavior has not yet become a fully integrated part of daily life.

The research also confirmed that economic factors are important in consumers' decisions to adopt sustainable practices. As in the literature, the cost emerges as one of the most significant disincentives to adopting circular practices. While consumers recognize the long-term benefits of the Circular Economy, they often choose affordable but less sustainable solutions. Financial incentives, such as subsidies for purchasing sustainable products or reducing repair costs, can play a crucial role in encouraging consumers to adopt more sustainable practices.

Lack of trust in companies is a critical issue that is emphasized both in the literature and the research results. Consumers are often skeptical about companies' environmental claims and the truthfulness of their sustainable practices. The literature emphasizes that to restore consumer confidence, companies need to improve their transparency through certification and audits. The

survey results show that transparency and the provision of reliable information by companies can increase consumers' willingness to support sustainable practices.

Furthermore, the literature review emphasizes the significance of social influences and community initiatives in promoting the Circular Economy. Social practices such as exchanging, renting, and sharing products can play a crucial role in encouraging circular consumption. The research results indicate that consumers are more inclined to adopt circular practices when they receive support from their communities or when these practices are promoted through social networks.

Moreover, the literature review methodologies highlighted the importance of consumer education and awareness concerning the Circular Economy. The survey results confirmed this, as many consumers expressed a lack of understanding of the principles and practices of the Circular Economy. This suggests the need for additional educational campaigns and initiatives to enhance awareness.

Also, the statistical analysis confirms the crucial role of consumer awareness in driving engagement with circular economy practices. ANOVA tests showed that consumers familiar with circular economy principles were significantly more likely to recycle and compost, underscoring again the need for targeted educational initiatives to boost sustainable behaviors. Additionally, Pearson correlation tests revealed positive links between beliefs about responsible consumption and the role of businesses in promoting circular practices, highlighting the importance of corporate accountability. Furthermore, the findings underscore the essential role of government policies in facilitating the circular economy. Most participants agreed that government intervention is necessary for promoting sustainable practices.

In summary, it's clear that even though consumers are more aware and have good intentions, there are still significant obstacles to achieving a fully Circular Economy. Connecting theory to real-world evidence indicates that successful implementation of Circular Economy principles necessitates coordinated action at various levels: improving education and information, offering financial incentives, making circular practices more accessible and easier to adopt, and increasing transparency and trust in companies. Through the combined efforts of governments, businesses, and consumers, we can achieve a transition to a sustainable and resilient economy that will protect natural resources and help reduce the impacts of climate change.

REFERENCES

Akbar, P., Hoffmann, S., 2018. Under which circumstances do consumers choose a product service system (PSS)? Consumer benefits and costs of sharing in PSS. J. Clean. Prod. 201, 416-427. https://www.sciencedirect.com/science/article/pii/S0959652618323424

B¨ocker, L., Meelen, T., 2017. Sharing for people, planet or profit? Analysing motivations for intended sharing economy participation. Environ. Innov. Soc. Transit. 23, 28–39. https://www.sciencedirect.com/science/article/pii/S2210422416300892?via%3Dihub

Babbitt, C.W., Gaustad, G., Fisher, A., Chen, W.Q., Liu, G., 2018. Closing the loop on circular economy research: from theory to practice and back again. Resour. Conserv. Recycl. 135, 1–2. https://www.sciencedirect.com/science/article/abs/pii/S0921344918301496

Bauman, Z., 2007. Consuming life. Policy Press, Malden, MA. https://scholar.google.com/scholar_lookup?title=Consuming%20Life&author=Z.%20Bauman&publication_year=2007

Circle Economy, 2023. "Circularity Gap Report 2023.". https://www.circularity-gap.world/2023

Cooper, T., 2020. Slower Cycles: an essential characteristic of the circular economy. In: Eisenriegler, S. (Ed.), The Circular Economy in the European Union: an Interim Review. Springer, pp. 99–116. https://doi.org/10.1007/978-3-030-50239-3

Den Hollander, M.C., Bakker, C.A., Hultink, H.J., 2017. Product design in a circular economy: development of a typology of key concepts and terms. J. Ind. Ecol. https://onlinelibrary.wiley.com/doi/10.1111/jiec.12610

Deutz, P., 2023. Exploring the limitations of a circular economy under capitalism and raising expectations for a sustainable future. Circular Economy 1 (3). https://circulareconomyjournal.org/articles/exploring-the-limitations-of-a-circular-economy-under-capitalism-and-raising-expectations-for-a-sustainable-future/

Emerson, R.W., 2015. Convenience Sampling, Random Sampling, and Snowball Sampling: How Does Sampling Affect the Validity of Research? Journal of Visual Impairment & Blindness, 109(2), pp. 164–168. https://journals.sagepub.com/doi/abs/10.1177/0145482x1510900215

European Commission, 2022. Executive Summary of the Impact Assessment Report. Brussels, 30.3.2022. SWD(2022) 86 final. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0086&from=EN. (Accessed 4 August 2022).

Fine B., Bayliss, K., Robertson, M., 2018. The systems of provision approach to understanding consumption. In: Kravets, Olga, Mclaran, Pauline, Miles, Steven, Venkatesh, Alladi (Eds), The SAGE Handbook of Consumer Cilture. Sage Publications, London.

https://scholar.google.com/scholar_lookup?title=The%20systems%20of%20provision%20approach%20to%20understanding%20consumption&author=B.%20Fine&publication_year=2018

Fine, Ben, Bayliss, Kate, 2021. A guide to the systems of provision approach: Who gets what, how, and why. Palgrave Macmillan, Cham. https://scholar.google.com/scholar_lookup?title=A%20Guide%20to%20the%20Systems%20of%20Provision%20Approach%3A%20Who%20Gets%20what%2C%20How%20and%20Why&author=Ben%20Fine&publication_year=2021

Giddens, A., 1984. The Constitution of Society: outline of the Theory of Structuration. The Policy Press. https://books.google.gr/books?hl=el&lr=&id=x2bf4g9Z6ZwC&oi=fnd&pg=PR9&ots=jPUN3orweE&sig=kj_VjXMPNsJBLlmWrhX98IAE8i8&redir_esc=y#v=onepage&q&f=false

Greene, M., Hansen, A., Hoolohan, C., Süßbauer, E., Domaneschie, L., 2022. Consumption and shifting temporalities of daily life in times of disruption: undoing and reassembling household practices during the COVID-19 pandemic. Sustain. Sci. Pract. Pol. 18 (1), 215-230. https://www.tandfonline.com/doi/full/10.1080/15487733.2022.2037903

Greene, M., Royston, S., 2021. Can people talk about their past practices? Challenges, opportunities, and practical applications of biographic inquiry for geographic research on consumption. Area 54 (2), 268–279. https://rgs-ibg.onlinelibrary.wiley.com/doi/10.1111/area.12773

Greening, L.A., Greene, D.L., Di, C., 2000. Energy efficiency and consumption - the rebound effect - a survey. Energy Pol. 28 (6-7), 389-401. https://www.scopus.com/record/display.uri?eid=2-s2.0-0034085840&origin=inward

Hediger, C., Farsi, M., Weber, S., 2018. Turn it up and open the window: on the rebound effects in residential heating. Ecol. Econ. 149, 21–39. https://www.sciencedirect.com/science/article/pii/S0921800917309291?via%3Dihub

Hediger, C., Farsi, M., Weber, S., 2018. Turn it up and open the window: on the rebound effects in residential heating. Ecol. Econ. 149, 21–39. https://www.sciencedirect.com/science/article/pii/S0921800917309291?via%3Dihub

Hipp, T., Jaeger-Erben, M., 2021. “Doing Value“ – wie Praktiken der Bedeutungszuweisung die Nutzungsdauer von Ger¨aten beeinflussen. In: Jonas, M., Nessel, S., Tr¨oger, N. (Eds.), Reparieren, Selbermachen und Kreislaufwirtschaften. Kritische Verbraucherforschung. Springer VS, Wiesbade https://link.springer.com/chapter/10.1007/978-3-658-31569-6_6

Hobson, K., 2003. Thinking habits into action: The role of knowledge and process in questioning household consumption practices. Local Environ. 8 (1), 95-112. https://www.scopus.com/record/display.uri?eid=2-s2.0-0037324649&origin=inward

Hobson, K., 2021. The limits of the loops: critical environmental politics and the Circular Economy. Environ. Polit. 30 (1–2), 161–179 https://www.tandfonline.com/doi/full/10.1080/09644016.2020.1816052

Hobson, K., Holmes, H., Welch, D., Wheeler, K., Wieser, H., 2021. Consumption Work in the circular economy: a research agenda. J. Clean. Prod. 321, 12896. https://www.sciencedirect.com/science/article/pii/S0959652621031607?via%3Dihub

Hofmann, F., 2019. Circular business models: business approach as driver or obstructer of sustainability transitions? J. Clean. Prod. 224, 361–374. https://www.sciencedirect.com/science/article/abs/pii/S0959652619308066

IPCC (Intergov. Panel Clim. Change). 2018. Global Warming of 1.5°C. Geneva: IPCC https://www.ipcc.ch/sr15/

Jaeger-Erben, M., Frick, V., Hipp, T., 2021. Why do users (not) repair their devices? A study of the predictors of repair practices. J. Clean. Prod. 28 https://www.sciencedirect.com/science/article/pii/S0959652620354287?via%3Dihub

Jaeger-Erben, M., Offenberger, U., 2014. A practice theory approach to sustainable consumption GAIA 23, 166-174 https://www.scopus.com/record/display.uri?eid=2-s2.0-84907680667&origin=inward

Jaeger-Erben, M., Rückert-John, J., Schäfer, M., 2015. Sustainable consumption through social innovation: a typology of innovations for sustainable consumption practices. J. Clean. Prod. 108, 784-798. https://www.sciencedirect.com/science/article/pii/S0959652615009312

Jay A, Reidmiller DR, Avery CW, Barrie D, DeAngelo B et al. 2018. Overview. Impacts, Risks, and Adaptation in the United States: 4th National Climate Assessment 2 DR https://nca2018.globalchange.gov/downloads/NCA4_Report-in-Brief.pdf

Kjaer, L.L.L.L., Pigosso, D.C.A., McAloone, T.C.T.C., Birkved, M., 2018. Guidelines for evaluating the environmental performance of Product/Service-Systems through life cycle assessment. J. Clean. Prod. 190, 666–678. https://www.frontiersin.org/articles/10.3389/fenrg.2018.00039/full

Koch, J., Vringer, K., 2023. Hoe ‘circulair’ zijn nederlandse consumenten? Planbureau voor de Leefomgeving online 30th June 2023 at. https://www.pbl.nl/publicaties/hoe-circulair-zijn-nederlandse-consumenten

Korhonen, J., Honkasalo, A., Sepp¨al¨a, J., 2018. Circular economy: the concept and its limitations. Ecol. Econ. 143, 37–46. https://doi.org/10.1016/j.ecolecon.2017.06.041.

Laurenti, R., Singh, J., Sinha, R., Potting, J., Frostell, B., 2016a. Unintended environmental consequences of improvement actions: a qualitative analysis of systems’ structure and behavior. Syst. Res. Behav. Sci. 33 (3), 381–399. https://onlinelibrary.wiley.com/doi/10.1002/sres.2330

Makov, T., Font Vivanco, D., 2018. Does the circular economy grow the pie? The case of rebound effects from smartphone reuse. Front. Energy Res 6, 1–11. https://www.scopus.com/record/display.uri?eid=2-s2.0-85046623880&origin=inward

Meis-Harriw, J., Klemm, C., Kaufman, S., Curtis, J., Borg, K., Bragge, P., 2021. What is the role of eco-labels for a circular economy? A rapid review of the literature. J. Clean. Prod. 299, 126913 https://www.sciencedirect.com/science/article/pii/S0959652621013536

Moalem, R.M., Mosgaard, M.A., 2021. A critical review of the role of repair cafe in a sustainable circular transition. SSustainability 13 (22), 12351. https://www.mdpi.com/2071-1050/13/22/12351

Murray, A., Skene, K., Haynes, K., 2017. The circular economy: an interdisciplinary exploration of the concept and application in a global context. J. Bus. Ethics 140 (3) ,369–380. https://link.springer.com/article/10.1007/s10551-015-2693-2

Ottelin, J., Cetinay, H., Behrens, P., 2020. Rebound effects may jeopardize the resource savings of circular consumption: evidence from household material footprints. Environ. Res. Lett. 15 (10) https://iopscience.iop.org/article/10.1088/1748-9326/abaa78

Rabiu, M.K., Jaeger-Erben, M., 2023. Reducing single-use plastic in everyday social practices: Insights from a living lab experiment. Resour. Conserv. Recycl. 1 (200), 107303. https://www.sciencedirect.com/science/article/pii/S0921344923004378

Ruzzenenti, F., Font Vivanco, D., Galvin, R., Sorrell, S., Wagner, A., Walnum, H.J., 2019. Editorial: the rebound effect and the Jevons' paradox: beyond the conventional wisdom. Front. Energy Res. https://www.frontiersin.org/articles/10.3389/fenrg.2019.00090/full

Schr̈oder, P., Bengtsson, M., Cohen, M., Dewick, P., Hoffstetter, J., Sarkis, J., 2019. Degrowth within – aligning circular economy and strong sustainability narratives. Resour. Conserv. Recycl. 146, 190–191. https://www.sciencedirect.com/science/article/pii/S0921344919301429?via%3Dihub Elsevier B.V.

Shevchenko T., Saidani M., Ranjbari M., Kronenberg J., Danko Y. , Laitala K., 2023, Consumer behavior in the circular economy: Developing a product - centric framework 384, https://www.sciencedirect.com/science/article/pii/S0959652622051423?fr=RR-&ref=pdf_download&rr=873cf8e98bbbeef4

Shojaeddini, E., Gilbert, B., 2023. Heterogeneity in the rebound effect: evidence from efficient lighting subsidies. Environ. Resour. Econ. 84 (1), 173–217. https://link.springer.com/article/10.1007/s10640-022-00721-x

Shove, E., 2010. Beyond the ABC: climate change policy and theories of social change Environ. Plann. 42, 1273. https://journals.sagepub.com/doi/10.1068/a42282

Sorrell, S., Gatersleben, B., Druckman, A., 2020. The limits of energy sufficiency: a review of the evidence for rebound effects and negative spillovers from behavioural change. Energy Res. Social Sci. 6 https://www.sciencedirect.com/science/article/pii/S2214629620300165?via%3Dihub

Spurling, N., McMeekin, A., 2015. Interventions in practices: sustainable mobility policies in England. In: Strengers, Y., Maller, C. (Eds.), Social Practices, Intervention and Sustainability: beyond Behaviour Change, first ed. Routledge, London, pp. 78–94. https://www.taylorfrancis.com/books/edit/10.4324/9781315816494/social-practices-intervention-sustainability-yolande-strengers-cecily-maller

Steffen W, Rockström J, Richardson K, Lenton TM, Folke C, et al. 2018. Trajectories of the earth system in the Anthropocene. PNAS 115(33):8252–59 https://pubmed.ncbi.nlm.nih.gov/30082409/

Tollefson, J., 2021. Carbon emissions rapidly rebounded following COVID pandemic dip. Nature, 04 November 2021 https://www.nature.com/articles/d41586-021-03036-x

United Nations. n.d., Sustainable Consumption and Production. United Nations, https://www.un.org/sustainabledevelopment/sustainable-consumption-production/

Webster K., 2017. The Circular Economy: A Wealth of Flows, second ed. Ellen MacArthur Foundation Publishing, Cowes, UK. https://cir.nii.ac.jp/crid/1130282270539850880?lang=en

York, R., Adua, L., Clark, B., 2022. The rebound effect and the challenge of moving beyond fossil fuels: a review of empirical and theoretical research. Wiley Interdisciplinary Reviews: Clim. Change 13 (4) https://wires.onlinelibrary.wiley.com/doi/10.1002/wcc.782

Yu, B., Zhang, J., Fujiwara, A., 2013. Evaluating the direct and indirect rebound effects in household energy consumption behavior: a case study of Beijing. Energy Pol. 57, 441–453. https://www.sciencedirect.com/science/article/pii/S0301421513001092?via%3Dihub

Yu, B., Zhang, J., Fujiwara, A., 2013. Evaluating the direct and indirect rebound effects in household energy consumption behavior: a case study of Beijing. Energy Pol. 57, 441–453. https://www.sciencedirect.com/science/article/pii/S0301421513001092?via%3Dihub

Annex I. Questionnaire

Invitation to participate in the survey: Consumer Engagement in the Circular Economy - Tackling the Climate Crisis.

My name is Karystinou Nikoletta and I am a student of the Postgraduate Program in "Bioeconomy, Circular Economy and Sustainable Development" of the University of Piraeus. As part of my thesis I am conducting research on the topic: "Consumer Involvement in the Circular Economy - Addressing the Climate Crisis". The research seeks to examine consumer attitudes, perceptions and practices regarding the circular economy.

The total time to complete the following questionnaire should not exceed 10 minutes. Your participation in the survey is important and voluntary. You are of course free to withdraw your participation at any stage of the questionnaire completion process if you wish. The questionnaire is anonymous. The data collected will be used solely for the purposes of the survey.

In any case, in this process, your anonymity will be preserved, in accordance with the requirements of Regulation 2016/679 of the European Parliament and of the Council of the European Union on the protection of individuals with regard to the processing of personal data.

Thank you in advance for your participation and support.

Yours sincerely,

Karystinou Nikoletta

Postgraduate Student

Email: nkarystinou@gmail.com

Section 1: Demographic information

1. Age:
    - Under 18
    - 18 - 29
    - 30 - 39
    - 40 - 49
    - 50 and over
2. Gender:
    - Male
    - Woman
    - I prefer not to answer
3. Education level:
    - High school or less
    - University degree
    - Postgraduate degree
    - Doctoral degree
    - Other (please specify)
4. Employment Status:
    - Full-time employment
    - Part-time employment
    - Self-employed
    - Unemployed
    - Student
    - Retired
    - Other (please specify)

Section 2: Information and Knowledge

5. How familiar are you with the concept of the circular economy?
    - Very familiar
    - Neutral
    - Not at all familiar
6. How did you first learn about the circular economy?
    - Social networks
    - News articles
    - Educational institutions
    - Work/Professional space
    - Friends/Family
    - Other (please specify)
7. How important do you think the circular economy is for tackling climate change?
    - Very important
    - Important
    - Not important at all

Section 3: Attitudes and Perceptions

8. Do you think your personal actions can help reduce climate change?
    - I totally agree
    - Neutral
    - I disagree
9. How much do you agree with the following statement: 'Businesses should be responsible for implementing circular economy practices'?
    - I totally agree
    - Neutral
    - I disagree
10. How much do you agree with the following statement: 'Governments must create policies to promote the circular economy'?
    - I totally agree
    - Neutral
    - I disagree

Section 4: Behaviors and Practices

11. How often do you do the following activities? (Rate each on a scale of 1 to 5, where 1 is "Never" and 5 is "Always")
    - Recycling
    - Composting
    - Use of reusable bags, bottles or containers
    - Purchase of second-hand or refurbished items
    - Repair instead of replacement products
    - Supporting companies with sustainable practices
12. When buying products, how important are the following factors to you? (Rate each on a scale of 1 to 5, where 1 is "Not at all important" and 5 is "Very important")
    - Price
    - Quality
    - Reputation of the brand
    - Environmental impact
    - Product lifetime
    - Easy recycling or disposal
13. Have you ever participated in a product return program (where you return used products to the manufacturer for recycling or reuse)?
    - Yes
    - No
    - No, but I would be interested in the future
14. Have you ever participated in a product rental program (where you rent products instead of buying them)?
    - Yes
    - No
    - No, but I would be interested in the future
15. How often do you evaluate whether you need an item before you buy it?

- Always
- Often
- Rare
- Never

16. How important is it for you to avoid unnecessary purchases?
    - Very important
    - Neutral
    - Not important at all
17. When you make a purchase, how often do you think about the long-term use of the item?
    - Always
    - Sometimes
    - Rare
    - Never
18. What strategies do you use to make sure you only buy what you need?(Check all that apply)
    - Construction of a shopping list
    - Setting the budget
    - Product research before purchase
    - Assessing whether the subject is necessary or desirable
    - Waiting for a certain period before taking the purchase decision
    - Other (please specify)
19. How often do you end up buying items you don't need?
    - Always
    - Sometimes
    - Rare
    - Never

20. Do you think that buying only what you need contributes to the circular economy?
    - I totally agree
    - Neutral
    - I disagree
21. How do offers and discounts influence your purchasing decisions? (Select all that apply)
    - They often lead me to buy more than I need
    - They help me save money on essential items
    - Have little or no effect on my shopping habits
    - Other (please specify)

Section 5: Incentives and Barriers

22. What motivates you to engage in circular economy practices? (Select all that apply)
    - Environmental concerns
    - Cost savings
    - Health benefits
    - Social responsibility
    - Influence from friends or the community
    - Incentives from the government
    - Other (please specify)
23. What are the main obstacles that prevent you from becoming more involved in circular economy practices? (Select all that apply)
    - Lack of information or lack of information
    - Convenience
    - Cost
    - Limited availability of sustainable products
    - Lack of confidence in companies' claims
    - Lifestyle habits or preferences
    - Other (please specify)

Section 6: Future Participation

11. What would encourage you to adopt more circular economy practices? (Check all that apply)
    - Better access to information and training
    - Financial incentives or subsidies
    - Greater availability of sustainable products
    - Improved ease and usability of participation
    - Stronger legislation and policies
    - Community programmes and initiatives
    - Other (please specify)
12. Are you willing to pay more for products that belong to the circular economy?
    - Yes
    - No
    - Maybe (depending on the price difference)
13. Would you be interested in participating in workshops or projects to learn more about the circular economy and sustainable practices?
    - Yes
    - No
    - Maybe