Human-in-the-Circular-Loop:

A consumer attributions-based approach for investigating the effect of enterprise greenwashing on wishcycling.

by

Anastasia Vayona

Submitted to Bournemouth University

in partial fulfilment of the

requirements for the

Degree of DOCTOR OF PHILOSOPHY

August 2024

Copyright Statement

List of Refereed Publications

Vayona, A., Demetriou, G., Hartwell, H., Britton, R. and Gillingham, P., n.d. A consumer attributions-based approach for investigating the effect of corporate greenwashing on wishcycling. *Sustainable Development*.

This publication relates to Chapters 4, 5, and 6

Vayona, A., Hartwell, H., Britton, R. and Gillingham, P., 2024. Human-in-the-circular-loop (HITCL): A human-centric approach in circular economy ecosystems research. 20th International Conference on Distributed Computing in Smart Systems and the Internet of Things (DCOSS-IoT), 29 April – 1 May 2024, Abu Dhabi, United Arab Emirates.

This publication relates to Chapter 3

Vayona, A., Alexandris, G., Alexaki, S., Cvitanovic, M. and Hartwell, H., 2023. Measurement scale validation for inner and outer circular economy loops: a proposal based on food and beverage circular packaging and wishcycling. *In: Closed Cycles & the Circular Society [online]. Presented at the 12th International Conference of the International Ecological Engineering Society (IEES)*, Chania, Greece. Available from: http://www.iees.tuc.gr/.

This publication relates to Chapters 4

Vayona, A., Alexandris, G., Hartwell, H. and Ioannidis, S., 2023. Human-in-the-circular-loop (HITCL): Towards the systematization of human factors in circular economy ecosystems research. *In: 4th Symposium on Circular Economy and Sustainability* 19-21 June 2023 Heraklion.

This publication relates to Chapters 3

Vayona, A. and Demetriou, G., 2020. Towards an operating model for attribution in circular economy. *In*: *2020 16th International Conference on Distributed Computing in Sensor Systems (DCOSS)*. 490–495.

This publication relates Chapter 1 and PhD concept

Abstract

With increasing consumers awareness of environmental problems, corporate greenwashing practices have become common for companies to gain, sustain, and improve a competitive advantage without bearing the costs of moving to more sustainable practices. However, although there is extensive research on greenwashing, there is limited work studying the degree of consumer attribution on corporate greenwashing practices and their consequences on wishcycling.

This thesis presents a novel approach to investigating the human aspects of Circular Economy (CE) ecosystems, introducing Human-in-the-circular-loop (HITCL). The framework integrates established theories from different disciplines, such as psychology, human resource management and marketing, to provide an understanding of the human factors influencing the adoption of circular practices. Acknowledging the important part that humans play as both consumers and employees in shifting to a CE, the HITCL framework provides a lens through which to study how individuals embrace the circular economy concept and how this influences their behaviors and decision-making regarding circular practices can be studied. The theoretical contribution of this thesis is the introduction of the HITCL framework, which builds upon mature theories from diverse academic fields and incorporates them into circular studies, thereby advancing the social aspects of circular economy research.

This thesis addresses the issue of corporate greenwashing and its impact on consumer behaviour, specifically in the context of circular food and beverage packaging. A survey was completed by 537 participants, and Structural Equation Modelling (SEM) was utilised to analyse the relationships between perceived company motives, consumer attributions, perceptions of greenwashing, and wishcycling behaviour. Additionally, the moderating effect of core self-evaluation on the relationship between circular packaging and greenwashing techniques was explored. The findings highlight the mediating role of consumer perceptions of company motives in the relationship between corporate greenwashing and wishcycling. Specifically, consumers are more inclined to engage in wishcycling when they attribute greenwashing practices to societal reasons thereby rather than business motives, despite their ability to recognise greenwashing techniques in both scenarios. It was also observed that consumer personality traits, particularly core self-evaluation, moderate the relationship

between circular packaging and perceptions of greenwashing. A confident consumer will purchase products packaged in what they perceive as circular packaging, when they are confident that they are not being subjected to greenwashing tactics. These results underscore the importance of understanding consumer behaviour and perceptions in circular environments and policy domains. The findings offer valuable insights for policymakers, businesses, and researchers aiming to promote circular consumption and mitigate environmental harm in the transition towards a more circular economy.

Table of Contents

List of Figures

List of Tables

Acknowledgements

I would like to express my gratitude to my supervisors, Dr Phillipa Gillingham, Prof Heather Hartwell and Prof Robert Britton for their trust, patience, guidance, and support. Their mentorship and valuable feedback have been crucial in shaping and improving my research. I am truly thankful for their encouragement and faith in me, which have made this journey both enriching and fulfilling.

I am indebted to all members of the Faculty of Science and Technology at Bournemouth University who embraced my efforts and showed their overwhelming support during the pilot validation phase of the survey.

A big thank you to the CERC crew at ‘Ecole des Ponts Business School and Prof Giorgos Demetriou, who have been my research family for the first years of my journey, making it colourful and interesting.

Nikoleta and Eleni, thank you for giving me the strength to complete my journey.

Declaration

I declare that no material contained in the thesis has been used in any other submission for an academic award.

Signature ***A. Vayona*** Date ***8th August 2024***

Chapter 1

1.1 Introduction

This chapter discusses the purpose of the study in detail, lists the research questions and associated hypotheses, and discusses the rationale behind the creation of the theoretical framework. In addition, having presented the operationalisation of all the concepts included in the thesis, the nature of the research is explained. Finally, the significance of the study is elaborated, and the definitions of key terms used further ahead in the study, are included.

1.2 Background and motivation

In the years prior to the Roaring ’20s, when food was mainly produced and consumed at the source, nature was the primary provider of food packaging. The international agriculture trade industry in the Western world has witnessed a significant surge since the 1960s to feed a growing population (Hashem et al. 2021). While urbanisation was initially limited to high-income nations until the 1970s, it has evolved into an ever-present global phenomenon (FAO 2009). Population increases through urbanisation resulted in a surge of people relying on food purchasing (FAO 2017) with the rise of supermarkets with ever-increasing products in quantity and choice (Beitzen-Heineke et al. 2017). Recent times have witnessed a dramatic change in consumer behaviour due to this urbanisation, and the adoption of a “live fast” lifestyle involving a higher proportion of convenience foods (Ibid; Zrnić et al. 2021).

The dramatic growth in agriculture, international trade, urbanisation, the rise of supermarkets and the continuing demand for processed convenience, have led to an increase in food production, which consequently increases the utilisation as well as increased use of packaging materials (Chakori et al. 2021; Ncube et al. 2021). Projections for the global annual food revenue forecast is $12 trillion by 2030 (Jeyavishnu et al. 2021) while the market size of the worldwide food packaging industry reached $346.5 billion in 2021 with a projected Compound Annual Growth Rate of 5.5% from 2022 to 2030 (ltd 2022).

Food and beverage packaging serves dual functional and aesthetic purposes as it protects, preserves, and promotes the products throughout the complex supply chain from production to

consumption (Innovate UK 2018). Moreover, packaging has a pivotal role as the initial point of consumer interaction, significantly influencing purchasing decisions (Boz et al. 2020). According to the Food Standards Agency (2022) in the UK, food and beverage packaging must comply with the retailer's shelf display criteria, adhere to the marketers' established brand guidelines, and carry all required labelling information, including the use-by date and product information (Ibid).

Although food packaging is essential for protection and preservation from external contamination (Robertson 2005), packaging solutions are mainly based on a linear economy concept (Sæter et al. 2020). Single-use plastic is the preliminary source of packaging, with the European Union producing 23 million tons of plastic packaging and a forecast of 92 million tons by the year 2050 (Guillard et al. 2018). Food packaging is the largest end-use sector in the UK (Innovate UK 2018) with flexible packaging (predominantly plastic) estimated to be the fastest-growing packaging material for the years 2017-2022 (GlobalData 2018). The amount of plastic produced and disposed of globally has grave consequences for the environment and human health (MacLeod et al. 2021). The infiltration of plastic into aquatic, terrestrial, and atmospheric systems has been documented through multiple pathways, including mismanaged waste, wastewater treatment plants, landfills, domestic sewage, agricultural activities, and urban pollution (Law 2017; Bai and Li 2020).

When plastic pollutes the environment, it can destroy habitats and harm biodiversity (Ivonie and Mardiastuti 2020), trap marine and terrestrial wildlife (Blettler and Mitchell 2021) and transfer invasive species across habitats (Carlton et al. 2017). Animals can also be affected by consuming microplastic in the short term (choking hazard) (Ryan et al. 2016) or long term (food chain infection by microplastic) which can result in harming human health (Igbani et al. 2021). The consumption of micro and nano plastics by humans, through their diets, may cause health complications, including but not limited to, cancer, developmental delays, reproductive and organ abnormalities (Allouzi et al. 2021) and a number of water-borne diseases (Quinete and Hauser-Davis 2021). Moreover, plastic pollution results from both the manufacturing process and the absorption of chemicals, such as heavy metals, from neighbouring materials into the plastic matrix affecting the environment, air and water quality (Turner 2018).

As sustainable development in a linear economic system consists of material recycling (Borrello et al. 2020), the packaging industry has initiated the incorporation of recyclable

plastics into its designs as a mitigative strategy (Ncube et al. 2021). Despite over four decades of large-scale recycling initiatives, only 14% of plastic is globally recycled, while 80% finds its way into landfills or the environment (WEF 2016; Brooks et al. 2018). According to Geyer et al. (2017), recycling delays, rather than avoids the end-of-life disposal of materials, highlighting the issue that recycling should not be the primary option when trying to tackle the food and beverage packaging problem (Chakori et al. 2021). Although recycling is the first thing that people envision when they hear the term "Circular Economy", such practices are placed at the bottom of the circular hierarchy (Valencia et al. 2023). In some cases, recyclability can be worse than using virgin materials (Sarkis et al. 2022), as in many cases, through downcycling, a great amount of thermodynamic energy needs to be used in addition to virgin materials in order to reuse recyclable materials for creating new products (Helbig et al. 2022).

Circular economy (CE), as a restorative and regenerative by-design paradigm, achieves an extended product lifespan through innovative design and servicing (Baran 2019). This approach seamlessly redirects waste from the terminal point of the supply chain to its inception, embodying a continuous cycle of resource utilisation as illustrated in Figure 1 (UNIDO 2017).

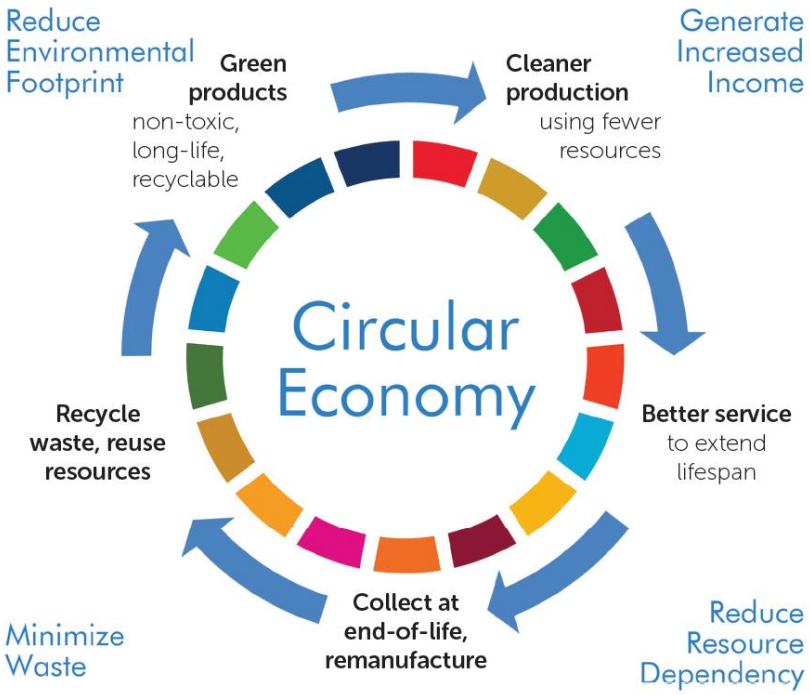

Figure 1: Circular Economy, Source UNIDO (2017)

Therefore, packaging which is created using CE principles needs to protect natural resources, maximise their usage, and reduce their detrimental effects on the environment (The Ellen Macarthur Foundation 2012). The main principle of circular packaging is the idea of "designing out waste" which summarises the concept (Szaky 2019). On a global scale, consumer campaigns led by organisations have effectively applied pressure to reduce plastic packaging pollution, with great results in shifting consumer behaviour (Norgren and Moss 2021). In 2017, the EU organised the #bereadytochange campaign highlighting that single-use plastic for products and packaging is not only of substandard quality but is also socially unacceptable (European Commission 2017). Moreover, the United Nations Environmental Programme (UNEP) in association with World Environment Day, India launched the campaign "Beat Plastic Pollution" in 2018, suggesting new norms towards reusable packaging and food waste by public demand and policy influence (UNEP 2018). In the UK, Friends of the Earth, created the "Plastic- free Easter eggs" campaign in 2018 promoting a consumer behavioural change towards a highly consumable seasonal product, the easter eggs which creates 3,000 tonnes of waste packaging per year (Friends of the Earth 2018).

Numerous studies have indicated that environmental attitudes as well as consumer beliefs and emotions are crucial indicators of environmentally responsible purchasing (Prakash and Pathak 2017; Yadav and Pathak 2017; Pawaskar et al. 2018; Alagarsamy et al. 2021). However, knowing the environmental characteristics of products and packaging is also essential, as it can prevent attitudes from turning into actions (Testa et al. 2020). For instance, studies on consumer perceptions of sustainable packaging have uncovered a disparity between consumers' perceptions of sustainable packaging attributes and actual performance based on life-cycle assessments (Boesen et al. 2019). Consumers' tendency to seek additional information on the environmental features of packaging is particularly critical for comprehending the environmental benefits of circular packaging, which may not always be readily apparent (Testa et al. 2020).

Furthermore, companies nowadays face increased pressure from policymakers and consumers for more sustainable production methods (Heras-Saizarbitoria et al. 2020) with some businesses exaggerating the environmental benefits of their operations, known as "greenwashing" (Ruiz-Blanco et al. 2022). In the UK there has been an increase in ethical consumer spending by 24% from 2019 to 2020 (Frith 2022), making greenwashing a very tempting perspective for some companies. Corporate greenwashing causes several problems,

one of which is that consumers may get swayed and perplexed in their purchasing choices due to their inability to distinguish between genuinely eco-friendly products and those that are falsely marketed as such (Martínez et al. 2020; European Commission 2022).

To this end, individuals often resort to recycling when faced with uncertainty regarding the proper disposal method for a given product (Blanco et al. 2023). The phenomenon known as "wishcycling," where items of uncertain recyclability are placed into the recycling stream, and despite reflecting good intentions, unveils a notable lack of knowledge and understanding of consumers concerning product recyclability. (Oikonomopoulou et al. 2023). Wishcycling can lead to recycle contamination, decreasing raw materials and machinery damage (Brundell 2022). The estimated wishcycling rates in the United States range between 17% and 25%, demonstrating a positive trajectory (Price 2020). Moreover, in the UK, councils rejected approximately 647,000 tonnes of recycling materials in 2021, redirecting them to landfills due to recycling contamination (Northen et al. 2023).

In this thesis, it is argued that it is easier for a greenwashed consumer to conduct wishcycling and that the lack of relevant regulations and punishment systems is a strong motive for corporate greenwashing (Lyon and Montgomery 2015). Wishcycling is a well-intended belief that a product is recyclable but can create many problems and has even been suspected of being the driving force behind China's banning of plastics imports, as enacted in 2018 through the China "National Sword" Policy (Warren et al. 2020).

1.3 Problem Statement

This study addresses the lack of research on the potential correlation between "greenwashing" and "wishcycling" in the circular economy paradigm and citizens' perceptions by incorporating theories from human relationships and psychology to enhance the social circular agenda. Although many studies have researched the definition and practice of greenwashing (Schmuck et al. 2018; de Freitas Netto et al. 2020; Guerreiro and Pacheco 2021; Ruiz-Blanco et al. 2022), in particular, whether environmental claims and implicit nature-evoking elements influence consumer perceptions positively (Parguel et al. 2015; Magnier and Schoormans 2017; Samaraweera 2020; Boncinelli et al. 2023), as well as the effects of corporate greenwashing techniques on consumer purchasing decisions (Boncinelli et al. 2023), the relationship between

corporate greenwashing and consumer wishcycling has not been researched yet. Greenwashing not only can harm the adoption and effectiveness of CE practices, such as the consumers' intention to adopt circular packaging but can also transfer the aforementioned pressure to the consumers who may in turn resolve to wishcycling.

Using circular packaging as a lens, this thesis investigates the role of consumer attributions towards corporate greenwashing and wishcycling. Attribution theory is a well-established concept in Human Resource practices when researching how employees in an organization adapt to changes inflicted upon them (Guest 2017). At the heart of the concept of attribution theory lies the assertion that people are constantly seeking to explain events that they encounter (Hewett et al. 2018). In the context of circularity (Vayona and Demetriou 2020; Katou et al. 2023), attribution theory provides a framework for understanding how consumers perceive a company's ability to adopt a more responsible business approach, how they attribute such motives to the actions of the company, and how this cognitive process ultimately impacts consumers' subsequent responses (Leonidou & Skarmeas, 2017). The theory is particularly applicable to the investigation of green products, as attributions are commonly triggered in situations where there is divisiveness and suspicion, which is a common occurrence in sustainable product marketing (Ibid).

At the same time, this thesis introduces core self-evaluations (CSE) which is a well-established concept in Psychology (Farčić et al. 2020) and Organizational Development (Joo and Jo 2017) related to sustainability research. CSE represents a fundamental and essential evaluation of an individual's self-worth, effectiveness, and capacity, influencing their level of motivation (Köppe and Schütz 2019). Individuals with high CSE possess the skills and mindset needed to effectively approach problems with dynamism and critical thinking (Kong et al. 2014).

In leveraging attribution theory and CSE, it is argued that governments and policymakers should be vigilant of corporate greenwashing techniques, their effects on citizens and consumer behaviour, and wishcycling, to be able to define and implement policies towards CE adoption. A recent example is the intent of the EU to regulate against corporate greenwashing after announcing that "half of the green claims used to sell products in EU are misleading" (European Commission 2023). The above statement highlights that although great efforts have been made by the UN's Global Sustainable Development Goals, the European Green Deal, the UK Government packaging waste goals and pioneers like the Ellen MacArthur Foundation, the

greenwashing effect and the domino effects it creates have not yet been adequately addressed.

In summary, the research problem addressed in this thesis explores the interconnections between corporate greenwashing and consumer wishcycling by integrating societal dimensions of consumer attributions and core self-evaluation (CSE) through the lens of the CE paradigm.

1.4 Purpose of the Study

This thesis aims to investigate the serially mediating relationships between companies' circular packaging practices, corporate greenwashing practices and individuals' wishcycling behaviours from a consumers' perspective, reflecting on their personality, perceptions and attributions of company intentions.

Inspired by the well-known concept of Human-in-the-Loop (HITL) in computer science which studies the need and arrangements for human intervention and control in machine learning systems, this thesis coins the term Human-in-the-Circular-Loop (HITCL). HITCL emphasises modelling and understanding the human perception and decision-making process when interacting within a CE ecosystem. As such, this study focuses on the HITCL aspects as elaborated above and as depicted in Figure 2.

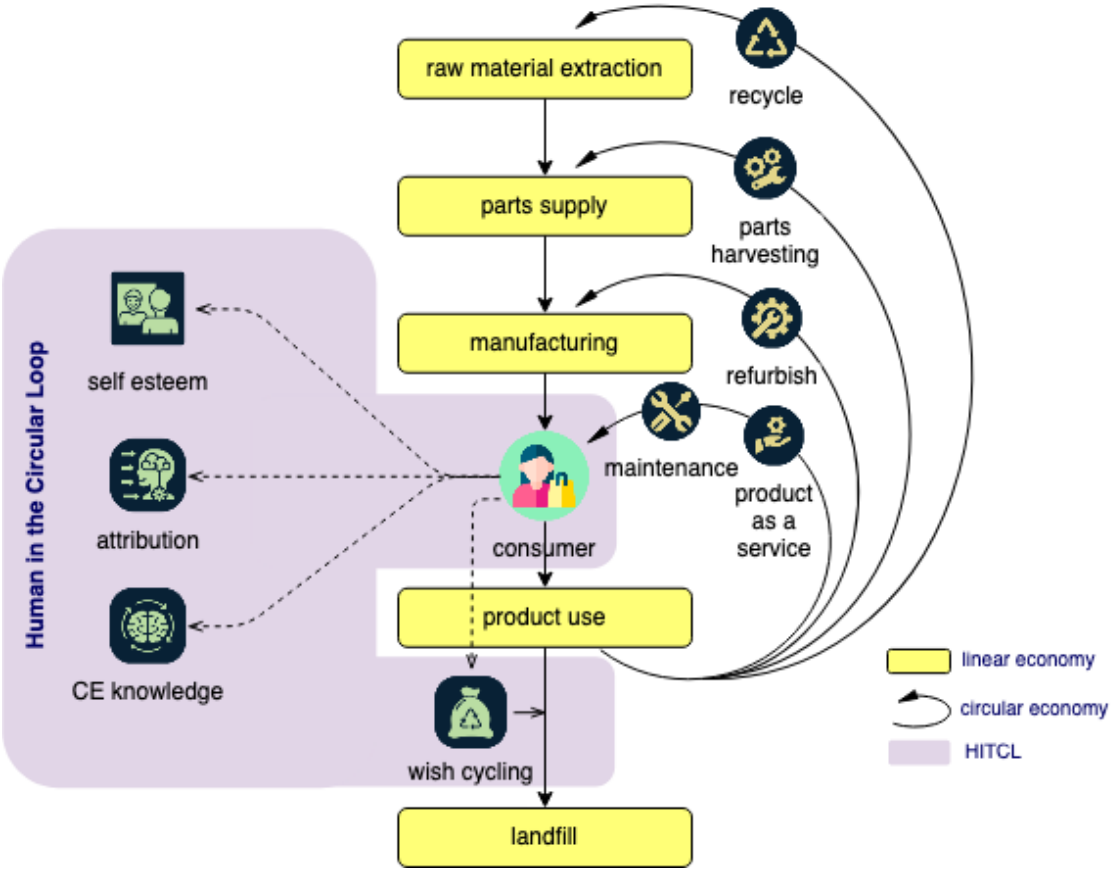

Figure 2: The Human-in-the-Circular-Loop
***Note**: Icons made by Flaticon.com by author*

The scope of the HITCL concept covers those human aspects that can potentially influence CE loops. It studies human decision-making in ways that can either hinder or support the transition towards the CE.

For example, consumers being influenced by factors such as self-esteem, consumer attribution, or CE knowledge, will choose to engage in circular or linear practices. The focus of this thesis is to examine ways to increase the factors that enable consumers to transition to circular practices. It is argued that an informed consumer will not only disengage from wishcycling activities but will be at the centre of control of the circular loops.

To this end, the following research questions have been formulated:

1.5 Research Questions

RQ1: Does consumers' personality serve as a moderating factor in the relationship between their engagement in circular food and beverage packaging and their perception of companies' greenwashing practices?

RQ2: To what extent can consumer attributions of companies' greenwashing practices be refined or outlined with greater granularity as driven by business-oriented and society-oriented motivations?

RQ3: What is the relationship between companies' greenwashing practices and consumers' attributions?

RQ4: What is the relationship between consumers' attributions and their wishcycling behaviour?

Accordingly, in relation to the research questions the following set of hypotheses has been developed:

1.6 Hypotheses

H1: Core self-evaluations negatively moderate the relationship between consumer engagement in circular food and beverage packaging (CP) and consumer perception of corporate greenwashing practices. This would mean that consumers with high CSE who engage with CP would be less likely to perceive they have been greenwashed.

H2: There is a positive relationship between greenwashing and consumer business-oriented attributions so that if consumers perceive that the motives behind greenwashing are business-oriented, they are likely to recognise greenwashing.

H3: There is a positive relationship between greenwashing and consumer society-oriented attributions so that if consumers perceive that the motives behind greenwashing are society-oriented, they are likely to recognise greenwashing.

H4: There is a negative relationship between consumer business-oriented attributions and

wishcycling so that if consumers perceive that the motives behind greenwashing are business-oriented, they are likely to recognise greenwashing and engage in less wishcycling.

H5: There is a positive relationship between consumer society-oriented attributions and wishcycling, so consumers are more likely to be persuaded by society-oriented greenwashing, resulting in higher levels of wishcycling.

1.7 Theoretical Framework

A theoretical framework provides a means to explain and analyse the phenomenon under investigation (Luft et al. 2022). To develop the theoretical framework, three things must be considered: first, the definition of the relevant concepts and theories that will serve as the foundation for the research, second, the establishment of the logical connections between them and third, the establishment of the relevance to the study (Varpio et al. 2020).

According to the research items in question stated previously, the concepts included in the study are the following: companies' circular packaging practices, companies' greenwashing practices, consumers' business-oriented attributions, consumers' society-oriented attributions, consumers' wishcycling behaviour, and consumers' personality.

Based on the hypotheses stated previously, the theoretical framework has been developed diagrammatically and presented in Figure 3.

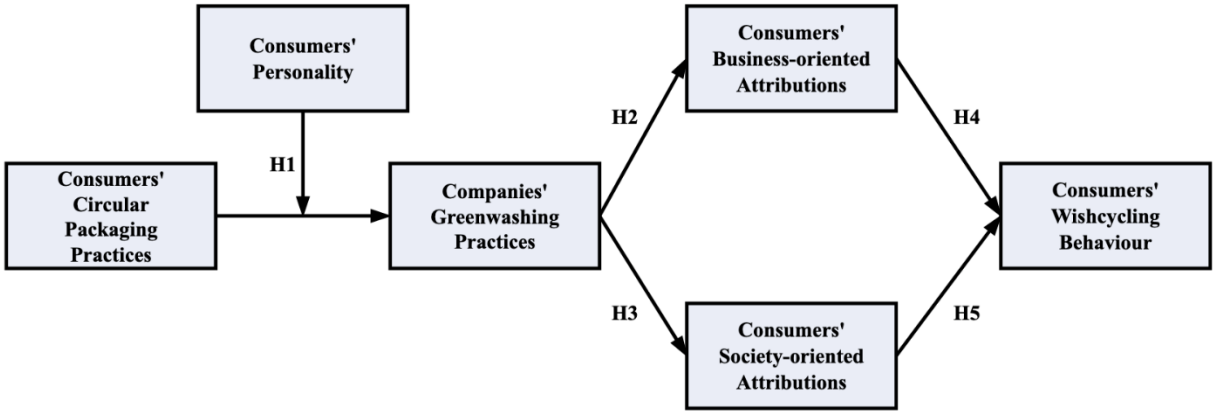

Figure 3: The Theoretical framework.

Having presented the theoretical framework in Figure 3, the next step was to develop the operational constructs to be used in the quantitative analysis of the study.

The operationalisation of the concepts, or now the constructs of the study, is as follows:

- *Consumers' personality (F1):* To evaluate consumers' personality the core self-evaluation (CSE) dimensions proposed by Judge et al. (2006) were adopted as follows: self-efficacy, self-esteem, emotional stability, and locus of control.
- *Consumers' circular packaging practices (F2)*: Based on Testa et al. (2020), this construct has two dimensions – circular food packaging and circular beverage packaging.
- *Companies' greenwashing practices (F3)*: Based on Tesla et al. (2020a), and Leonidou and Skarmeas (2017), this construct comprises the well-established literature dimensions of the so-called seven sins, namely: false environmental claims, misleading labels, hidden trade-offs, irrelevant environmental claims, lesser of two evils in packaging, unproven claims, and vague claims (TerraChoice 2010).
- *Consumers' business-oriented attributions (F4)*: This construct comprises two dimensions developed according to Nishii et al. (2008) as follows: increasing companies' sales and minimum disruptions of companies' processes.
- *Consumers' society-oriented attributions (F5)*: This construct comprises two dimensions developed according to Nishii et al. (2008) as follows: demonstrating environmental ethos and signifying social responsibility.
- *Consumers' wishcycling behaviour (F6)*: This construct is based on Econie & Dougherty (2019) and it consists of three dimensions as follows: quality, contamination, and machinery damages.

1.8 Nature of the research

Having operationalised the concepts into constructs, a structured questionnaire was developed with respect to the dimensions built-in in each construct. The items included in each dimension were structured under a 5-point Likert scale which consisted of "1 = strongly disagree" to "5 = strongly agree". Overall, the questionnaire created included 92 items distributed according to the literature among dimensions in constructs and 7 demographic characteristics of the respondents (controls).

The quantitative research employed for the analysis of the phenomenon under study is based on the following steps:

1. A pilot study was conducted and administered via the online platform Qualtrics[1] a week before the full release, which verified that the survey was clear and comprehensive.

2. Using three different approaches based on Zikmund et al. (2003), Kline (2011), and Gaskin (2023), for determining an acceptable sample size for the study, it is found that such a sample should be between 535 and 545 correspondences.

3. The actual survey was administrated by an online platform and the correspondences were all received within a three-hour window. The participants were UK adult residents, and probability simple random sampling was conducted via the online platform Prolific[2]. The raw data was only visible to the researcher and available to download immediately via the online platform.

4. From the full release on the online platform and after examining the questionnaires received for possible outliers, the actual sample size used in estimation was 537 respondents, which was within the sample size range indicated in Step 2.

5. Before estimating the operational model and testing the hypotheses, a series of evaluations were made to examine the properties of the constructs and their dimensions, such as the consistency, validity, reliability, common method bias etc., via SPSS software.

6. To estimate the proposed framework and test the developed hypotheses, the methodology of *structural equation models* (SEM), or *latent variable models* (Hair et al. 2013), was used. This is because SEM is effective in evaluating path analytic models that involve mediating and moderating variables, as well as latent constructs that are measured through multiple items (Luna-Arocas and Camps 2008).

[1] https://www.qualtrics.com/uk/

[2] https://www.prolific.com/academic-researchers

1.9 Significance of the Study

The phenomenon under study in this thesis provides a novel approach to investigating the human aspects of CE ecosystems. Focusing on consumer engagement with circular food and beverage packaging, this thesis unveils the interconnections between corporate greenwashing and consumer wishcycling. Employing a comprehensive theoretical framework, the study draws upon attribution theory and core self-evaluation to reveal the underlying mechanisms and psychological factors shaping these phenomena.

Although these two theories have been researched extensively in other disciplines, to the best of knowledge to date, they have not yet been applied adequately to circular economy studies. Accordingly, this thesis develops a strong theoretical and empirical perspective that enhances understanding of the phenomenon under study.

Specifically, the thesis supports that consumer personality (reflected in core self-evaluations) influences their engagement with circular food and beverage packaging, as well as their perception of corporate greenwashing. Specifically, consumers with high self-esteem and high engagement with circular packaging practices believe that companies conduct less greenwashing, in contrast to those with lower self-esteem. Moreover, the thesis explores how the phenomenon under study may depend on some specific consumer demographics, such as their education, age and understanding of the CE. Furthermore, this thesis introduces the concept of two distinct categories in corporate motives for greenwashing, business-oriented and society-oriented.

Ultimately, the informed reader is likely to take from this thesis that not only does consumer engagement with circular food and beverage packaging have an impact on consumers' wishcycling behaviours, but they are also likely to comprehend the moderating and mediating mechanisms that are involved between the concepts in the phenomenon under study. Finally, the information presented in the thesis should prove useful to practitioners dealing with CE relationships, given that it is grounded on rigorous theoretical and empirical research.

In summary, it may be considered that the thesis is innovative, novel and high-quality, aiming to advance theoretical and empirical knowledge and address practices in the area of CE.

1.10 Definitions of Key Terms

Primary Packaging*:* The packaging that is in direct contact with the product (usable or consumable) (Ramakanth et al. 2021). Primary packaging (items) is the smallest unit of distribution that contains the product purchased for consumption (Konstantoglou et al. 2020) such as a pack of crisps or a plastic water bottle.

Secondary Packaging: Combines all primary packaging into a single product. It enables the products to be stored and transported more efficiently (Ramakanth et al. 2021). It is the material used to enclose the primary packaging, such as cardboard or wooden boxes (Konstantoglou et al. 2020).

Tertiary Packaging*:* Combines secondary packaging to one product. Ensures minimum storage space for storage and transportation and protection from the environment (Ramakanth et al. 2021). A pallet of cardboard boxes containing pack of crisps is an example of tertiary packaging.

1.11 Thesis overview

In Chapter 1 of this thesis, the objective and aim of the study are outlined. The goal is to explore the interconnected relationships between companies' implementation of circular packaging practices, instances of corporate greenwashing, and individuals' wishcycling behaviours, from consumer perspective. The study considers how consumers' personalities, perceptions, and attributions of company intentions influence these dynamics. As such, Chapter1 forms the research questions, hypotheses and theoretical framework of this thesis.

Chapter 2 provides the literature review for the present study and consist of four distinct sections. The first section offers a brief historical overview of packaging evolution from early years to the contemporary era. This historical narrative highlights the circular practices and principles in food and beverage packaging prior to the 1950s, underscoring parallels with contemporary governmental and policymaker initiatives. The second section presents an overview of both linear and circular economic models, with specific focus on their application within the food and beverage packaging domain. In the third section, the concept of "greenwashing" is introduced, revealing its implications within the context of circularity discourse. Subsequently, the fourth section explores into the "wishcycling" phenomenon examining its effects within waste management.

HITCL framework is presented in Chapter 3. Drawing on established theories it aims to understand human influences on the adoption of circular practices. By recognising humans as consumers and employees crucial in transitioning to the Circular Economy, HITCL facilitates the study of how individuals embrace circular economy concepts and how this affects their behaviours and decision-making regarding circular practices. Using a case study of circular packaging for food and beverage products, the framework places emphasis on the Remanufacture, Refurbish, Reuse, and Recycle loops, particularly regarding wishcycling. Employing attribution theory and core self-evaluation within HITCL, the chapter reveals the psychological mechanisms underlying wishcycling. While these theories have been extensively studied in other fields, their application to circular economy studies is novel.

Chapter 4 sets the methodology employed in this study, where the measures undergo evaluation through validity, reliability, and normality tests. These tests are essential to ensure the accuracy, consistency, and appropriateness of the measures used. Consequently, the study proceeds to employ Structural Equation Modelling (SEM), as detailed in Chapter 5, to analyse the relationships between variables and test the proposed theoretical framework. Chapter 6 then presents the discussion of the findings, highlighting the theoretical and research implications as well as the managerial and policy-making implications, followed by Chapter 7 where the conclusions, recommendations for future research and limitations are presented.

Chapter 2
Literature Review

2.1 Introduction

This chapter aims to explore existing literature and better understand current perspectives on corporate greenwashing and citizen wishcycling in the context of circular food and beverage packaging. This review aims to synthesise new knowledge on the concepts by connecting existing research streams (Torraco 2005). The literature review begins with the definition of food and beverage packaging and a historical review of the subject, with a strong emphasis on how the industry has evolved since the beginning of human civilisation and how consumer perception has changed through different historical times. In the second part of the literature review, the concepts related to circular food and beverage packaging are discussed, corporate greenwashing, and citizens' wishcycling.

Resources from Google Scholar, Scopus, ScienceDirect were used for this literature review, together with web published EU and UK policy documents, online publications and newspapers. Articles were grouped into the following themes: history of packaging, general food and beverage packaging, circular food and beverage packaging, Circular Economy, greenwashing, and wishcycling. To ensure the most recent knowledge was synthesised, articles were sorted based on their publication date, with a majority of the papers used in this research being published between 2017 and 2023. Earlier research was selectively used, where it related to the evolution of a theory or the history of packaging, or where it was the most recent contribution to a topic. Additionally, grey literature sources were considered when required to supplement information on the history of food and beverage packaging, filling gaps not covered in peer-reviewed articles. In the context of this thesis, grey literature is used to establish background information, such as historical examples of food and packaging materials, UK and EU policy papers and new developments in the compostable packaging industry, with no direct contribution to the methodology and results.

2.2 Food and beverage packaging

Currently, packaging is a crucial part of the modern food and beverage industry, and most products are sold with some form of packaging (Qolbi 2023). Packaging describes the variety of materials that are used to protect, handle, transport and preserve food and beverage products across their entire life cycle—from initial raw materials to the final destination, the consumer (Konstantoglou et al. 2020). Many different types of materials are used as primary packaging, such as paper, plastic, aluminium, paperboard, and a mix of two or more of the above (Karmaus et al. 2018).

The packaging for food and beverage products is crucial as it *protects* the contents, securely *contains* them, offers *convenience*, and *communication* aids (Pou et al. 2022). Packaging *protects* against moisture, oxygen, vapour, smells and micro-organisms that can be very harmful environmental factors for food and beverage products (Zhang et al. 2022). Additionally, the *containment* function of packaging relates to the material's capability to prevent product leakages into the environment and safeguard the product from potential contamination by foreign objects (Pascall et al. 2022). This function protects the environment, for example by preventing oil leakages to water streams, and contributes to food waste reduction (Hahladakis et al. 2018).

It is estimated that total food waste worldwide is almost 17% with 11% of total food grown wasted by households, 5% by the food services sector and 2% by retail firms (UNEP 2021). In the United Kingdom, contemporary studies reveal that 25% of the 58.7 million metric tons of food produced is discarded, with 46% of this wastage occurring during the consumption stage (Jeswani et al. 2021). This observation highlights a noteworthy disparity between global food waste patterns and the specific case of the United Kingdom, implying that Western nations exhibit elevated levels of food wastage compared to the global average. While food waste remains a major global concern due to nutritional losses, it also indicates the inefficient utilisation of essential resources, including land, water, and energy, contributing to environmental degradation (Ibid). Research conducted in the United Kingdom has unveiled that food waste contributes to 3% of the national greenhouse gas (GHG) emissions and constitutes 6% of the country's water footprint (WRAP 2020). Adding to the above, Brennan et al. (2021), observed a contemporary shift in perspective, in which the examination of food waste and packaging's role in waste reduction extends beyond the food-related concerns to

include broader considerations such as waste management, sustainability, cleaner production, and environmental implications. Moreover, the *convenience* function of packaging relates to the ease with which consumers can transport, use, and dispose of the packaging (Omar et al. 2022). Packaging designed for convenience, characterised by a brief lifespan, contributes to reduced recyclability and poses environmental challenges due to increased potential for food contamination (Thurber and Curtzwiler 2020). Finally, packaging acts as a "silent salesman" (Telzer 1989) helping companies in *conveying messages* to consumers. As part of this, packaging serves as a medium to provide crucial nutrition and environmental information through labelling, empowering consumers to make informed product comparisons and distinctions (Robertson 2005).

The food industry selects the most suitable packaging materials for a food product by taking into account factors such as the packaging material's functional attributes (including protection, barrier, and appearance) (Cheng et al. 2022), the intrinsic characteristics of the food (such as pH, water activity and acid content) (Redding et al. 2023), the extrinsic properties (like temperature and gaseous atmosphere) (Ahankari et al. 2021), the required shelf-life of the product, legal regulations, and cost considerations (Etxabide et al. 2022).

For this study, packaging is considered a separate product from the food/drink it preserves. Ensuring clear and improved communication to consumers regarding the purchase of packaged products is of greatest importance. This involves recognising the purchase as buying two separate products, rather than just one main item and a by-product, essentially, a waste. Before consumption, most customers view the package as being part of the product (Panda et al. 2022) however, in post-consumption, it is regarded as waste (Fogt Jacobsen et al. 2022). Regulatory and media attention on limiting packaging usage developed from concerns about waste, aiming to influence consumers accordingly (Franz and Welle 2022; Khuc et al. 2023). As a result, consumers believe that packaging presents a bigger problem for environmental sustainability than actual food waste (Wohner et al. 2019) and food production (Grönman et al. 2013). Additionally, there is evidence indicating that individuals with a higher environmental awareness tend to be more sceptical towards packaging materials (Rhein and Schmid 2020).

To further understand and evaluate the communicative effectiveness of packaging as a medium between companies and consumers, in the next section a brief historical overview is provided with a focus on the evolving patterns in consumer behaviour over recent times.

2.3 A brief history of packaging

2.3.1 Early years

Packaging has evolved since the first people began using tools, and it has a long history that parallels the growth of human civilisation (Knorr and Augustin 2023). Prehistoric people did not need to store their food; they consumed food when available through foraging and hunting (Bottinelli 2021). The first nomad communities developed the need to find means to transport food, and nature provided the packaging in the form of shells, leaves, animal organs, and hollowed logs (Sarkar and Aparna 2020). Later, when people established villages, the need for storing, preserving, and transporting food began, and people developed more innovative packaging in the form of woven baskets, wooden boxes, crates, and clay vessels (Risch 2009). Greeks and Romans used amphorae, pottery made in different forms and shapes, to store, preserve and transfer olive oil, wine, grains, and other goods across the ancient Mediterranean continent (Cheung 2021; Cvetkovic et al. 2022).

In this era, goods were preserved in bulk rather than portion packaging, and transportation was very labour-intensive and time-consuming due to all products having different-sized packaging, resulting in inefficient use of space, and unbalanced vessels (Harutyunyan and Malfeito-Ferreira 2022).

The two most influential and creative inventions of ancient civilisations to packaging were the Ancient Egyptians' development of glass blowing around 3500 BC and China's invention of paper in 105 AD, during Emperor Ts'ai Lun of the Imperial Court era, with paper being the earliest instance of flexible packaging (Shenoy and Aithal 2016; Panneels 2019; Galic et al. 2021). There were many years of evolution before glass and paper could be used as packaging material (Bolanča et al. 2018). In the 16th century, paper packaging was utilised by Europeans due to the need for a lightweight and easily transportable material when transferring goods from their colonies (Ibid). Glass has been used in packaging for centuries, but few bottles from early times are preserved because glass was thin, fragile, and costly to make, leading to its exclusive use for luxury items (Mocioiu et al. 2017). The oldest unopened wine bottle was discovered in a Roman tomb, near what is today the city of Speyer in Germany, and dates between 325 and 359 AD (Feier et al. 2019). The unusual-shaped bottle was sealed with wax,

and a thick layer of olive oil prevented the wine from evaporating (Ibid p.19).

Another form of packaging was used when people started exploring new continents and travelling through the oceans, which was made in the form of wooden barrels and boxes to store food, necessary for long travels, and to transport back valuable discoveries (Galic et al. 2021). The first commercial shipping container was invented by William Parry in 1852 and could hold up to 20 tons (Nagal 2022). Only later, in 1925, the steel shipping container was invented by George Steers Jr, by reducing the amount of cargo needed, making transportation by ships faster and more efficient (Ibid).

2.3.2 19th century

During the Industrial Revolution, the rapid pace of urbanisation led to many changes and developments at social, cultural, economic, political, and military levels (Fomunyam 2019). The introduction of mass production and machinery created the possibility for more efficient packaging methods that could keep up with accelerated production (Regattieri et al. 2019). Although manufacturers and producers needed large storage and transportation packaging, consumers wanted smaller, more attractive, easy-to-use, individual packaging (Mittal 2014), which led to the invention of primary packaging for commercial use. By that era, glass had become more available as a packaging material. New techniques, better material and coal ovens had made glass stronger, thicker, and darker and developments in machinery led to glass production of 200 bottles per day (Owusu-Apenten and Vieira 2023).

For 300 years before the Industrial Revolution, soldiers ate salted meat and hardtack biscuits; malnutrition claimed the lives of more than half of the British navy in the Seven Years' War (Shephard 2006). In 1795, Napoleon Bonaparte offered a cash prize to whoever could invent a solution to preserve food for his army (Christensen 2023). The discovery came 15 years later by Nicolas François Appert, known as "the father of canning", who used glass food jars closed with a cork and sealed with wax, which he boiled (Misra et al. 2017). Later in the same year, Philippe de Girard replaced the glass jars with cans he sterilised by boiling (Christensen 2023). Significant advancements in paper production also occurred during the mid-19th century. Paper was now produced from wood pulp and machinery was invented to bleach it and make it more attractive (Evans 2021). In 1852, Francis Wolle created a paper bag machinery which, together with the invention of glued paper sacks in 1870, gained great popularity as food packaging

materials (Grieco et al. 2020).

2.3.3 The first half of the 20th century

The differentiation between the two halves of the 20th century is essential, considering the historical events of the two World Wars and the Great Depression that dominated the first half (Sayed and Peng 2020). During this period, many families lost their income and struggled to gather enough food (Leighninger 2019). People started making frequent visits to the shops and purchasing smaller and more affordable quantities, which also impacted the way goods were packaged (Brusso 2021). Everyday necessities were packaged in paper, sealed in wax or cork, and carried in fabric, reusable bags (Nagal 2022). During this period, individual packaging was still costly and laborious and was used for luxurious goods, such as jewellery, gifts, shoes, and premium foods (Risch 2009). The culture of the time was to preserve, refurbish, repair, and reuse all resources, so packaging was designed with dual purpose, to be reused after consuming the goods it held (Jones and Tadajewski 2016).

One example is the Dixie Queen cut plug tobacco box (Figure 4), which measured 7.5x 5x 4 inches and had handles and a design resembling a picnic basket (Mittal 2014). The box was designed to be reused as a lunch box after tobacco consumption, resulting in product advertisement long after consumption. Over the years, the company changed its packaging to be reused as a toy of popular figures (Ibid).

https://www.michianaantiquemall.com/images/advertising/b21dix1.jpg

https://hannemanarchive.com/tag/dixie-queen/#jp-carousel-1252

Figure 4: Dixie Queen cut plug tobacco box and little girl with Dixie Queen tobacco box
Note. Left panel: Dixie Queen tobacco box (https://www.pinterest.co.uk/pin/antique-advertising-collectibles--380976449705404862/). Right panel: The tobacco box being reused as a lunch box by a child, by *Hanneman Archive, 2014* (https://hannemanarchive.com/tag/dixie-queen/). Reproduced with permission.

Another example of the public perception of packaging of the era is the reuse of flour, sugar, and other commodity bags (Powell 2012). Companies, like Bemis Bro Bag Co. from Minneapolis and Asa Bales of the Southwest Milling Co. in Missouri, started to print attractive patterns on their cotton bags which led to customers being more interested in fabric patterns rather than the product itself (Ibid). The decorative bags were upcycled and turned into dresses, aprons, and curtains but also necessities such as children's clothes, diapers, towels, sheets, and pillowcases (Mittal 2014). The repurposing of the bags had become so popular at the time that women organised swap parties to get enough material of the same patterns to complete their design (Powell 2012). The movement was so popular with consumers that some manufacturers sponsored dress-making competitions, with some of the entries displayed today in museums (Wright 2013). Even Marilyn Monroe, when criticised for a red dress she wore at a Hollywood party, decided to reuse a sack of potatoes and turn it into a photoshoot dress (Dhayef and Al-Zubaidi 2021). The dress was designed by costume designer William Travilla, and one of the pictures was published in Stare, a cheesecake magazine (LaVine 2023).

Through that era, consumers' shopping experience changed forever with the introduction of "self-service" shopping (Shaw et al. 2004). Previously, the customers gave their lists to a clerk who would then collect all the products and bring them to the counter, without the consumer

having the opportunity to walk around aisles and choose between different products (Sundarabharathi and Muthulakshmi 2023). The first supermarket was called Piggly Wiggly and opened in Tennessee, USA, by Clarence Saunders (Ibid).

Now, consumers had more choices, and the rising number of vehicles meant that people could travel long distances to find better deals (Neuninger 2019). Offering a broader range of options at discounted prices forced companies to enhance product appeal and distinctiveness, to provide consumers with more attractive choices. (Cook et al. 2021). In this era, the phrase "let the buyer beware" became popular, since there was a sudden plethora of goods, some of inferior quality (Chauhan 2021). To overcome this obstacle, companies started to create new and innovative packaging to distinguish their products from those of their competitors and to inform customers of their product superiority; this was the time when branding started to emerge, and logos started to be used to indicate the manufacturer and product quality (Frohlich 2022). Packaging therefore became a means of communicating messages to the consumer (Shaw et al. 2004). It was during this time that, the first bio-based plastic was invented from cellulose (Habib, 2022), and although synthetic plastic was invented during the first half of the 20th century, its production and use were monopolised by the military until the end of WWII (Molenveld and Slaghek 2022).

2.3.4 The second half of the 20th century

The end of the war marked a dramatic change in the Western way of living, where people, after years of austerity, could once again consume and enjoy the conveniences and comforts of modern life (Lahtinen 2023). Companies previously devoted to military production modified their production to everyday household goods (Rahardiyan et al. 2023). This was when refillable bottled beverages changed to single-use aluminium cans, and plastic became a popular alternative for packaging, advertised as a disposable, cheap and invaluable material (Rothman and Ryan 2023).

Companies launched focus campaigns introducing the throwing-away culture that people were unfamiliar with up to that point (Chin et al. 2023). These advertisements promoted low cost and high convenience for the new packaging materials, portraying plastic as cheap enough to be disposed of and metal cans as more convenient than the returnable glass bottle alternatives (Ibid). In 1955, LIFE magazine published an article entitled "Throwaway Living" (Figure 5),

where the convenience of single-use plastic was celebrated (Cronin et al. 2022).

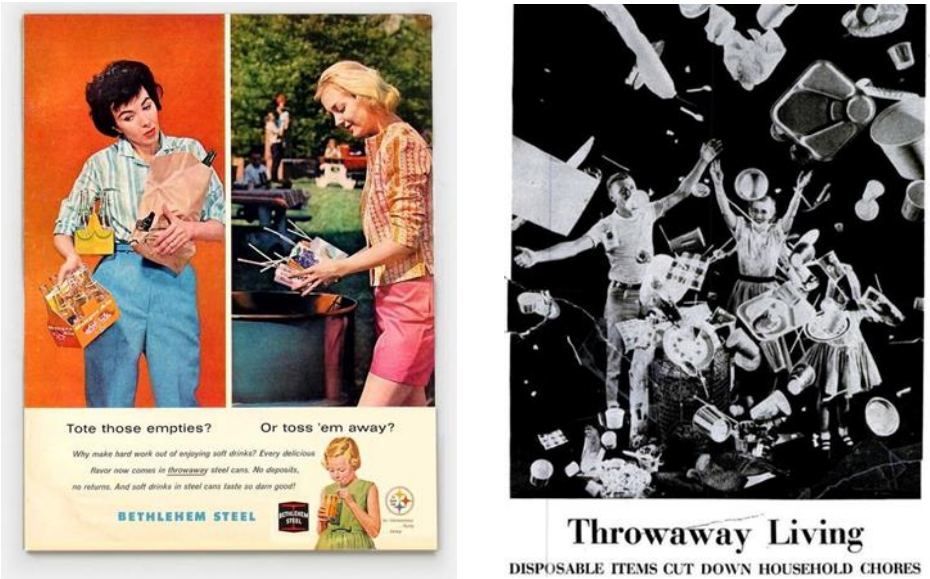

Figure 5: "Throwaway Living" culture
Note. Left panel: Single-use packaging promotion advertisement (https://virtuebrush.com/blogs/news/the-story-of-plastic-how-plastic-has-changed-the-world). Right panel: LIFE magazine 1955 "Throwaway Living" (https://virtuebrush.com/blogs/news/the-story-of-plastic-how-plastic-has-changed-the-world).

Through marketing and messaging, plastic packaging was presented as the most viable choice, as it could be see-through, allowing consumers to observe the quality of the food they were buying, hygienic and a packaging that could increase the shelf life of products and, at the same time, decrease food waste (Ibid). DuPont has been one of the companies that helped dramatically change the way consumers perceive food packaging. In the early 50's, they developed a series of advertisements where babies (associated with innocence, purity, and cleanliness) were wrapped in cellophane though the campaign did not last long due to fears of suffocation (Ibid).

By the end of the 20th century, a substantial number of different plastic materials were available, and coupled with advances in computing and the evolution of printing technologies, plastic became the dominant packaging material (Mittal, 2013). Most recently, and due to the lack of proper regulations and the disguise of convenience, food packaging has entered the extreme-packaging era. Eggs, fruit, and vegetables have been stripped of their natural, compostable packaging to be wrapped in plastic (Figure 6). As such, overpackaging has become a grave concern (Sokolova et al. 2023).

https://www.boredpanda.com/unnecessary-wastefulpackaging

https://packhelp.com/bad-packaging/

Figure 6: Extreme- packaging era, mandarins and eggs were removed from natural packaging. ***Note.*** Left panel: Twitter post by Nathalie Gordon, 2016 (https://twitter.com/awlilnatty/status/705375555030556672/photo/1). Right panel: "Bad" packaging example by Phil Forbes, nd. (https://packhelp.com/bad-packaging/).

However, this excessive packaging trend did not last long as, through the early 21st century, consumers, governments, many packaging companies, and food producers alike, started to question this trend and demand new and innovative packaging solutions (Palazzo et al. 2023). The demand has been aimed towards governments to provide relevant regulations and for companies to rethink their packaging and give consumers reusable, repairable and fully recyclable packaging (Swetha et al. 2023).

2.4 Circular Economy and Circular Packaging

2.4.1 Linear Economy (take-make-dispose)

As discussed previously, the last part of the 20th century marked a shift in consumer behaviour with the introduction of the term "consumerism" (Slijepcevic 2023). People had more disposable income and a drive to better their lives by obtaining consumer goods and material possessions (Ortega Alvarado et al. 2022). Benton (2020) referring to Victor Lebow (1955), a prolific retail analyst, emphasised the statement:

"Our enormously productive economy demands that we make consumption our way of life,

that we convert the buying and use of goods into rituals, that we seek our spiritual satisfaction, our ego satisfaction, in consumption… We need things consumed, burned up, replaced and discarded at an ever-accelerating rate" (Lebow 1955).

This consumer culture led the Western world to the "take-make-dispose" economic model, known today as the Linear Economy (LE) (Ana 2023). The essence of this economic model is that businesses can take all the resources they need to make a product, sell it for profit, and, in turn, dispose of everything that either companies or consumers perceive as waste (Ajwani-Ramchandani et al. 2021). In this light, and in line with the culture of the time, food and beverage packaging stopped being a luxury product, and became a cheap, single-use, and disposable by-product, a waste (Etxabide et al. 2022). The linear model is nowadays penalised for the excessive exploitation of finite natural resources and the harmful accumulation of waste and is also held responsible for global environmental challenges and the deterioration of valuable ecosystems (Dey et al. 2021). In the linear era, different types of single-use plastic (Polyethylene (P.E.), Polypropylene (P.P.), Polyvinyl chloride (PVC), Polystyrene (P.S.), Celluloid), and mixed materials (which in most cases do contain plastic) have replaced almost all forms of natural packaging materials due to their excellent preservation and food protection qualities and low cost (Gahleitner and Paulik 2017; Dey et al. 2021; Tan et al. 2021).

In 2016, The World Economic Forum (WEF) estimated in their report on "The New Plastic Economy" that 8 million tons of plastic are leaked into the ocean each year, with packaging responsible for the lion's share (WEF 2016). It is expected that, by 2050, plastic in the oceans will be heavier than the weight of fish (WEF 2016). Henderson Island, an uninhabited island 3.200 miles from New Zealand and a UNESCO World Heritage Site since 1988, has now been recognised as the area with the highest density of plastic pollution on the planet, with 671 items of plastic per square metre (Lewis 2023). A report published by Reuters (2019), claims that humans consume 5 grams of microplastics (pieces smaller than 5mm) each week, mainly through water (Senathirajah and Palanisami 2019).

Figure 7 illustrates the plastic waste generated by different industrial sectors for the year 2019, where it becomes evident that packaging is the primary plastic waste producing industry, with 142.6 million tonnes of waste, 31% of the total (OECD 2022).

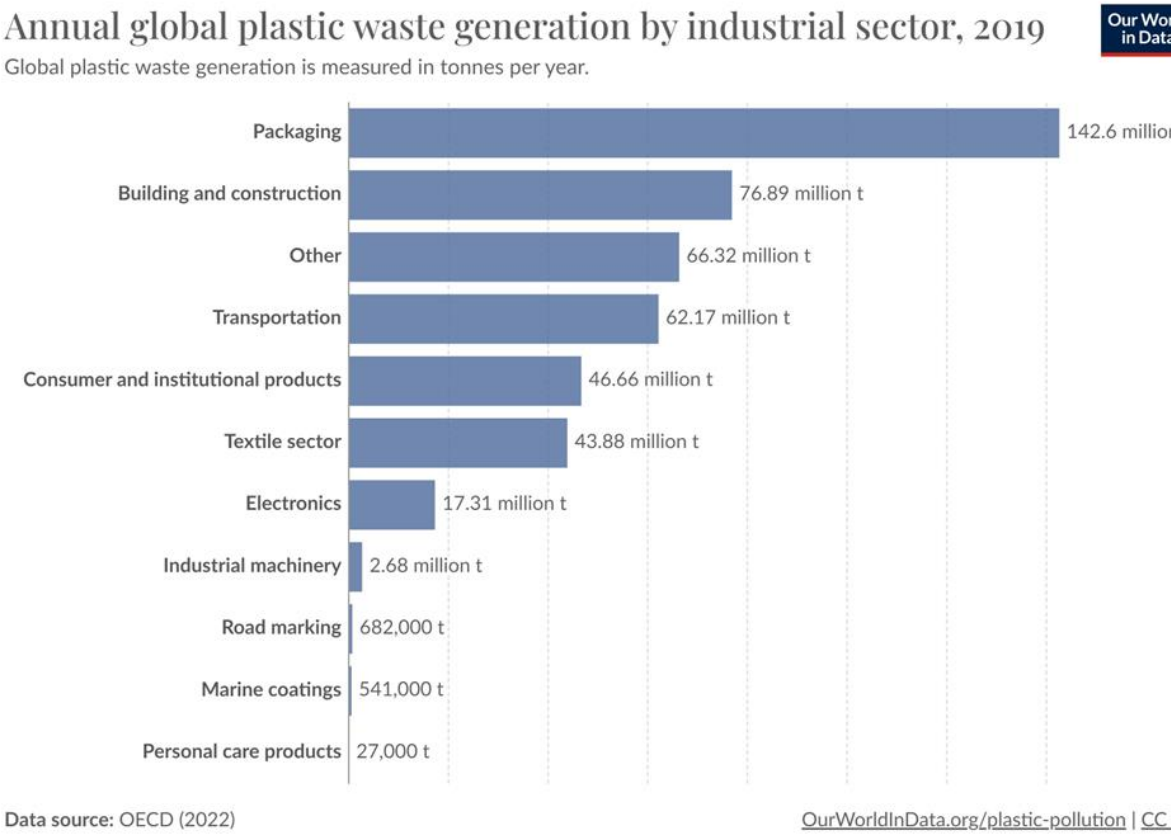

Figure 7: Plastic waste generator by Industrial sector (2015)
Note: OECD 2022, generated using Our World in Data (https://ourworldindata.org/)

The existing recycling systems cannot handle all the packaging innovations introduced into the market, and consumer-product companies produce materials that end up in landfills more than ever before in the history of humankind (Szaky 2019). Despite the general improvement in packaging recyclability over recent decades, the recyclability of food and beverage packaging still presents a challenge (Garcia-Garcia et al. 2022). This is attributed to the to-date necessity for mixed-material packaging to preserve perishable items and the limited recyclability of flexible plastic packaging (Arrieta et al. 2019; Luzi et al. 2019). The percentage of plastic packaging that is recycled globally into new packaging materials is only 2% (Defruyt 2019). Despite this, recycling and other unsustainable end-of-life solutions, such as downcycling and landfills, are still the main narrative for corporate sustainability (Phelan et al. 2022). The Circular Economy approach offers a valuable solution to the packaging pollution problem by focusing on "designing out waste" and preserving valuable finite resources.

2.4.2 Circular Economy (take-make-use)

The concept of Circular Economy dates back to 1966 when Kenneth Boulding, in his essay

"The economics of the coming spaceship Earth", introduced the notion of closed systems and a future economy that would operate and regenerate existing finite resources (Rizos et al. 2017). It is worth mentioning that Boulding, in the same essay, argued that there is strong historical evidence that when a society loses its past connections and a positive image for the future, it also loses its capacity to solve problems of the present and falls apart (Weigend Rodríguez et al. 2020).

It wasn't until the 1990s that the term Circular Economy (CE) was introduced by Pearce and Turner (1990). Since then, many definitions of the term "circular economy" have been proposed, with Kirchherr et al. (2023) examining 221 different definitions and concluding that they will continue to evolve as the circular economy itself evolves. For this thesis, the Ellen MacArthur Foundation's (2012) definition is used as it focuses on the end-of-life stage of products rather than the design phase of the circular economy.

"[CE], an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and within this, business models" (The Ellen Macarthur Foundation 2012).

The Ellen MacArthur Foundation (2019) created the Butterfly Diagram, in an attempt to visualise the concept of Circular Economy, based on Braungart & McDonough (2010), Cradle to Cradle (C2C) (Figure 8). The diagram presents two separate cycles, one "biological" and one "technical". The biological cycle represents the process by which nutrients return to the soil and help regenerate nature, whereas materials in the technical cycle can be used in closed-loop systems through sharing, maintaining, reusing, remanufacturing, and recycling (The Ellen MacArthur Foundation 2019).

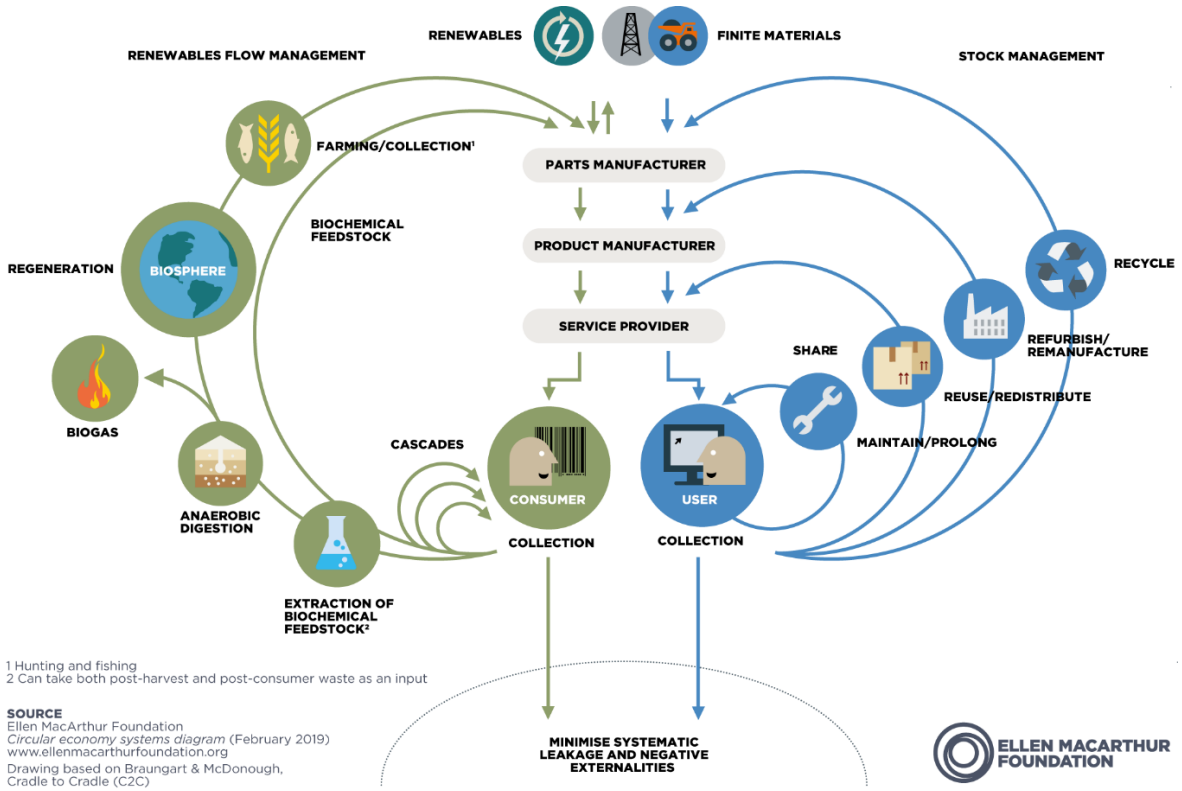

Figure 8: CE Butterfly Diagram
Note. Circular Economy diagram by the Ellen McArthur Foundation, 2019 (https://ellenmacarthurfoundation.org/circular-economy-diagram).

Another well-known framework referring to CE, this time developed by McKinsey (2015) for the Ellen McArthur Foundation, is the ReSOLVE framework of six core principles and corresponding actions for a company's transition to a Circular Economy: REgenerate, Share, Optimise, Loop, Virtualise and Exchange (Sadeghi et al. 2023). The framework is presented in Figure 9.

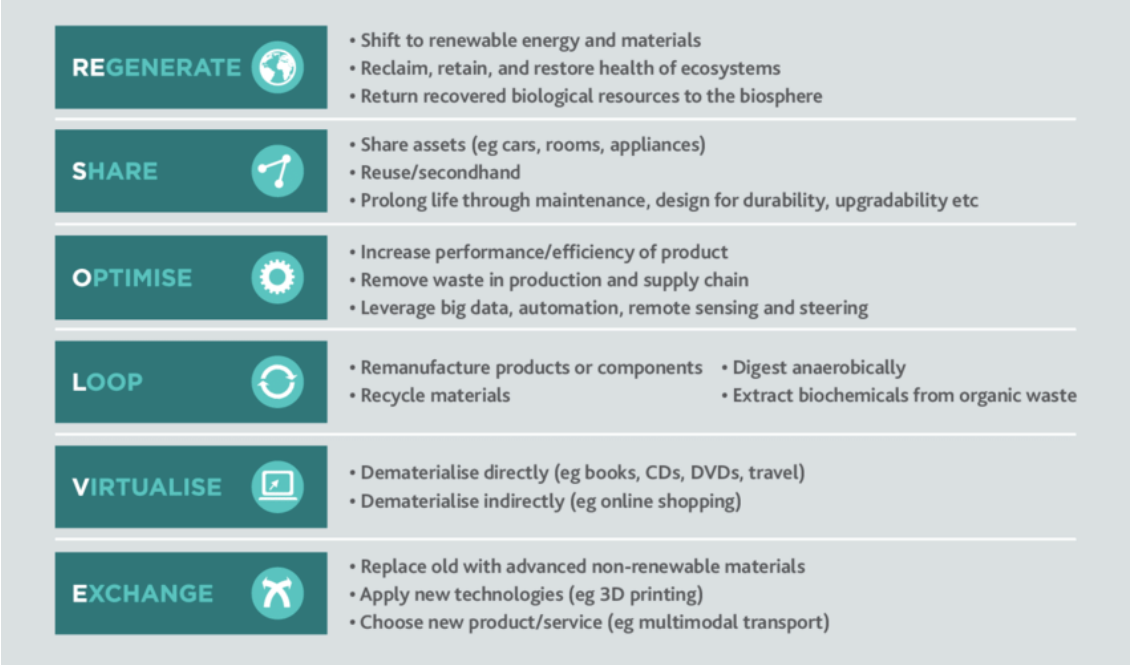

Figure 9: The ReSOLVE framework six action areas for business and countries towards CE.
Note. Circular Economy diagram by McKinsey Center for Business and Environment, 2015 (https://www.mckinsey.com/capabilities/sustainability/our-insights/growth-within-a-circular-economy-vision-for-a-competitive-europe#/).

The Butterfly and ReSTORE frameworks represent a synthesis of relevant frameworks which were developed before the conception of the term Circular Economy, and for which CE is used as an umbrella concept (Blomsma 2018). Those frameworks are Cradle-to-Cradle (Braungart et al. 2007), Performance Economy (Stahel 2006), Blue Economy (Evans et al. 2023), Regenerative Design (Lyle 2008), and Industrial Symbiosis (Lowe and Evans 1995).

The Ellen MacArthur Foundation has been a strong force and a key advocate in the global movement towards CE and has inspired governments and companies worldwide (Velenturf et al. 2019); yet the definition adopted by the Foundation overlooks a vital facet, namely, the social aspects of CE. Antithetically, the term sustainable development has been widely recognised by governments, institutes, and companies, including the United Nations and the US Environmental Protection Agency, as a framework with three distinct pillars: social, economic, and environmental sustainability (Di Vaio et al. 2023). Numerous scholars, such as Lieder & Rashid (2016), Hobson & Lynch, (2016), Camacho-Otero et al., (2017), Wastling et al., (2018), Heidbreder et al., (2019), have highlighted this lack of attention to the social drives towards a circular future, the role society is called to play in achieving it, and the benefits

consumers have to gain. To resolve this shortcoming, Kirchherr et al. (2017), after reviewing over 100 literature definitions, defined circular Economy as:

"an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations".

Moreover, as McDonough and Braungart (2010) explained, the foundation of circular-economic thinking is that a circular economy is restorative and regenerative, meaning that economic activities, instead of breaking down social and environmental resources, would instead strengthen them. This would mean that products and materials would not only be of high quality but could also be reused many times; to encapsulate this phenomenon, the term *upcycling* was introduced, referring to the process whereby components and products would not be allowed to deteriorate on the value hierarchy, but rather maintain, and even increase, their value (Ibid).

Studies have shown that the transition from Linear to Circular Economy will positively affect the economy, society and the environment (Jørgensen and Pedersen 2018). A study conducted by the Ellen MacArthur Foundation (2015) in 7 European countries concluded that a circular transition could reduce each nation's greenhouse gas emissions by 70% and, at the same time, create a net increase of 6 million jobs by 2030 (ILO 2018).

The Circular Economy aims to look beyond the current linear production system and redefine growth, focusing on positive society-wide gains (The Ellen Macarthur Foundation 2015). It involves designing out waste from the system and eventually separating economic activity from the use of finite resources, by focusing on the following three principles (i) designing out waste and pollution, (ii) keeping products and materials in use, and (iii) regenerating natural ecosystems (Elisha 2020).

Another significant distinction between the linear and circular economic models is the perception of sustainability. In a linear system, the focus is on eco-efficiency, whereas in CE,

attention shifts towards eco-effectiveness (Borrello et al. 2020). More specifically, in the LE model, sustainability is achieved by recycling, reducing the volume, velocity, and toxicity of a material flow, however, some impact on the environment remains (Braungart et al. 2007). In a circular, eco-effective, sustainable system, the aim is to minimise the environmental impact and create a positive ecological, economic and social impact (Mathews and Tan 2016). As a result, eco-effectiveness centres on imagining new methods to create materials, design goods, and structure industrial systems and business models ("doing the right things"), whereas eco-efficiency initiatives strive to eliminate negative effects ("doing things right") (Herrmann et al. 2015).

The above differences between Linear and Circular Economy are summarised in Table 1.

Table 1: Linear vs Circular Economy (Elisha, 2020)

	Linear Economy	***Circular Economy***
Step Plan	Take-make-**dispose**	Take-make-**use**
Focus	Eco-e**fficiency**	Eco-e**ffectiveness**
System boundaries	Short-term from purchase to sale	Long-term, multiple life cycles
Reuse	Downcycling	Upcycling, high-grade recycling

The Circular Economy, as a restorative or regenerative concept by design, ensures that resources used in these processes and activities are kept at their best value for as long as feasible and strives to eliminate waste using materials, products, and systems (including business models) that are superiorly designed (EPA 2021).

2.4.3 Circular packaging in food and beverage products

The global packaging industry is worth an estimated $424 billion with a 3.5% annual growth rate, of which food accounts for 38% of all packaging, beverage for 18%, and pharmaceutical, cosmetics and other products for 44% (PDA 2016). Food and beverage packaging therefore accounts for 56% of global packaging material production, with the majority of it being oil-based (Guillard et al. 2018). More than 40% of all the oil-based plastic materials that are globally produced are used for packaging (Rhim et al. 2013), and 95% of the total plastic

packaging ($80- 120 billion) is single-use, lost to the economy after only one life cycle, and discarded in landfills or the natural environment (WEF 2016). In urban settings, drainage systems frequently encounter blockages caused by plastics, food and beverage packaging, peelings, and other debris, resulting in stormwater overflow and urban flooding (Nyambane et al. 2022). In soil and marine environments, plastic also degrades into micro and subsequently nano-sized particles, which can easily penetrate the food chain with dramatic long-term effects (European Commission 2011). With increased understanding that packaging waste causes environmental deterioration, there is an increased demand for more sustainable solutions regarding the design, manufacturing, consumption, and recyclability of packaging materials (Ncube et al. 2021).

To counter the adverse environmental effects caused by packaging, policymakers from the European Union (EU), the United Kingdom (UK) and China adopted the Circular Economy concept, in an attempt to address these environmental concerns by closing the loop of the product lifecycle (Korhonen et al. 2018; Charef et al. 2021). In October 2018, the UK government signed the Ellen MacArthur Foundation's New Plastics Economy Global Commitment (DEFRA 2018), which brings together governments, cities, and companies to addresses the plastic waste and pollution problem, with a focus on packaging (UNEP 2018). By approving the Commitment, the UK Government adopted a shared vision and pledged to implement ambitious measures in important areas, before 2025, including the "(1) elimination of problematic or unnecessary plastic; (2) encouraging reuse models; (3) incentivising the use of reusable, recyclable, or compostable plastic; (4) increasing collection, sorting, reuse, and recycling rates, and (5) stimulating demand for recycled plastics" (DEFRA 2018).

This commitment has now been translated to action: In July 2020 the UK government announced the Circular Economy Package (CEP) policy statement which identified steps for reducing waste and presented a roadmap for management and recyclability (DEFRA 2020). The policy presents three essential requirements for packaging: "(i) packaging must be designed, manufactured and commercialised to permit reuse or recovery; (ii) the content of hazardous or noxious materials in packaging must be minimised; and (iii) the packaging weight and volume must be limited to the minimum amount while achieving the necessary level of hygiene, safety and acceptance for the consumer" (Zhu et al. 2022).

Furthermore, in November 2022, the EU proposed a revision of the Packaging and Packaging

Waste Directive to achieve the Green Deal goals and Circular Economy Action Plan, by ensuring that "all packaging on the EU market is reusable or recyclable in an economically viable way by 2030" (European Commission 2022). Current policies propose that circular packaging should be reusable, refillable and recyclable, whilst not compromised in quality (after use), being economically viable and substituting virgin materials (Ibid). According to the circular paradigm and the 3R strategy (reduce, reuse, recycle), reuse is prioritised over recycling on account of energy saving, sustainable resource management and litter reduction (Markevičiūtė and Varžinskas 2022).

Considering all the above, circular packaging aims to maximise material recovery and reuse through closing the loop in recycling, by substituting finite resources and/ or reusing renewable materials (Gürlich et al. 2020). Packaging should be designed and manufactured in a way that, following either single or multiple uses, allows for high material recovery (to be used as secondary raw materials), package reuse, and/or packaging production from renewable raw materials (Ibid).

While recycling is considered less preferable than other R strategies such as reuse, recovery, repurpose, and rethink (Milios 2018), primarily due to its energy intensity, transportation requirements, and the need for physical, chemical, or mechanical treatments, it remains a significant and valuable source of secondary materials within the CE paradigm (Cullen 2017). Through CE, products can be recycled through closed-loops, where secondary materials are reused within the same industry, or open-loops, where these materials find application in different industries (Morseletto 2020). In closed-loop systems, the secondary product can be returned to the manufacturer where can be easily used as a primary material to create similar products (Deschamps et al. 2018). One example of closed-loop recycling is the milkman practice discussed earlier in this chapter. Open-loop recycling CE systems resemble a more biological-inspired concept, where one species waste becomes another's breeding ground (Mulrow et al. 2017). One example of this symbiosis is the mixed glass recycling materials which can be used as supplementary cement materials in construction applications (Deschamps et al. 2018). As recycling depends on factors such as use, price, and material properties, choosing between closed or opened recycling loops is determined by the goal of reducing environmental impact (Geyer et al. 2016). To achieve that, high quality recycling schemes should be encouraged, with materials being easily recyclable, and closed loops within the industry or the product category should be encouraged (Morseletto 2020).

Furthermore, compostable bioplastic packaging has been promoted as a valuable alternative to oil-based plastic and many organisations are deliberating on introducing it to their policies for circularity and sustainability (WEF 2016; European Commission 2017; National Zero Waste Council 2018). While composting holds promise as a potential alternative to plastic packaging, further research and regulation are necessary for it to truly become a viable option (Matthews et al. 2021), as it should have the ability to naturally decompose in the environment without requiring specialised industrial composting processes (Van de Nadort 2018). Furthermore, factors such as land utilisation for the cultivation of agricultural products required for bioplastic, energy consumption, water usage, and the reliance on fossil fuels should be considered before fully embracing bioplastics as an alternative to plastic, as these practices can significantly impact climate change and the overall sustainability of the production process (Moshood et al. 2022). Under CE, waste is conceptualised and used as raw material for new manufacturing, and future value is created through repurposing resources to keep them in the economy for as long as possible (European Parliament 2023).

Moreover, in parallel with the environmental concerns that packaging creates, the unique nature of food and beverage packaging needs to be considered. It is important to distinguish food and beverage packaging from other packaging forms, as it is expected to protect and distribute the right product to the end-user in a safe, user-friendly and cost-effective way (Matthews et al. 2021) and at the same time, be healthy, ethical and attractive (Testa et al. 2020). Packaging that does not comply with the above would result in an unsafe product that would become waste, even before use, contributing to the environmental impact (Katajajuuri et al. 2010). Moreover, it has been found that food and beverage packaging play an important role in reducing food waste (Wikström et al. 2019).

The aforementioned highlights the importance of circular innovations in food and beverage packaging and recognises that innovations in this sector may not be equally significant or relevant to other packaging sectors (Hafsa et al. 2022), thus further emphasis is needed on the food and beverage packaging industry to achieve sustainability goals.

Some recent examples of companies developing circular food/beverage packaging are:

- *The Magical Mushroom Company* has created a plastic-free, home compost heap or

flowerbed degradable packaging, made from mycelium (fungi) and post-processing agricultural waste such as hemp, hops, corn, and timber. (Allen 2022). Mycelium biomaterials offer advantages compared to traditional synthetic materials, including lower cost and carbon footprint, reduced energy consumption, and superior biodegradability (Jones et al. 2019).

- Notpla has designed an edible, 100% plastic-free, compostable flexible material made from seaweed, which is a packaging alternative to plastic film for sauces, condiments and salad dressings (Patel 2019). The material can be consumed by humans or used as a coating for food packaging to replace plastic and takes the same amount of time to decompose as vegetable peeling, 4 to 6 weeks (Lomartire et al. 2022). In December 2022, the company was named as one of Prince William's Earthshot climate prize winners (Espiner 2022). Seaweed can be a very valuable alternative as it is widely available in marine environments, it has unique benefits like reducing greenhouse gasses, is consumable by humans and can be used in a variety of products (Tarangini et al. 2023).

- Other companies are also developing flexible packaging materials, and alternative to plastic film, such as *TripleW*, collecting food waste from supermarkets and restaurants (Spiro 2021) and *Mi Terro*, which collects yoghurt and cheese by-products (Markuz et al. 2022).

- *AEROPOWDER* has designed thermal packaging for delivering temperature-sensitive food, using bird feathers taken out of the poultry industry waste stream (Toledano 2022). The material can be used to replace traditional polystyrene packaging, promoting more sustainable delivery practices (Brandão et al. 2021).

- *TRACELESS* ®, a German company, has created food and beverage packaging materials comparable in properties to conventional plastic but 100% plant-based and 100% compostable (Totaro 2023). By using agricultural waste, they can create flexible and rigid packaging, single-use items, paper and cardboard coating and adhesive solutions which are home compostable, and the process can take 2 to 9 weeks (Ibid).

As people become more aware of the issue of plastic pollution and ask for products and

packaging that are sustainable (Khandelwal et al. 2019), there is a strong motivation among different groups, such as investors, governments, policymakers, and companies, to make a significant effort in using packaging to communicate their environmental efforts (Boz et al. 2020). Unfortunately, some companies opt not to change their business models towards sustainability, leading to a phenomenon known as greenwashing, where consumers may be misled about the environmental impact of the products or practices (Qayyum et al. 2022).

2.5 Greenwashing

In the last 20 years, consumers have become increasingly aware of environmental issues, have recognised the direct relationship between their consumer habits and environmental problems, and have, therefore, been seeking environmentally friendly products (Yan et al. 2022). According to a 2021 study, 57% of consumers in the UK are willing to pay extra for environmentally friendly products, with younger generations being more likely to do so (69% for GenZ, 63% for Millennial, 53% for GenX and Baby Boomer) (Nguyen 2020). Moreover, according to a survey carried out by PwC in 2019 on 1000 shoppers, 52% prefer products that come in recyclable packaging materials and 48% of millennial shoppers are open to changing brands solely based on the packaging (Číž 2022).

This increasing demand for sustainable products drives companies to create green marketing plans to demonstrate their sustainable corporate vision and social responsibility (Zhang et al. 2018). However, as the importance of sustainability performance disclosure increases, so do the opportunities and the incentive for businesses to engage in greenwashing (Lyon and Montgomery 2015; Marquis et al. 2015).

Although the term “greenwashing” has been extensively used in the corporate world and policymaking, academia has been somewhat slow to follow suit, as the term remains ambiguous (Ghitti et al. 2020). The Oxford English Dictionary defines greenwashing as an act “to mislead (the public) or counter (public or media concerns) by falsely representing a person, company, product, etc., as being environmentally responsible; *(b)* to misrepresent (a company, its operations, etc.) as environmentally responsible” (OED 2023). Moreover, corporate greenwashing involves the dissemination of inaccurate, incomplete (Furlow 2010), or misleading environmental information regarding a company, product, or service (Siano et al.

2017). It may also involve hiding harmful environmental impacts within messages about environmental performance (Yu et al. 2020) and potentially omitting false or unethical information, portraying the company as socially responsible (Jones 2019).

The primary goal of greenwashing is to give consumers the impression that the organisation is using all necessary procedures and rules to manage its environmental footprint responsibly (Bulut et al. 2021). Several factors compel companies to engage in greenwashing practices, including deficient implementation of government environmental policies, competition between companies, and the perceived advantages of greenwashing in terms of market opportunities, with the latter being a particularly significant cause (Yang et al. 2020).

These deceptive practices are mainly exposed when the media, non-governmental organizations (NGOs), and other concerned entities bring attention to them (Seele and Gatti 2017). The general public is sceptical of green claims, and organisations and companies can damage their image and their sales if a green claim turns out to be false (Wahab 2018). The most well-known example of corporate greenwashing is the so-called "dieselgate" scandal, where the German car company Volkswagen admitted that it had fitted its cars with software which could detect when the vehicle was undergoing an emission test and temporarily reduced emission levels by up to 40% (Turna 2022). "Dieselgate" has proven to be a reputationally and economically damaging event, with the company spending over £26bn in legal fees and payouts to customers worldwide, and £193m to settle 91,000 claims in England and Wales alone (Gatzert 2015).

Greenwashing undermines consumer trust and leads to green scepticism, where consumers cannot distinguish between true and false green claims (de Freitas Netto et al. 2020). Efforts to address and expose greenwashing include initiatives like the Greenwashing Index, designed to identify misleading advertisements (Elmore 2009), and STOP Greenwashing, which serves as a classification system for genuinely sustainable products (Stopgreenwashing 2020).

In 2010, TerraChoice published a list known as the "7 Sins of Greenwashing" to assist consumers in recognizing deceptive product claims (TerraChoice 2010; Strähle and Hauk 2017). This categorisation aids in identifying instances of firm-based or product-based greenwashing (Markham et al. 2014), to discourage such practices by educating consumers about various corporate tactics (Antunes et al. 2015).

The 7 Sins of Greenwashing are:

- The sin of *Hidden Trade-off*: a claim that a product is "green" based on a limited set of characteristics while ignoring other critical environmental issues (de Freitas Netto et al. 2020). For example, paper-based packaging is portrayed as a better choice of material when it comes from a sustainably managed forest, when in fact there could be other environmental issues arising from the very paper-making process, such as greenhouse gas emissions or chlorine from the bleaching process (TerraChoice 2010).

- The sin of *No Proof*: an environmental claim that cannot be supported by easily accessible supporting documentation or a credible third-party certification (de Freitas Netto et al. 2020b). For example, companies state the percentages of recyclable materials in their products without offering supporting evidence in the small prints or relevant links on their packaging (TerraChoice 2010).

- The sin of *Vagueness*: a claim that is poorly defined or overly broad, a claim that is deliberately not specific so that consumers may misinterpret its actual meaning (de Freitas Netto et al. 2020). In 2022, Keurig led consumers in Canada to believe that they could recycle their coffee capsules after emptying the coffee into their domestic recycling bins (Fraser 2022). This resulted in the city of Toronto having to remove 90 tons of plastic pods and the company paying a $3 million fine, as well as being ordered to change the misleading claims on the packaging (Ibid).

- The sin of *Worshiping False Labels:* refers to a product that misleads consumers into believing it has gone through a legitimate, green certification process by using a false suggestion or certification-like image (de Freitas Netto et al. 2020). One such sin was committed in 2017, when coffee company KAUAI advertised their coffee pods as "Certified 100% Compostable Single-Serve", using a logo not from a certification body, but from an environmental advocacy group (Charles 2021).

- The sin of *Irrelevance*: an environmental issue unrelated to the product is highlighted (Marriya 2017). For example, when a product today claims it is "CFC free", while the specific chemical was banned by law, for being harmful to the ozone layer, in 1987

(Yildirim 2023).

- The sin of *Lesser than Two Evils*: a claim that, while true within the product category, potentially diverts consumers' attention away from the category's overall environmental impact (de Freitas Netto et al. 2020). For instance, a tobacco company in the USA was advertised in 2016 as "organic", implying that their cigarettes were less harmful to consumers' health and the environment (Houghton et al. 2018).

- The sin of *Fibbing:* refers to environmental claims proven to be false (Marriya 2017). In 2022, Plastic Rebellion accused Innocent - a company part of The Coca Cola Company, the world's worst plastic polluter- of deceitful T.V. adverts (Akseki 2022). The advertisement was banned in the UK by the Advertising Standards Authority (ASA) (Ibid).

Overall, a greenwashed consumer would not be in a position to make informed decisions about recycling (Brouwer 2016). In a report published by European Parliament, 53% of the green claims throughout Europe were found to be misleading, and as a result, new policies against greenwashing are being considered by the EU (European Parliament 2023a). Moreover, the UK government has established an independent group, The Green Technical Advisory Group (GTAG), aiming to help tackle greenwashing (Treasury 2021).

2.6 Wishcycling

Wishcycling is the practice of disposing of questionable items in recycling bins, in the hope they will get recycled somewhere down the line (Walzberg et al. 2023). The term is a play on the word "wishful" since people wish that certain items were recyclable, although they are not (Price 2020). This phenomenon remains significantly under-researched, and while various terms like "overinclusive recycling" (Catlin et al. 2021) or "aspirational recycling" (Kramer et al. 2023) have been used to describe it, scholars have not yet reached a consensus on a singular term for this behaviour. These recycling practices contribute to higher recycling costs (EPA 2020) resulting for example in the closure of 54 curbside recycling programs in the US.

According to New Zealand Infrastructure Commission (2021), wishcycling results in recycling

contamination, and there are three significant reasons it causes problems:

- Wishcycling contaminates and leads to waste: when recyclable and non-recyclable materials are mixed, recycling facilities need to separate them, either mechanically or manually, which causes delays, financial loss, long waiting times for incoming loads and an increase in waste (Lee et al. 2022). If a batch is contaminated, in order to save money and time, and to protect the health of the people who work in recycling plants, the entire recyclable batch could end up in landfills (Ibid).

- Wishcycling decreases the quality of the raw material: Although materials like glass and aluminium can be recycled infinitely without losing their original characteristics, other, like paper and plastic, are easily contaminated (Garcia and Robertson 2017). For example, if an oily pizza box enters the recycling process, the oil will downcycle the pulp, resulting in recycled paper with holes, which is rendered unusable (Kramer et al. 2023).

- Wishcycling damages the machinery: Placing the wrong items in the recycling bin, such as oily paper, can contaminate the pulp resulting, not only, in an unusable and downcycled final product, but also in damaged machinery (Brundell 2022).

It is consumers that lie in the heart of the wishcycling vicious circle. Commonly referred to as "wishcyclers", there are consumers who believe that an item could be recycled and somebody "down the line" would know what to do better than them (Price 2020). They think that it is better to dispose of something in recycling bins, even if unsure, rather than missing the opportunity of it being recycled altogether (Paty 2021). It is argued that greenwashing can affect wishcycling in several ways:

- Since Greenwashing can lead to confusion about what can be recycled (Bulut et al. 2021), it automatically enhances wishcycling. If a product is marketed as being "recyclable", consumers may assume it can be placed in a recycling bin, without checking in advance whether or not it is accepted by their local recycling programme.

- Greenwashing can lead, through wishcycling, to the contamination of the recycling stream (Yotapukdee et al. 2017). If consumers dispose of items that are not recyclable

in recycling bins, other materials in the bin could be contaminated, making it more difficult to process the recyclable materials. For example, shredded paper containing plastic can be mixed with other materials making them difficult to separate or containers with oil that can be mixed with fully recyclable materials and can be difficult to clean and recycle.

- Greenwashing can lead, through wishcycling, to a false sense of environmental responsibility (De Jong et al. 2020). If consumers believe "they are doing their part" by recycling, they may be less likely to take other action to reduce their environmental impact, such as reducing consumption or buying products with less packaging.

- Greenwashing, through wishcycling, can reduce the recycling value of raw materials (Bartl 2014). If companies are not truthful about the capability to recycle a product, consumers may not recycle it, with the product ultimately ending up in landfills, and hence contributing to environmental pollution. For example, insufficient consumer guidance on removing plastic film and/or cup attachments from plastic beverage bottles before disposal in recycling bins, may lead to plastic bottles not being recycled at all.

Extensive research has been conducted to determine the impact that food and beverage packaging characteristics have on consumer behaviour and how modifying and improving these aspects can support proper recycling and sorting (Lindh et al. 2016; Wikström et al. 2019). Different factors have been identified that prevent good practice in recycling behaviour, including difficulty in emptying, cleaning, folding, and separating packaging, and perceived inconvenience when sorting (Williams et al. 2018). In this thesis it is investigated *how* people perceive the causes of behaviour and events (Lowery and Burrow 2019) such as corporate greenwashing and wishcycling.

2.7 Summary

Packaging has been an inseparable component of food throughout human history and its evolution has been, not only, parallel to human progress and industrialisation, but also influenced by societal and cultural factors. The recent aspiration for a transition to a circular economy, comes with a series of challenges, due to competing and conflicting agendas. The

maximisation of profits is one of the primary objectives of companies, and the societal and regulatory pressure felt by them, often manifests as greenwashing. At the same time, consumers are increasingly becoming environmentally aware and, despite their willingness to act responsibly, may get caught in a state of wishcycling, eventually, doing more harm than good to the environment. Such seemingly paradoxical consequence may have deeper roots which can be explained by attribution theory, which delves into "*how*" people explain the causes of decisions, policies and events.

Chapter 3
Human-in-the-circular-loop theoretical framework

3.1 Introduction

This chapter introduces the Human-in-the-circular-loop framework developed for this thesis, which aims to systematise the role of humans within circular economy ecosystems. The framework integrates established theories from a range of disciplines, such as psychology and human resource management, to provide an understanding of the human factors influencing the adoption of circular practices. Acknowledging the important part that humans play as both consumers and employees in shifting to a Circular Economy the HITCL framework provides the lens under which one can study how individuals embrace the circular economy concept and how this influences their behaviours and decision-making when it comes to circular practices.

To illustrate the potential of HITCL, an example case of circular packaging for food and beverage products is presented and its placement on the Remanufacture, Refurbish, Reuse and Recycle loops, regarding wishcycling (deBortoli et al. 2022). Taking into consideration that these concepts are examined under the lens of consumers, attribution theory and core self-evaluation is employed, derived from the HITCL framework, to reveal the underlying mechanisms and psychological factors shaping the wishcycling phenomenon. Although these two theories have been researched extensively in other disciplines, to the best of my knowledge to date, they have not yet been applied adequately to circular economy practices with a focus on consumer perceptions.

3.2 Motivation

It is widely acknowledged that a CE provides the prospect of cultivating a more sustainable society, including enhancements in both social well-being, through environmental preservation, and economic prosperity (Oliveira et al. 2021). It has been posited as a remedy to the complex socio-environmental-economic crises of the twenty-first century by scholars (Oliveira et al. 2021; Calisto Friant et al. 2023), policymakers (European Parliament 2023b), and private organisations (The Ellen MacArthur Foundation 2019).

The CE paradigm has been developed as an umbrella concept (Blomsma and Brennan 2017) and is attracting global interest to address key sustainability considerations and, more specifically, to explore environmental and economic concerns (Murray et al. 2017). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) recommends this approach as a means to achieve sustainable consumption and production, thereby enhancing the circularity in economic and financial systems (Brondizio et al. 2019). CE-related initiatives and policies have been adopted in national settings, for example in the European Union (European Parliament 2023), UK (Yuille et al. 2022) and China (Geng et al. 2013). Moreover, these strategies manifest at the organizational level, facilitating the advancement of the circular economy through the formulation of innovative business models (Puntillo 2023). The integration of CE into the business domain has been realised through diverse approaches and concepts, including industrial symbiosis, closed-loop supply chains, and designing-out waste products (Mies and Gold 2021). These methodologies follow fundamental principles, notably the expansion of finite resource efficiency, extension of product life cycles, and the closure of material and nutrient loops (Blomsma and Brennan 2017). The appeal of these policies originates from their potential to attain sustainability by enabling and decoupling economic growth from environmental degradation (Geng et al. 2013).

Despite widespread acceptance and development of the concept focusing on environmental and economic dimensions, most CE frameworks lack treatment equitably addressing all three pillars of sustainability (social, environmental, economic) (Murray et al. 2017). Therefore, many scholars advocate for an intensified focus on the social dimension of the CE, emphasising the necessity of establishing a comprehensive and holistic sustainable approach (Blomsma and Brennan 2017; Kirchherr et al. 2017; Padilla-Rivera et al. 2020; Schröder et al. 2020; Mies and Gold 2021). In a systematic review, De Pascal et al. (2021), measured 61 CE indicators across micro, meso and macro levels, and noted the absence of works exclusively addressing the social aspects.

Recent attempts to incorporate the societal dimension in the CE paradigm have mainly focused on the notion that actions within the business domain would positively affect societal well-being and the environment (Mies and Gold 2021), in terms of job creation (Sulich and Sołoducho-Pelc 2022), safety in the work environment (Héry and Malenfer 2020), improved recyclability (Chowdhury 2023), product life cycle assessment (Antwi-Afari et al. 2023), and energy saving potentials (Chau et al. 2017). Similarly, diverse propositions have emerged for

indicator frameworks designed to quantify circularity, yet the social circularity aspects has been largely overlooked (Corona et al. 2019; Saidani et al. 2019)

Although it has been documented that the circular economy can provide a valuable "toolbox" for achieving a number of the UN Sustainable Development Goals (SDGs) (Schroeder et al. 2019), further research and attention to the social dimension is imperative for the CE to substantively contribute to sustainable development. This involves fostering social equity and presenting an alternative, holistically sustainable economic system (Kirchherr et al. 2017).

In this thesis, the need to put humans in the circular loop are discussed. All processes, procedures and policies need to be developed, implemented, and accepted by humans; the notion that circularity involves biological and technical loops alone is outdated. It is argued that scientists, policymakers, and industry have managed to implement the development and, in most parts, the implementation of circularity but so far, a tool to measure and influence the acceptance of circularity in the human sphere has not yet been developed.

3.3 Human In The Circular Loop

3.3.1 Human In The Loop concept

The concept of "Human In The Loop" has evolved, reflecting the increasing recognition of the focal role that humans play in various systems and processes (Holzinger 2016). Initially emerging in fields such as human-computer interaction and control systems, the concept highlighted the importance of human decision-making and intervention alongside automated technologies (Arambepola and Munasinghe 2021). As advancements in artificial intelligence and automation have progressed, the concept has expanded to encompass broader domains, including robotics, machine learning, and complex socio-technical and cyber-physical systems (Herrmann and Pfeiffer 2023).

The evolution of the concept reflects a growing understanding of the limitations of purely automated systems and the need to integrate human expertise, judgment, and ethical considerations with these (Jotterand and Bosco 2020). It emphasises the value of human input in decision-making, adaptability to context, learning from feedback, flexibility, creativity and problem-solving ability (Mabrok et al. 2020).

3.3.2 Human In the Circular Loop definition

HITCL theoretical framework studies and emphasises the role of human acceptance, perception and decision-making within the CE ecosystem. It builds upon the concept of Human-in-the-Loop in computer science, which explores human intervention and control in machine learning systems (Wang et al. 2022). In the context of HITCL, the focus is on understanding how humans (as consumers and employees) accept the concept of CE and how it affects their behaviour and decision-making towards the transition to a circular sustainable future.

This framework encompasses the various human aspects that can potentially influence circular economy loops. Factors such as self-esteem (Ta et al. 2022), consumer/employee attribution (Vayona and Demetriou 2020), circular economy knowledge (Erdiaw-Kwasie et al. 2023), status consumption (Rogers 2021) and organisational sustainable performance (Jones et al. 2023) can influence choices between circular and linear practices.

By introducing established theories and concepts on motivations, attributions and decision-making to circular economy from domains such as psychology and human resource management, amongst others, effective strategies and interventions can be developed to encourage circular sustainable behaviours and address challenges more efficiently and inclusively.

The objective of HITCL is to identify and study the human factors that enable or hinder the transition towards circular practices. In this perspective, an informed consumer/ employee is seen as being central to the control of the circular loops actively participating in the circular economy.

3.3.3 Transferable properties between concepts

According to the HITL literature, the concept needs to promote a number of properties to be successful (Valtonen and Makinen 2022), including fairness (Teodorescu et al. 2021), accountability (Binns et al. 2018), transparency (Binns et al. 2018), trust (Hernandez et al. 2021), explainability and interpretability (Valtonen and Makinen 2022). Those properties are summarised in Table 2, alongside their translation in the respective HITCL concepts in the CE domain.

Table 2. High-level mapping of properties between the "Human In The Loop" and "Human In The Circular Loop" concepts

Human in the Loop	*Human in the Circular Loop*
Fairness (Teodorescu et al. 2021)	Fairness is one of the main premises of CE, ensuring equitable and just outcomes for individuals within social systems.
Accountability (Binns et al. 2018)	Individuals should have access to information on how decisions are made, the criteria used, and the potential impacts.
Transparency (Binns et al. 2018)	Includes providing clear information about the goals, strategies, and impacts of circular economy initiatives and agendas.
Trust (Hernandez et al. 2021)	People need to trust policymakers and academics that the changes they suggest would be beneficial for their well-being, the environment, and the economy.
Explainability (Valtonen and Makinen 2022)	This allows individuals and communities to evaluate the potential benefits and risks associated with the adoption of circular practices.
Interpretability (Valtonen and Makinen 2022)	Ability to explain the cause-effect relationships between circular economy activities and outcomes.

From the HITL properties outlined above, fairness seems to carry a considerable amount of weight as it is directly aligned with the underpinning philosophy of the CE (Li et al. 2020). Fairness in the context of the CE requires that the benefits and opportunities generated by circular practices are distributed equitably among individuals and communities. This includes considering issues such as fair wages, worker rights, and access to resources and services derived from CE activities (Berry et al. 2022). Efforts should be made to prevent the concentration of benefits in the hands of a few, ensuring that the transition to a circular economy promotes social equity (Crespo-Rosas and Franco-García 2023). Moreover, fairness entails ensuring that the shift towards a CE does not disproportionately impact vulnerable or disadvantaged groups. This includes providing support, resources, and opportunities for those affected by the changes, such as workers in industries undergoing transitions (Crespo-Rosas and Franco-García 2023).

Moreover, leveraging HITL concepts on CE enforces the view of the need for a *data-driven*

CE approach, where information would flow within the system and be accessible for the individuals and communities to help them make informed decisions (Shennib and Schmitt 2021).

3.4 Human in the Circular Loop interdisciplinary approach

The focus of this study is to provide an approach for the identification of social factors and interactions that influence adoption of CE practice. Humans are categorised into two distinct roles: consumers and employees. These two classifications represent the principal stakeholders involved in the implementation processes of CE practices (Klein et al. 2022).

Consumers play a pivotal role in the development of CE as they purchase goods, maintain them, repair, resell, reshare, refurbish, repurpose and recycle or dispose of them (Maitre-Ekern and Dalhammar 2019). Not enough attention has been given to date on the role of consumers in CE adoption and how they will affect or be accepted by circular economy ecosystems (Kirchherr et al. 2017). Consumers are frequently characterized as “passive agents” within the current discussion (Elzinga et al. 2020). Disregarding consumers may lead to the formulation of incomplete business models, impeding the realisation of the full potential inherent in a Circular Economy (Lewandowski 2016; Kirchherr et al. 2017; Planing 2018).

In the organizational context, employees constitute an integral stakeholder group within the organizational framework (Coutinho et al. 2018). They engage in the utilisation of resources, actively contributing to the establishment of habits, behavioural patterns, and organisational practices (Klein et al. 2022). In this context, employees play a crucial role in organisational settings and operations which is a crucial aspect that demands attention for comprehensive understanding (Coutinho et al. 2018). Understanding employees’ perceptions regarding the incorporation of CE practices within their organizations will offer valuable insights into the capacity of organisational systems to implement circularity (Klein et al. 2022), and this domain remains inadequately explored within the existing body of research (Chiappetta Jabbour et al. 2019).

The Human in the Circular Loop (HITCL) framework incorporates established theories from diverse disciplines, contributing to a comprehensive understanding of human aspects within

the circular economy. The integration of these theories enriches the analysis of factors influencing human acceptance, perception, and decision-making in the context of circular practices. The HITCL diagram is presented in Figure 10.

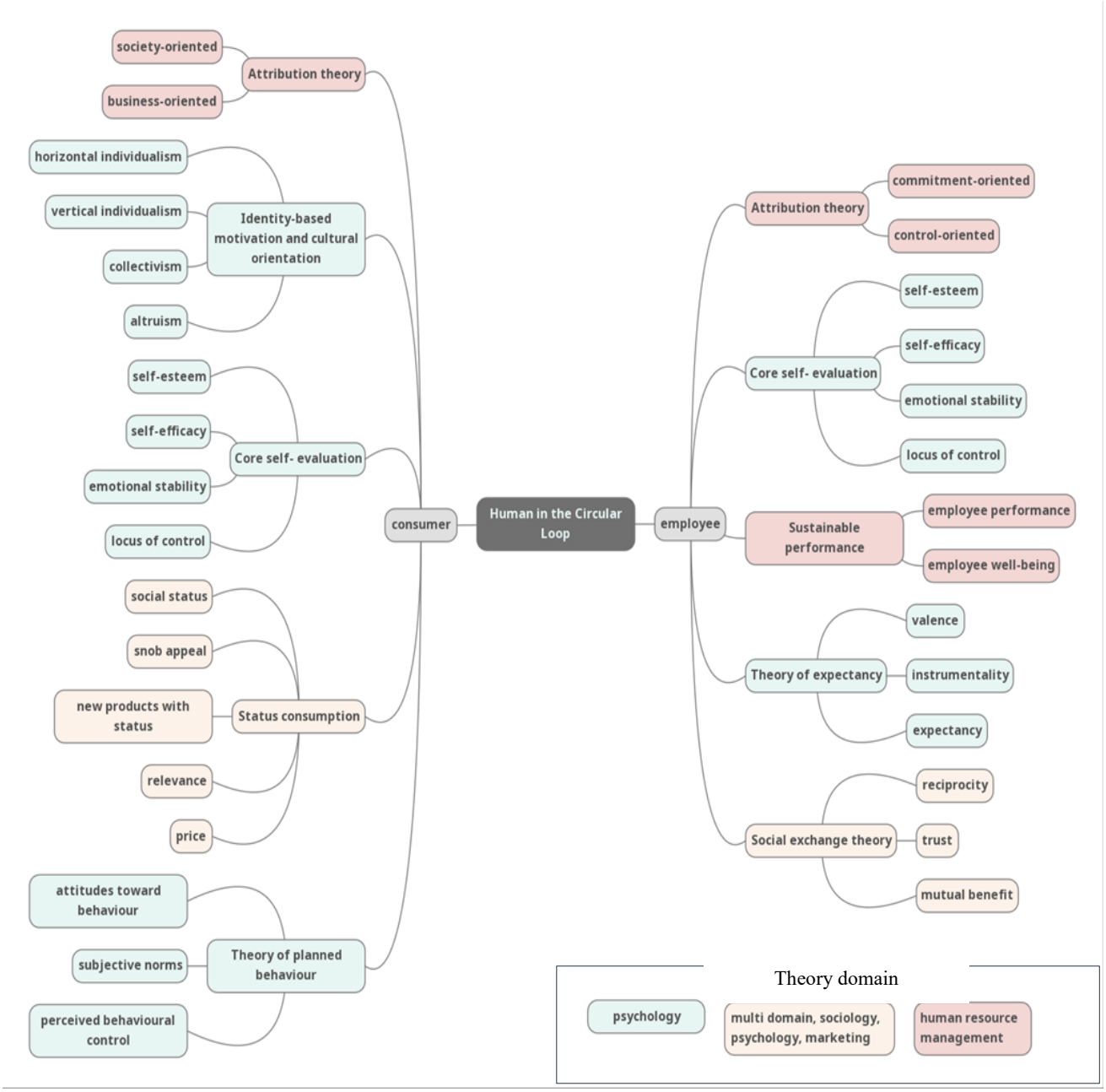

Figure 10. The Human in the Circular Loop (HITCL) framework (created by author using mindmup.com)

The theories presented in Figure 10 are indicative of the selection of interdisciplinary theories and metrics that can be used in the research of CE attribution and acceptance. It is noted that although in the context of this thesis, humans are regarded as consumers or employees, there are a number of theories that apply in both settings. For example, attribution theory and core

self-evaluation are both applicable for researching consumer and employee behaviour. Further research in the form of a systematic review is needed to record all theories that could be used in this context.

In more detail, the selected theories that provide mature measures for quantitative research that can contribute to investigating human understanding and acceptance of circularity are as follows:

3.4.1 Theory of planned behaviour

The theory of planned behaviour is a widely recognised psychological framework utilised to explain and predict human behaviour and decision-making across various domains (Ashaduzzaman et al. 2022). It has been noted that it is the main theory in social psychology that effectively aids in conceptualising and identifying factors or variables considered by customers in their planned, intended, or goal-oriented buying behaviour (Zaremohzzabieh et al. 2019). The theory consists of three key constructs: attitudes toward the behaviour, subjective norms, and perceived behavioural control (Ashaduzzaman et al. 2022).

3.4.2 Sustainable performance

Although the sustainable performance of organisations and industry has been widely researched, the concept of employee-sustainable performance is still in the early stages (Ji et al. 2021). Employees demonstrating high levels of sustainable performance actively contribute to the cultivation of a sustainable future for both them and their respective organisations (Ibid). Sustainable performance consists of two main determinants; employee performance and employee well-being (Ibid).

3.4.3 Identity-based motivation and cultural orientation

Grounded in psychological theories, identity-based motivation explores how individuals' perceptions of themselves, and their affiliations influence their commitment to sustainable behaviours, incorporating elements such as self-concept and social identity theory (Wanke 2008). It is frequently used to study consumer behaviour and its association with culture and identity saliency, attempting to explain the circumstances and mechanisms under which consumers' identity and cultural values act as motivators for engagement in specific actions, such as recycling or purchasing environmentally friendly products (de Morais et al. 2021). The

metrics utilised to quantify and investigate this phenomenon are the need for social status, which is measured by horizontal and vertical individualism and collectivism and altruism assessed in terms of pure and competitive dimensions (Ibid).

3.4.4 Theory of expectancy

Expectancy theory, originated from psychology, focuses on the belief that employees will be motivated to exert effort if they believe their efforts will lead to good performance, and good performance will be rewarded (Vroom 1964). It considers the relationship between valence, instrumentality, and expectancy in shaping employee behaviour (Osafo et al. 2021).

3.4.5 Social exchange theory

Rooted in the social sciences, social exchange theory holds broad implications across diverse research domains (Ahmad et al. 2023). Social exchange theory emphasizes the mutual exchange of resources and benefits between employees and their organisations (Meira and Hancer 2021). It suggests that employees engage in behaviours that they perceive will result in fair and equitable exchanges, influencing their commitment and performance. The measurement of social exchange theory involves reciprocity, trust, and mutual benefit as key indicators (Torro et al. 2022).

For the purpose of this thesis, two theories that apply equally to both consumers and employees were used. These theories are:

3.4.6 Attribution Theory

Central to attribution theory is the assertion that individuals are consistently engaged in an ongoing attempt to analyse the events they face (Hewett et al. 2018). Although it is a well-established theory in Human Resource Management for employees (Katou 2021), it has recently been applied in sustainable studies in consumer settings (Vayona and Demetriou 2020). It studies how people explain the causes of behaviour and events (Sotirovic 2003) and is a valuable theory on how humans attribute the motivations behind circular policies and practices (Wanke 2008).

Attribution theory has been studied for many years in relation to multiple strands of individual behaviour. Heider (1958), Kelley (1973) and Weiner (1979) have been some of the most influential scholars (Muschetto and Siegel 2021). Specifically:

Heider's attribution theory: The theory supports the idea that perceived causality affects a perceiver's response, and actions and can be summarised into three major themes. The first assertion claims that people's attribution of causality depends on whether the *locus of causality* presented as either internal (attributed to the person), external (attributed to the environment), or a combination of both (Hewett et al. 2018). Internal locus relates to *motivation* and *ability*, while external locus involves *external situational* factors that influence the perceiver's attribution.

The second assertion concerns specific attribution errors that occur when people make causal inferences (Hewett et al. 2018). These errors can either be *fundamental* (when people focus on internal factors to explain behaviour) or of the *actor-observer effect* kind (when people attribute their own actions to external factors) (Jones and Nisbett 1987). A well-documented example of a fundamental error is when people attribute someone else tripping or falling to clumsiness or lack of care, whereas when the error is of the actor-observer effect kind, people are more likely to blame the uneven ground, were they to fall at the same spot (Christopher Paul 2021).

The third assertion refers to the notion of the *self-serving bias*, according to which people attribute their success to dispositional and internal factors. However, they use external and uncontrollable factors to explain their failure (Hewett et al. 2018).

Kelley's attribution theory refers to the covariation model, which is a logical model for determining whether a specific action should be attributed to a person's characteristics (dispositional/ internal) or the environment (situational/ external) (Martinko and Mackey 2019). The theory argues that in trying to understand the causes of human behaviour, people act like scientists by considering three cues, namely *consensus*, *distinctiveness*, and *consistency* (Lin et al. 2023). *Consensus* refers to the extent that other people behave in similar situations, with high consensus being associated with internal factors; *Distinctiveness* refers to the extent a person acts the same way across similar situations, typically related to external factors; *Consistency* refers to the extent that a person behaves consistently over time, and is, generally, associated with external factors.

Unlike Heider and Kelley, who presented relatively static attribution models, **Weiner's attribution theory** discussed how causal attributions affect future expectations, emotions, and performance (Hewett et al. 2018). According to Weiner (1979), the completion of a task leads to the elicitation of emotions based on whether the task is deemed a success or failure. These emotional responses are then evaluated, resulting in an overall positive or negative emotional outcome. Weiner (1979) argued that any task, whether successful or not, is followed by a three-dimensional search for the cause of the outcome: *locus of causality* (as per Heider's work), *stability* (as per Kelley's work), and *controllability* (Ibid). Controllability refers to the extent that an individual can influence attribution and control future events (Hewett et al. 2018). According to Weiner (1979), people's emotions are influenced by the attributions they make. For example, people are more likely to feel proud if they believe their success is due to internal factors, such as innate talent, rather than external factors, such as luck (Popp et al. 2022).

Attribution theory is particularly suited to investigating consumer behaviour (Cho et al. 2021). When applied to the context of sustainability, attribution theory provides a framework for understanding how consumer attributions of organisational motives influence their evaluations (Ibid). This can help to clarify how consumers perceive a company's ability to adopt a more responsible business approach, how they attribute motives to the actions of the company, and how this cognitive process ultimately impacts consumers' subsequent responses (Eberly et al. 2011; Leonidou and Skarmeas 2017). The connection between perceived knowledge and long-term purchase intentions can be explained by the theoretical justification that exists in the form of feelings of self-competence in relation to the attribution of responsibility (Frommeyer et al. 2022). The theory is particularly applicable to the investigation of green products, as attributions are commonly triggered in situations where there is divisiveness and suspicion, which is a common occurrence in relation to sustainable products (Leonidou and Skarmeas 2017).

In the context of this research, the analysis of consumer attribution involves the realisation of quantification through the examination of society-oriented attributions, where consumers perceive business actions as directed towards enhancing community well-being, or business-oriented attributions, where individuals believe that corporate actions are profit-driven. (Lee et al. 2012). Equally, for employees, the assessment involves attributions that are commitment-

oriented, referring to quality enhancement, and those that are control-oriented, to minimise costs (Katou et al. 2021).

3.4.7 Core self-evaluation

Originating from industrial and organisational psychology, core self-evaluation (CSE) is a construct described as "an advanced concept demonstrating people's central evaluations about self and their functioning in the environment" (Judge et al. 2004). CSE enables a detailed exploration of how *individuals assess themselves*, their *attitudes towards the environment*, and the situations they encounter (Judge 2009). It also sheds light on their perception of their own *self-esteem* and *competences* (Ibid). These four domains are distinct, each providing a unique contribution to the comprehensive evaluation of an individual (Farčić et al. 2020). Research into CSE challenges the comprehension of personality trait structure and provides novel insights into the interconnections between traits and behaviour, providing a construct that can be used for both consumers and employees (De Fruyt and Salgado 2003).

Individuals characterised by high levels of CSE are recognised for their proficiency, showcasing a high degree of skill in various aspects of their actions (Crocker and Park 2004). Moreover, a notable trait associated with such individuals is their tendency towards risk-taking in decision-making processes (Ibid). This tendency stems from their effective utilisation of positive resources available in their immediate environment (Farčić et al. 2020). They have a high level of confidence in their abilities and a sense of control over events, with minimum stress in the process of decision making (Cristofaro 2017).

The components (also known as *dispositions*) of CSE are briefly presented as follows: *self-esteem* reflects the level to which individuals believe that they are people of worth; *self-efficacy* reflects the level to which individuals believe that they are skilled to effectively and efficiently complete tasks; *emotional stability* reflects the level to which individuals believe that they are functional; lastly, *locus of control* reflects the level to which individuals believe that they are capable of managing their own future. In summary, individuals who have high self-evaluation across these components are assessed to have high levels of CSE qualities (Kim & Lyon, 2015).

In essence, CSE provides a solid basis for understanding how individuals view themselves in relation to sustainability, offering insights into the psychological aspects that influence their

environmentally conscious behaviour (Hirschfeld and Wagner 2022). This study aims to dissect the cognitive and emotional dimensions of CSE, contributing valuable perspectives to the broader discourse on sustainable decision-making.

3.5 Human in the Circular Loop illustrated

To illustrate the potential of HITCL, an example case of circular packaging for food and beverage products is presented and its placement on the Remanufacture, Refurbish, Reuse and Recycle loops, in regards to wishcycling (deBortoli et al. 2022). Taking into consideration that these concepts are examined under the lens of consumers, attribution theory and core self-evaluation is employed, derived from the HITCL framework, to reveal the underlying mechanisms and psychological factors shaping the wishcycling phenomenon. Although these two theories have been researched extensively in other disciplines, they have not yet been applied adequately to sustainability studies. Through its application, the aim is to discern how individuals attribute value and responsibility to the circular packaging practices associated with food and beverage items. Concurrently, the incorporation of core self-evaluation, also rooted in the HITCL framework, facilitates an in-depth exploration of individuals' self-perceptions and their influence on sustainable consumption behaviours. It is noteworthy that while attribution theory and core self-evaluation have received substantial attention in various academic domains, their application within the realm of circular studies remains under researched. The present study represents a novel effort to bridge this gap and contribute to a more comprehensive understanding of the psychological complexities underpinning sustainable consumer choices within the HITCL framework.

Such HITCL instance is depicted in Figure 11, which translates into the theories that need to be employed to research the selected concepts.

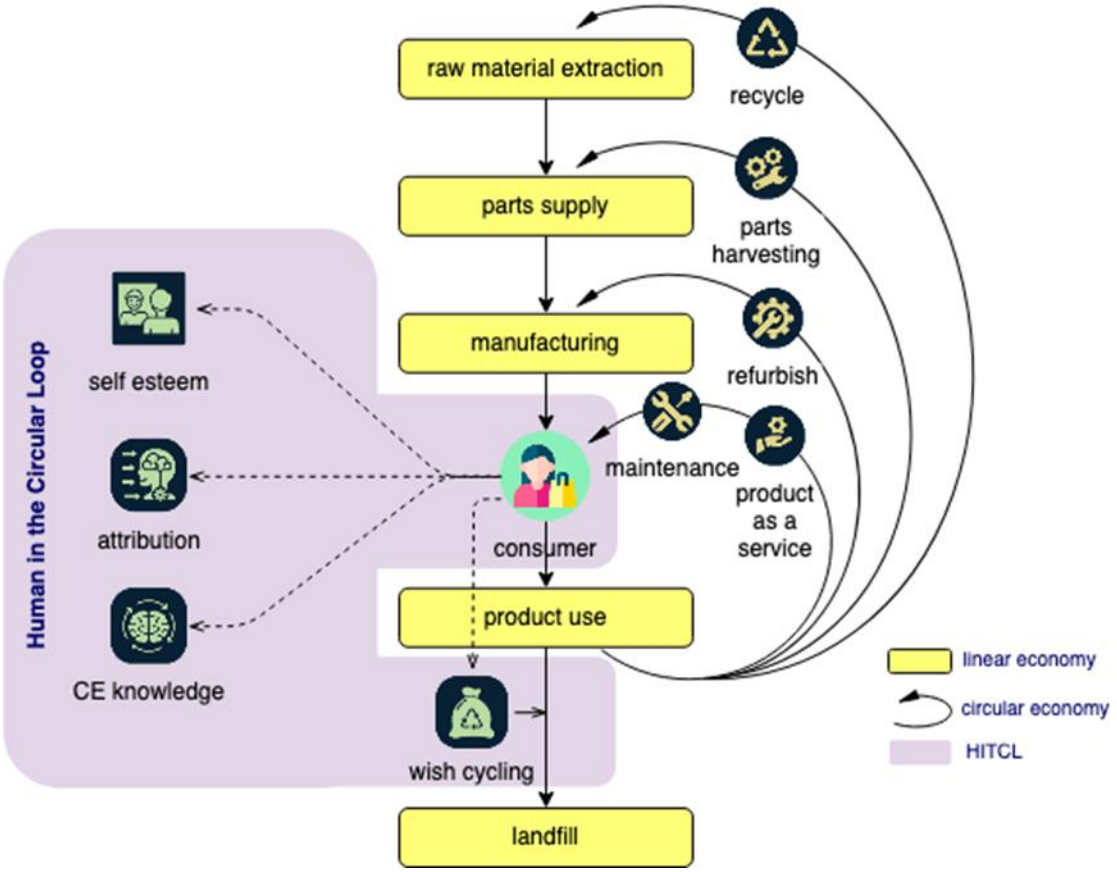

Figure 11. The Human in the Circular Loop framework influencing consumer behaviour towards wishcycling (created by the author).
***Note*.** Icons made by Flaticon.com.

The HITCL concept covers those human aspects that can potentially influence circular economy loops. It studies human decision-making in ways that can either hinder or support the transition towards the circular economy.

For example, consumers being influenced by factors such as self-esteem, consumer attribution, or circular economy knowledge, may choose to engage in circular or linear practices. HITCL provides a comprehensive map of theory background from diverse disciplines that researchers can use to explain and influence human acceptance of and transition towards CE policies. In this instantiation of HITCL, it is argued that an informed consumer will not only disengage from wishcycling activities but will be at the centre of control of the circular loops. The methodology to be used to complete the research can be quantitative, using well-matured measures from the respective domains and is further analysed in the next chapter of this thesis.

3.6 Summary

The HITCL framework provides insights into the human aspects of the circular economy, underscoring the central role of well-informed consumers/employees in understanding, accepting, controlling, and implementing circular loops. By incorporating established theories from diverse disciplines such as psychology and human resource management, the HITCL framework provides valuable insights into human acceptance, perception, and decision-making in the context of circular practices. It emphasises the need to develop effective strategies and interventions to encourage circular sustainable behaviours and address challenges more efficiently and inclusively.

Chapter 4
Research Methods

4.1 Introduction

In this Chapter, the research hypotheses are constructed, and the operational model is developed. As this thesis adopts a quantitative research approach, following the presentation of an operational model, the research methodology is elaborated. This includes the description of the primary data acquisition (including sampling method and questionnaire development), assessment of the validity and consistency of the survey instrument, and description of the statistical analysis approach.

4.2 Development of the research hypotheses

4.2.1 Core self-evaluations, circular packaging, and greenwashing.

While it is important to describe the personality of individuals according to their CSE, a question of contextual relevance arises: what is the level of the individual's engagement with circular food and beverage packaging, and how does this relate to greenwashing? The term *circular packaging* is used to describe the packaging design of reusable, refillable, compostable, biodegradable, and/or recyclable materials, with a strong emphasis on the substitution of virgin materials and being economically viable (European Commission 2022).

Greenwashing may be achieved via *seven sins*: false environmental claims, misleading labels, hidden trade-offs, irrelevant environmental claims, lesser of two evils, unproven claims, and vague claims (Strähle and Hauk 2017). A greenwashed consumer would not be able to make informed decisions about recycling and whether their actions contaminate the recycling stream (Brouwer 2016). Accordingly, greenwashing undermines consumer trust and leads to green scepticism, where consumers cannot distinguish between true and false green claims (de Freitas Netto et al. 2020).

However, study of the relationship between circular packaging and greenwashing comes with its own set of challenges, as the literature shows contrasting results. Lopes et al. (2023) investigate circular consumption - the broader domain circular packaging falls under – and its

relationship with greenwashing. While they acknowledge that the prevailing position in the literature is that circular consumption and greenwashing are negatively related (Zhang et al. 2018), they nevertheless observed a positive relationship between them. The authors interpreted this as a committed effort by environmentally conscious consumers to counter corporate greenwashing. Lopes et al. (2023) acknowledge the complexity of this association and suggest the need for further research into additional factors that may come into play. Notably, there have been limited studies investigating the influence of personality on topics related to sustainability and the circular economy (Zarei and Mirzaei 2022). Research has shown that personal factors affect how individuals perceive their purchasing actions (Verma et al. 2019), with personality traits having moderating effects (Zarei and Mirzaei 2022). Therefore, this thesis considers the consumer's personality dimensions, particularly those described by the mature CSE construct.

Several studies consider the influence of consumers' self-esteem when making purchases (Bi and Zhang 2023; Qiu et al. 2023). Self-esteem is particularly interesting as a moderating factor, with paradoxical findings when studying campaigns capitalising on negative feelings. According to Hansen et al. (2010), consumers with high self-esteem smoke more when exposed to mortality salient warnings on cigarette packets. For this thesis it is argued that consumers with high CSE are more likely to recognise greenwashing techniques (i.e., an activity with a negative connotation).

Accordingly, the following hypothesis was formulated:

Hypothesis 1. Core self-evaluations negatively moderate the relationship between consumer engagement in circular food and beverage packaging (CP) and consumer perception of corporate greenwashing practices. This would mean that consumers with high CSE who engage with CP would be less likely to perceive they have been greenwashed.

4.2.2 Consumer greenwashing attributions

Attribution theory is particularly suited to investigating consumer behaviour (Cho et al. 2021). In the context of sustainability, attribution theory provides a framework for understanding how consumers perceive a company's ability to adopt a more responsible business approach, how they attribute motives to the actions of the company, and how this cognitive process ultimately

impacts consumers' subsequent responses (Leonidou and Skarmeas 2017). The connection between perceived knowledge and long-term purchase intentions can be explained by the theoretical justification that exists in the form of feelings of self-competence to the attribution of responsibility (Frommeyer et al. 2022). The theory is particularly applicable to the investigation of green products, as attributions are commonly triggered in situations where there is divisiveness and suspicion, which is a common occurrence in sustainable product marketing (Leonidou and Skarmeas 2017).

When consumers encounter marketing communications perceived to exhibit greenwashing, they may engage in cognitive processes aimed at understanding the motivations behind such strategies. Consumers may conjecture that companies resort to greenwashing due to heightened competition within their industry or in response to the rapid and dynamic economic shifts affecting their sector (Jansen et al., 2006). This inclination to rationalise the phenomenon of greenwashing underscores consumers' efforts to make sense of corporate behaviour within the broader context of market dynamics and economic exigencies. In other words, this rationale influences their attributions concerning greenwashing based on situational external factors (Heider, 1958). Following the distinction introduced by Lee et al. (2012), those factors could be either business-oriented (increase sales, lower cost, facilitate operational processes), or society-oriented (demonstrate environmental ethos, signify social responsibility). This dichotomy into two major classes of factors is justifiable as it reflects the dual nature of corporate motivations, wherein businesses strive to achieve both economic objectives and societal expectations. Indeed, greenwashing would be the manifestation of an antagonistic relationship between these two classes of factors. As such, this rationale influences consumers' attribution towards greenwashing, controlling future events (Weiner, 1979), such as their wishcycling activities.

Accordingly, the following hypotheses were formulated:

Hypothesis 2. There is a positive relationship between greenwashing and consumer business-oriented attributions, so that if consumers perceive that the motives behind greenwashing are business-oriented, they are likely to recognise greenwashing.

Hypothesis 3. There is a positive relationship between greenwashing and consumer society-oriented attributions, so that if consumers perceive that the motives behind greenwashing are society-oriented, they are likely to recognise greenwashing.

4.2.3 Consumer attributions and wishcycling

Although mistakes in recycling can easily be made by misinformed consumers, we argue that consumers may perceive deliberate misinformation (greenwashing) differently depending on whether they attribute the reasons for it as business-oriented or society-oriented. Business-oriented attributions may be perceived as selfish actions of companies and thus produce negative feelings in consumers, which in turn passes on to wishcycling. On the contrary, society-oriented attributions may be perceived as altruistic actions of companies and thus produce positive feelings in consumers (Lee et al., 2012), which again passes on to wishcycling. This is in line with the practice of so-called advocacy advertising (Lee et al., 2019) and the concept of socially responsible consumption (Lăzăroiu, Ionescu, Andronie, et al., 2020; Lăzăroiu, Ionescu, Uță, et al., 2020; Prendergast & Tsang, 2019), tapping into consumer's emotional engagement. For example, Palacios-Gonzalez et al. (2022) unveiled a relationship between emotional engagement and responsible consumption, part of which is the reduction of waste generation.

Accordingly, the following hypotheses were formulated:

Hypothesis 4. There is a negative relationship between consumer business-oriented attributions and wishcycling, so that if consumers perceive that the motives behind greenwashing are business-oriented, they are likely to recognise greenwashing and engage in lesser wishcycling.

Hypothesis 5. There is a positive relationship between consumer society-oriented attributions and wish cycling, so that consumers are more likely to be persuaded by society-oriented greenwashing resulting in higher levels of wishcycling.

4.3 The operational model

Summarising the development of the research hypotheses presented previously, Figure 12

presents the operational model of the thesis. By combining hypotheses H2 and H4, and hypotheses H3 and H5, this model indicates the following:

H2-H4: Consumer business-oriented Attributions negatively mediate the relationship between greenwashing and wishcycling.

H3-H5: Consumer society-oriented Attributions positively mediate the relationship between greenwashing and wishcycling.

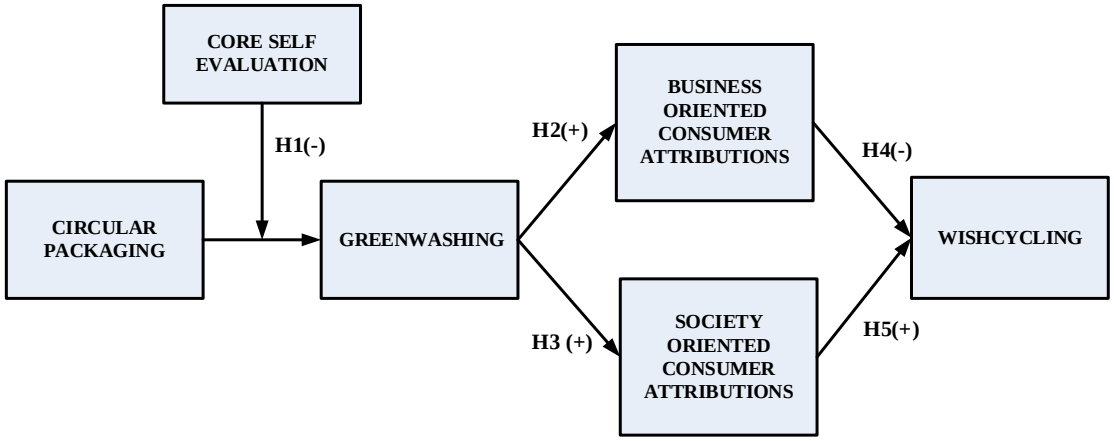

Figure 12. The research framework that represents the relationships between consumer engagement in circular packaging, consumer perception of corporate greenwashing techniques and consumer wishcycling and the way they are affected by consumer self-evaluations and business and society-oriented consumer attributions.
H: Hypotheses
(+) positive relationship
(-) negative relationship

This framework proposes that the relationship between circular packaging practices and perception of greenwashing is moderated by CSE, and greenwashing negatively or positively affects wishcycling, depending on the business-oriented or society-oriented consumer attributions as mediating mechanisms. Combining the previous individual hypotheses, a reduced general hypothesis is that the conceptualised model refers to a multi-path and serially mediating mechanisms research framework.

4.4 Research Methodology

The primary data for this study were collected via a questionnaire survey targeting individual consumers in the United Kingdom (UK). The UK was selected as it developed the Circular

Economy Package (CEP) policy statement in 2020 (Zhu et al. 2022) and joined the New Plastics Economy Global Commitment in April 2018 (UN 2018).

The survey included 92 scale items in total and 7 demographic questions. For this thesis a simple random sampling technique was used to ensure equal opportunities for individuals to take part in the study (Noor et al. 2022). During the first week of October 2022, a pilot study was performed through Qualtrics[3] online platform. In this pilot study, 42 fully answered questionnaires were returned. As the pilot study participants did not mention any problems understanding the questions, the full-scale survey proceeded without changes.

To determine the necessary sample size, four methods were followed. First, the classical method of means reflected in the formula $n = (Z_{\alpha/2})^2 s^2/e^2$, where α = significant level, s = standard deviation and e = |sample mean – population mean| = sampling error (Zikmund-Fisher et al. 2010). In this case $\alpha = 0.05$, $Z = 1.96$, using the pilot study results the mean and the standard deviation of the ordinal items are equal to 3.5982 and 0.91981, and the sampling error is computed at the $\alpha/2$ level, as 0.025x3.5982. Accordingly, the sample size derived is equal to 402.

Second, for complicated structural equation modelling cases the range of acceptable sample sizes should follow the N:q rule, where N = number of responses and q = number of estimated parameters. It is argued that acceptable sample sizes should be between 10:1 and 20:1 according to complexity (Kline 2011; Brown 2015). In our case considering that q = 30, the sample size should be between 300 and 600.

Third, a highly acceptable rule of thumb for complicated SEM cases follows the rule of 50+5X where X = number of observed variables (Gaskin 2023). Taking into consideration that in my case X = 92, the derived sample size is equal to 510.

Finally, the GPower [4] software, which is an existing online tool which considers parameters and requirements for statistical tests (Kang 2021). By applying this software according to its advised parameters, medium effect size = 0.15, error probability $\alpha = 0.05$, statistical power =

[3] https://www.qualtrics.com/uk/
[4] http://www.gpower.hhu.de/en.html

0.95, and number of predictors = 149, derived by counting all the interconnections between the dimensions involved in constructs, and applying linear multiple regression, the sample size was estimated to be equal to 545 correspondences (Figure 13).

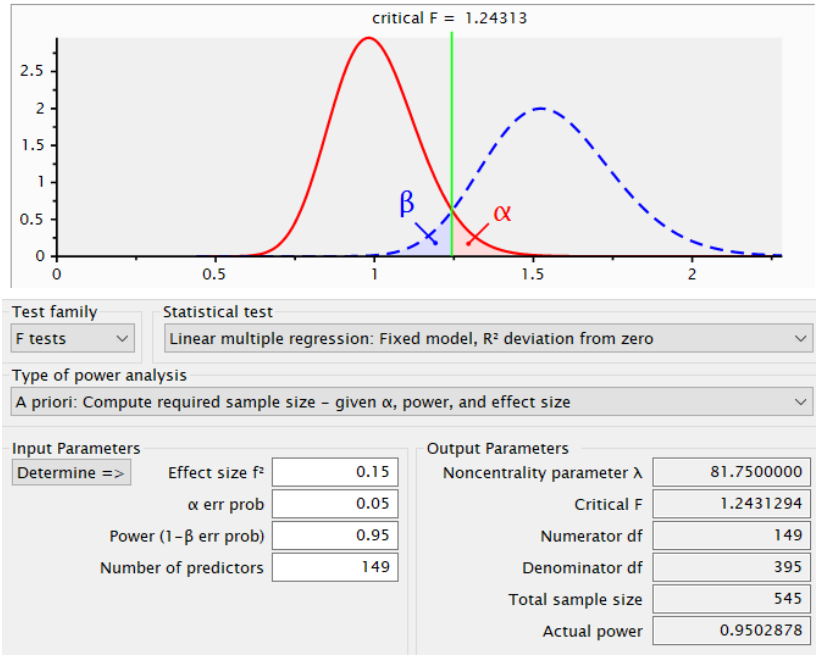

Figure 13. Sample size using GPower software.

Summarising the results of these approaches, the sample sizes derived from the first (402), third (535) and fourth (545) approach, are between the minimum (300) and the maximum (600) values of the second approach. However, a narrower sample size could be between the third (535) and fourth (545) approach.

The full-scale survey was released on the 17th of October 2022 through the online platform Prolific.co[5], an online platform dedicated to subject recruitment specifically designed for researchers (Palan & Schitter, 2018). According to this platform, random sampling was applied to UK consumers, to ensure equal opportunities for individuals to take part in the study (Noor et al., 2022). From this source, 495 fully answered questionnaires were received covering most areas in the UK, thus ensuring that the sample represents the entire population. Accordingly, and taking into consideration that the time difference between the pilot study and full-scale study was short and cannot support changes in individual behaviour, the full-scale and the pilot-

[5] https://www.prolific.co/

study responses were amalgamated to a database of 537 responses. Since this sample size is in the same range with the sample sizes indicated by the three sampling methods employed, it is supported that the statistical power of the study is equal to 0.95, i.e. the statistical power used in the sample size determination. Demographics of the sample respondents are presented Table 3.

Table 3. Respondent demographics of the full study

CHARACTERISTIC	FREQUENCY (N)	PERCENTAGE OF SAMPLE (%)
Gender		
Male	192	38.8
Female	333	62.0
Non-binary	8	1.5
Prefer not to say	4	0.7
Age (in years)		
- 30	162	30.2
31 – 40	156	29.1
41 – 50	96	17.9
51 – 60	74	13.8
61 +	49	9.1
Education		
High school	83	15.5
College	133	24.8
University	188	35.0
Post graduate studies	133	24.8
Employment status		
Employed	397	73.9
Unemployed	120	22.3
Other	20	3.7
Income (in £)		
- 20,000	100	18.6
20,001 – 30,000	119	22.2
30,001 – 50,000	159	29.6
50,001 +	159	29.6
Circular economy knowledge		
None	334	62.2
General	156	29.1
Expert	47	8.8

Note. *N*=537.

Respondents from 102 cities in the UK took part in the survey. The geographical distribution of the respondents is shown in the map in Figure 14.

Figure 14. The geographical distribution of the sample respondents

Figure 14 shows an even distribution of responses throughout the United Kingdom, which would not have been possible without the use of a crowdsourcing platform for this thesis. As shown in Table 3, the age distribution of the sample is well balanced and closely aligns with the figures provided by the Office for National Statistics – Census (2021), with 50% of

respondents being under 50 years old.

However, there is a notable gender imbalance in the sample, with a higher proportion of female respondents compared to the overall UK population. Specifically, while the UK population is approximately 51% female and 49% male (Office of National Statistics 2023), this research has a sample of 60% female and 40% male. This discrepancy may be attributed to the fact that women are generally more involved in food purchasing and preparation within households (Tandon et al. 2021) making this research more appealing to them.

Finally, the sample is not balanced in terms of education level, with 25% of respondents holding a postgraduate qualification. This imbalance may be attributed to the pilot sample being drawn from Bournemouth University academics, as well as the study's focus on circularity and sustainability issues, which tend to attract consumers with higher education levels (Sánchez-Bravo 2020).

4.5 Instrumentation

The questionnaire used for the study was developed through the literature review and validated with the pilot study. To have a better response distribution throughout the region of interest, the online platform Prolific.co was selected to administer the survey. Prolific adds approval rating filters and offers various additional pre-screeners, such as blocking suspicious or duplicate IPs and using a pre-approved sample of workers, geolocation filters, and access to a diverse participant pool (Eyal et al. 2021; Henkel & Hill 2023). While limitations have been identified and are presented in Section 7.3, studies show that crowdsourcing platforms like Prolific provide high-quality data at a low cost (Chen et al. 2021).

As this online platform was used, all responses were collected in 3 hours. Before choosing the platform, the researcher acted as correspondent to different studies to experience and observe the selection criteria the platform uses. The criteria used for this study for the correspondence selection were adults with a permanent residency in the UK.

4.6 Measures

Most measures were based on the research cited. In all structural items, a five-point Likert scale was used (Nikmard et al. 2023), ranging from 1 = strongly disagree to 5 = strongly agree. Additionally, all constructs / dimensions were operationalized as reflective, since they were assumed to reflect variations in the construct / dimension, and any measurement error is considered as random error. The measures developed were:

Core self-evaluations: This construct is based on Judge et al. (2006). It consists of 12 items distributed evenly among four sub-scales: *self-efficacy, self-esteem, emotional stability,* and *locus of control.*

Circular packaging: This construct is based on Testa et al. (2020). It consists of 11 items distributed among three sub-scales: *packaging general (3 items), food packaging (4 items),* and *beverages packaging (4 items).*

Greenwashing: This construct is based on Testa et al. (2022) and Leonidou and Skarmeas (2017). It consists of 21 items distributed evenly among seven sub-scales (i.e. the sins); *false environmental claims, misleading labels, hidden trade-offs, irrelevant environmental claims, lesser of two evils, unproven claims,* and *vague claims*.

Consumer attributions: There is no consumer attributions scale available in the literature in relation to greenwashing. Thus, followed the structure of the scale referring to Human Resource Management that was developed by Nishii et al. (2008). This was modified by developing seven sub-scales (i.e., corresponding to the seven types of sins). Each consumer responded to all seven types of sins. For example, for one sub-scale, the five response items of the consumers were: *Companies use false environmental claims on their packaging (sin 1) for: increasing their sales, keeping costs down, minimum disruption of their processes, demonstrating environmental ethos,* and *signifying social responsibility*. This response structure was repeated for the other six types of greenwashing sins, producing 35 items altogether for all types.

Wishcycling: This construct is based on Sløgedal and Starling (2020). It consists of 11 items distributed among three sub-scales: *quality (4 items), contamination (4 items),* and *machinery damages (3 items).*

Appendix C presents all items, along with the frequency and percentage of responses.

4.6.1 Validity and reliability of the survey instrument

Validity is described as the "ability of the instrument to measure what it is supposed to measure" (Wood et al. 2006). The questionnaire developed for this research has been operationalised by well-accepted items developed in the literature, supporting its *content validity* (Straub, 1989). The properties of the items and 1st and 2nd order dimensions were examined through Confirmatory Factor Analysis (CFA) and the corresponding loadings delivered are presented in Table 4.

Table 4. Questionnaire: Constructs, Sub-constructs, Items, and 1st-order and 2nd-order loadings using CFA

CONSTRUCTS (Sub-constructs) (Items)	**1st order Loadings of items**	**2nd order Loadings of sub-constructs**
Core self-evaluations.		
Self-efficacy		0.816
I complete tasks successfully	0.766	
I am capable of coping with most of my problems	0.815	
I never have doubts about my competence	0.733	
Self-esteem		0.870
I am confident I will receive the success I deserve in life	0.840	
When I try, I generally succeed	0.808	
Overall, I am satisfied with myself	0.826	
Emotional stability		0.794
There are never times when things look bleak and hopeless to me	0.808	
I feel useful most of the time	0.699	
I never feel depressed	0.813	
Locus of control		0.820
I determine what will happen in my life	0.796	
I feel in control of my success in my career	0.872	
I always feel in control of my work	0.801	
Circular packaging		
Packaging (general)		0.568
Compostable packaging is more sustainable than biodegradable packaging	0.705	
Circular packaging should be designed and produced in a way that it permits the reuse or recovery of raw materials, and the use of materials from renewable raw materials	0.562	
Excessive packaging is a big problem, e.g., individually packed apples in plastic film	0.718	

Food packaging		0.918
When I buy a food product, I usually look for reusable packaging	0.891	
When I buy a food product, I usually look for packaging made from recycled material	0.908	
When I buy a food product, I usually look for packaging that is easily separated into recyclable components	0.864	
When I buy a food product, I usually check the recyclability information	0.827	
Beverage's packaging (tea, coffee, etc.)		0.923
When I buy beverages, I usually look for packaging that can be reused, e.g., bring my own cup for coffee/tea	0.756	
When I buy beverages, I usually look for packaging made from recycled material	0.909	
When I buy beverages, I usually look for packaging that has a simple design that can be easily recycled	0.890	
When I buy beverages, I usually check the recyclability information	0.871	
Greenwashing		
False Environmental claims (sin1)		0.629
Companies use made-up concerns about the environmental features of their products, e.g., false Energy star rating	0.886	
Companies use made-up concerns referring to the waste recycling of their products, e.g., use of the TerraCycle logo in areas where TerraCycle does not operate	0.888	
Companies use made-up research findings to enhance the sustainability of their product, e.g., claims such as "according to recent research, cars do not produce CO2"	0.858	
Misleading labels (sin 2)		0.798
Companies use misleading visuals about the environmental features of their products, e.g., visuals with animals, leaves, and nature.	0.926	
Companies use misleading graphics about the environmental features of their products, e.g., green colour banners, and circular arrows.	0.945	
Companies use a combination of environmental-related words although the company is not interested in the environment, e.g., the use of pretending like nature-, eco-.	0.911	
Hidden trade-offs (sin 3)		0.810
Companies hide important information about the environmental features of their products, e.g., clothing companies that use green coloured labels and language like "conscious"	0.829	
Companies leave out important information about the environmental consequences of their products, e.g., for a	0.893	

battery company that uses recyclable plastic for their packaging ignoring the raw materials used for the batteries		
Companies concentrate on a narrow set of attributes of their product without paying attention to other important environmental issues, e.g., airline companies advertise themselves as having “lower emissions”.	0.879	
Irrelevant environmental claims (sin 4)		0.824
Companies provide vague information about the environmental features of their products, e.g., when apple packaging has a “green vegan” logo is more sustainable	0.851	
Companies provide seemingly un-provable information about the environmental features of their products, e.g. when packaging is claiming to have 70% less plastic	0.838	
Companies promote an environmental claim that is technically true but irrelevant to their products, e.g., when apple packaging has a CFC- free logo is more sustainable	0.865	
Lesser of two evils (sin 5)		0.754
Companies make environmental claims for their product although this product has no environmental benefits, e.g., organic cigarettes made from non-bleached paper in traditional packaging are better for the environment	0.844	
Companies make environmental claims within the product category although their product has nothing to do with environmental benefits, e.g., plastic-wrapped apples are a more sustainable choice because they last longer	0.863	
Companies make environmental claims for their product by distracting consumers from other major environmental impacts, e.g., Fairtrade bananas in plastic packaging are more sustainable	0.868	
Unproven claims (sin 6)		0.759
Companies are using environmental claims that cannot be easily verified by the customer, e.g., using statistics without providing a source	0.871	
Companies are using environmental claims that are not verified by a certification body	0.869	
Companies claim they have eco-friendly products but give no proof of the raw materials, processes, and supply chain they use.	0.882	
Vague claims (sin 7)		0.808
Companies use broad claims to be deliberately misunderstood by buyers, e.g., “All-natural” claims that nature can be also poisonous ingredients	0.837	

Companies use poorly defined claims to be deliberately misunderstood by buyers, e.g., “eco-conscious”, and “eco-friendly” claims without elaboration are meaningless	0.900	
Companies use vague graphics to be deliberately misunderstood by buyers, e.g., the use of graphics that resembles the universal recycling logo	0.831	
Consumer Attributions		
Consumer attributions with respect to False Environmental claims (asin 1)		0.769
Companies use false environmental claims on their packaging for: *increasing their sales*	0.782	
Companies use false environmental claims on their packaging for: *keeping costs down*	0.601	
Companies use false environmental claims on their packaging for: *minimum disruption of their processes*	0.755	
Companies use false environmental claims on their packaging for: *demonstrating environmental ethos*	0.763	
Companies use false environmental claims on their packaging for: *signifying social responsibility*	0.777	
Consumer attributions with respect to Misleading labels (asin2)		0.854
Companies use misleading labels on their packaging for: *increasing their sales*	0.759	
Companies use misleading labels on their packaging for: *keeping costs down*	0.558	
Companies use misleading labels on their packaging for: *minimum disruption of their processes*	0.657	
Companies use misleading labels on their packaging for: *demonstrating environmental ethos*	0.828	
Companies use misleading labels on their packaging for: *signifying social responsibility*	0.839	
Consumer attributions with respect to Hidden trade-offs (asin3)		0.856
Companies use hidden trade-offs on their packaging for: *increasing their sales*	0.750	
Companies use hidden trade-offs on their packaging for: *keeping costs down*	0.602	
Companies use hidden trade-offs on their packaging for: *minimum disruption of their processes*	0.670	

Companies use hidden trade-offs on their packaging for: *demonstrating environmental ethos*	0.834	
Companies use hidden trade-offs on their packaging for: *signifying social responsibility*	0.820	
Consumer attributions with respect to Irrelevant environmental claims (asin4)		0.900
Companies use irrelevant environmental claims on their packaging for: *increasing their sales*	0.742	
Companies use irrelevant environmental claims on their packaging for: *keeping costs down*	0.642	
Companies use irrelevant environmental claims on their packaging for: *minimum disruption of their processes*	0.697	
Companies use irrelevant environmental claims on their packaging for: *demonstrating environmental ethos*	0.789	
Companies use irrelevant environmental claims on their packaging for: *signifying social responsibility*	0.794	
Consumer attributions with respect to Lesser of two evils (asin5)		0.863
Companies use lesser of two evils on their packaging for: *increasing their sales*	0.765	
Companies use lesser of two evils on their packaging for: *keeping costs down*	0.635	
Companies use lesser of two evils on their packaging for: *minimum disruption of their processes*	0.697	
Companies use lesser of two evils on their packaging for: *demonstrating environmental ethos*	0.805	
Companies use lesser of two evils on their packaging for: *signifying social responsibility*	0.813	
Consumer attributions with respect to Unproven claims (asin6)		0.888
Companies use unproven claims on their packaging for: *increasing their sales*	0.767	
Companies use unproven claims on their packaging for: *keeping costs down*	0.881	
Companies use unproven claims on their packaging for: *minimum disruption of their processes*	0.704	
Companies use unproven claims on their packaging for: *demonstrating environmental ethos*	0.817	

Companies use unproven claims on their packaging for: *signifying social responsibility*	0.828	
Consumer attributions with respect to Vague claims (asin7)		0.872
Companies use vague claims on their packaging for: *increasing their sales*	0.732	
Companies use vague claims on their packaging for: *keeping costs down*	0.682	
Companies use vague claims on their packaging for: *minimum disruption of their processes*	0.726	
Companies use vague claims on their packaging for: *demonstrating environmental ethos*	0.832	
Companies use vague claims on their packaging for: *signifying social responsibility*	0.814	
Wishcycling		
Wishcycling: Quality		0.789
I usually put items in the recycling bin that do not belong there, hoping that they will be recycled	0.890	
When I am not sure if the packaging is recyclable, I put it in the recycling bin hoping that somebody else down the line knows better	0.758	
I usually put items in the recycling bin that do not belong there, hoping that they will not lead to waste	0.896	
I throw in the recycle bin whatever I wish would be recycled	0.781	
Wishcycling: Contamination		0.851
I usually put soft plastic in the recycling bin, hoping that it will not cause down-cycling, e.g., meat container lids	0.689	
If the packaging is not easy to clean, e.g., a toothpaste tube, I put it in the recycling bin with the leftovers of the product	0.758	
I usually put dirty/ oily paper in the recycle bin, hoping that it will not cause big trouble, e.g., empty pizza boxes	0.773	
I usually put plastic bottles and tins in the recycling bin without first washing them, hoping that they will not cause a big problem	0.731	
Wishcycling: Machine damage		0.854
I usually put pressurized aerosol cans in the recycling bin, hoping that they will not damage the recycling machinery	0.678	

I usually put film plastic in the recycling bin, hoping that it will not damage the recycling machinery	0.818	
I usually put ceramics in the recycling bin, hoping that they will not damage the recycling machinery	0.780	
Grouped Consumer Attributions		
Consumer Attributions for Increasing Sales		0.801
False environmental claims	0.703	
Misleading labels	0.805	
Hidden trade-offs	0.794	
Irrelevant environmental claims	0.850	
Lesser of two evils	0.788	
Unproven claims	0.833	
Vague claims	0.833	
Consumer Attributions for Keeping Costs Down		0.704
False environmental claims	0.690	
Misleading labels	0.798	
Hidden trade-offs	0.729	
Irrelevant environmental claims	0.863	
Lesser of two evils	0.769	
Unproven claims	0.822	
Vague claims	0.792	
Consumer Attributions for Minimum Disruption of Processes		0.764
False environmental claims	0.719	
Misleading labels	0.792	
Hidden trade-offs	0.814	
Irrelevant environmental claims	0.865	
Lesser of two evils	0.785	
Unproven claims	0.826	
Vague claims	0.816	
Consumer Attributions for Demonstrating Environmental Ethos		0.846
False environmental claims	0.740	
Misleading labels	0.823	
Hidden trade-offs	0.791	
Irrelevant environmental claims	0.859	
Lesser of two evils	0.796	
Unproven claims	0.848	
Vague claims	0.834	
Consumer Attributions for Signifying Social Responsibility		0.853
False environmental claims	0.744	
Misleading labels	0.843	
Hidden trade-offs	0.788	
Irrelevant environmental claims	0.866	
Lesser of two evils	0.823	
Unproven claims	0.857	
Vague claims	0.845	

Since the loadings belonging to the 1st and 2nd order dimensions are higher than the critical value of 0.40, the survey instrument supports *construct validity* (Hair et al. 2013).

The properties of the constructs used for testing the model are presented in Table 5. Since 82% of Cronbach's alphas are higher than 0.70, the survey instrument supports *internal consistency* (Nunnally 1978). The Total Variance Explained (TVE) per dimension obtained by applying CFA with Varimax rotation and the eigenvalue greater than one criterion (Hajjar 2018) are higher than 50.0%, so the *instrument construct validity* is supported (Hair et al. 2013). The calculated Composite Reliability (CR) scores are higher than 0.80 so the *construct composite reliability* is acceptable (Ibid). As the values of Kaiser-Meyer-Olkin (KMO) measure are > 0.50 and the Bartlett's test is significant ($p < 0.05$) (Chakraborty et al. 2020), the data is significantly meaningful for further analysis and suitable for structure detection (Kaiser 1974). Finally, as the Intra-Correlation Coefficients (ICC) have values much larger than 0.10, structural equation analyses are supported, and as the Inter-Rater Agreement Measures (RWG) are > 0.70, aggregation between units is justified (Kozlowski and Klein 2000).

Table 5. Properties of the constructs of the study. TVE stands for Total Variance Explained, CR for Composite Reliability, KMO for Kaiser-Meyer-Olkin, ICC for Intra-correlation Coefficient and RWG for Inter-rater Agreement Measures.

Constructs	Sub-constructs	Number of items	Cronbach Alpha	TVE (%)	CR	KMO (Bartlett test)*	ICC	RWG
Core Self-Evaluation (CSE)		4	0.839	68.133	0.895	0.801	0.565	0.950
	• Self-efficacy	3	0.611	59.596		0.644	0.344	0.928
	• Self-esteem	3	0.755	68.049		0.695	0.506	0.902
	• Emotional stability	3	0.688	60.101		0.638	0.401	0.902
	• Locus of control	3	0.762	67.825		0.667	0.517	0.892
Circular Packaging (CP)		3	0.754	67.199	0.855	0.566	0.705	0.908
	• General packaging	3	0.585	45.491		0.679	0.260	0.967
	• Food packaging	3	0.894	76.225		0.830	0.679	0.825
	• Beverages packaging	4	0.878	73.716		0.819	0.643	0.824
Green Washing (GW)		7	0.882	73.217	0.950	0.899	0.517	0.971
	• False environmental claims	3	0.850	76.995		0.727	0.654	0.845
	• Misleading	3	0.918	85.964		0.747	0.789	0.848

	labels	3	0.835	75.206		0.709	0.627	0.895
	• Hidden trade-offs	3	0.809	72.432		0.713	0.585	0.901
	• Irrelevant environmental claims	3	0.822	73.745		0.718	0.606	0.887
	• Lesser of two evils	3	0.844	76.379		0.729	0.644	0.876
	• Unproven claims	3	0.815	73.313		0.686	0.595	0.889
	• Vague claims							
Business Oriented Consumer Attributions (BoA)		3	0.904	72.008	0.884	0.629	0.578	0.927
	• Increasing sales	7	0.905	64.311		0.907	0.577	0.960
	• Decreasing costs	7	0.893	55.697		0.879	0.543	0.944
	• Disruption of processes	7	0.907	64.558		0.913	0.583	0.948
Society Oriented Consumer Attributions (SoA)		2	0.963	96.469	0.982	0.500	0.969	0.862
	• Environmental ethos	7	0.913	66.251		0.907	0.600	0.954
	• Social responsibility	7	0.921	68.036		0.916	0.623	0.954
Wish Cycling (WC)		3	0.775	69.185	0.871	0.689	0.534	0.897
	• Decrease quality	4	0.845	69.516		0.798	0.576	0.872
	• Contamination	4	0.721	54.501		0.753	0.393	0.848
	• Machinery damages	3	0.613	57.881		0.619	0.345	0.862

* Bartlett's test $p < 0.001$

4.6.2 Normality tests

To prevent any potential distortion of the overall findings, normality tests and coefficient calculations were performed to identify any extreme scores on individual or multiple variables (Samsudin and Hasanan 2017). The Kolmogorov-Smirnov (K-S) test suggests that, while the data on circular packaging, greenwashing, and wishcycling were normally distributed, the data for core self-evaluations, business-oriented consumer attributions, and society-oriented consumer attributions may not have been (Table 6). As a result, the skewness and kurtosis values were calculated. Although there is no clear consensus regarding the cut-off values for skewness and kurtosis before non-normality becomes a concern (Kline 2011), it is generally accepted that data are considered normally distributed if skewness falls between -2 to +2 and kurtosis between -3 to +3 (Byrne 2016). With skewness ranging from -0.884 to 0.550 and kurtosis ranging from -0.328 to 2.650 (see Table 6), all variables considered to be normally distributed.

Table 6. Parameters of constructs and normality tests

Constructs	CSE	CP	GW	BoA	SoA	WC
Mean	3.369	3.512	3.802	3.669	3.944	2.124
Standard Deviation	0.588	0.681	0.588	0.616	0.696	0.715
Skewness	-0.263	-0.168	-0.822	-0.281	-0.884	0.550
Kurtosis	0.339	-0.328	2.650	2.650	2.070	0.004
K-S test	p=0.033	p=0.062	p=0.141	p=0.038	p<0.001	p=0.054

Note. CSE – Core self-evaluations, CP – Circular Packaging, GW – Greenwashing, BoA – Business-oriented attributions, SoA – Society-oriented attributions, WC – Wishcycling.

Additionally, correlation coefficients between pairs of all constructs used in estimation and the square root of the Average Variance Explained (AVE) of each construct were calculated, to examine the *construct discriminant validity* (**Error! Not a valid bookmark self-reference.**). The correlation coefficients are significantly different from unity and are smaller than the square root of each construct's AVE, thus providing evidence for separate constructs.

Table 7. Correlation Coefficients between constructs and AVE of constructs.

	Correlation coefficients					
Constructs	CSE	CP	GW	BoA	SoA	WC
CSE	[0.825][a]					
CP	-0.093*	[0.820]				
GW	-0.182**	0.113**	[0.856]			
BoA	-0.139**	0.083	0.668**	[0.848]		
SoA	-0.095*	0.016	0.635**	0.539**	[0.982]	
WC	-0.021	-0.237	-0.040	0.038	-0.027	[0.832]

Note. CSE – Core self-evaluations, CP – Circular Packaging, GW – Greenwashing, BoA – Business-oriented attributions, SoA – Society-oriented attributions, WC – Wishcycling.

* Correlation is significantly different from unity at the 0.05 level (2-tailed)
** Correlation is significantly different from unity at the 0.01 level (2-tailed)
[a] the values in square brackets represent the square root of AVE

4.6.3 Common method bias

To investigate the possibility of common method bias, the single-factor test proposed by Harman (1967) was conducted. When all items were simultaneously loaded onto a factor analysis without any rotation, five factors were identified instead of just one. Moreover, the first factor only explained 30.515% of the total variance, indicating that any common method bias present in the data was minimal.

4.6.4 Estimation methodology

The above results allow proceeding with a Structural Equation Model (SEM) approach to test the developed research hypotheses of the proposed framework. SEM consists of two interwoven parts (Civelek 2018), the measurement and the structural models. The structural model cannot be established if the measurement model is unreliable or invalid (Hair Jr. et al. 2021). For the purpose of this study the software Mplus was chosen which is designed for latent variable modelling and is frequently used in social science and psychology to examine latent variable frameworks (Chang et al., 2020). Although the skewness and kurtosis rules indicated that the constructs follow normality, weighted least square (WLS) parameter estimates were used, via Mplus, since the Kolmogorov–Smirnov (K-S) tests indicated that some constructs do not follow the normal distribution (Muthén & Muthén, 2017). Additionally, considering that the research goal of this study is theory testing, where the focus is on assessing the fit of a hypothesized model to the data, the covariance-based SEM approach was followed.

To evaluate the overall model fit, Bollen's (1989) suggestion to consider multiple indices has been followed. This is because a model may be acceptable based on one fit index but not on others. To increase the likelihood of rejecting a mis-specified model, it is advisable to use more fit indices (Fan et al. 2016), and at least two fit indices should be considered to accept an SEM (Hu and Bentler 1999). Therefore the following fit indices were used, following Bentler (1990): *chi-square* (with critical significance level $p < 0.05$), *normed-chi-square ratio* (with critical level no more than 3), *Tucker Lewis Index (TLI)* (with critical level not lower than 0.80), *Comparative Fit Index (CFI)* (with critical level not lower than 0.90), *Root Mean Squared Error of Approximation (RMSEA)* (with critical level not more than 0.08).

However, the TLI and CFI indices are sensitive to the complexity of the model and the size of the sample. Thus, if these indices are lower but close to the indicated values they may still be

accepted (Judge and Hulin 1993). Additionally, there must be at least observations for each parameter estimated in SEM must be at least 15 (Hair et al. 2013). With estimated 32 parameters, the sample must at least 480 observations. This research consists of 537 observations fulfilling this rule.

4.7 Summary

Chapter 4 presents the research methodology that was adopted for this research. The chapter begins with the development of the research hypothesis and the formulation of the corresponding operational model. Following, the survey methodology, sampling and data collection is analysed. After presenting the demographics of the study, the data undergo a series of validity and reliability tests of the survey instrument. Having applied a series of relevant tests, it is found that both the structure of the survey instrument and the data collected can be further used for estimating and testing the hypotheses of the thesis.

Chapter 5
Findings and Data Analysis

5.1 Introduction

In the previous chapter the survey structure and data collected were subjected to a series of validity and reliability tests to confirm they can be further used for the hypothesis testing of this thesis.

In Chapter 5, the analysis and research findings are presented. The chapter begins with a discussion of the statistical analysis and the rationale behind selecting the structural equation model (SEM) estimation methodology for hypothesis testing. Two models were initially examined: the hypothesized and the single-factor model. The analysis showed that it is viable to proceed with the estimation of the structural model presented in Figure 12. Using MPlus as the chosen software, SEM was conducted, which is also presented in diagrammatic form, and hypothesis testing was performed. Chapter 5 concludes with an evaluation of the hypothesis testing and a summary of the findings.

5.2 Structural Equation Model approach

To test the developed research hypotheses of the proposed framework the methodology of structural equation model (SEM), or latent variable model (Hair et al. 2013) was used. The goal of the SEM framework is to assess the degree to which sample observations are consistent with the operational model (Hair et al. 2021). SEM is a powerful analysis tool for testing models that involve path analysis with mediating and moderating variables, as well as latent constructs that are measured using multiple items (Luna-Arocas and Camps 2008). SEM is a confirmatory type of approach to data analysis that requires *a priori* assignment of the inter-variable relationships (Wisner, 2003). It allows the researcher to model and study social science phenomena through the incorporation of several variables and intricate patterns of interaction (Kember and Leung 2006). The SEM approach consists of two interwoven parts (Civelek 2018), the measurement and the structural models. The structural model cannot be established if the measurement model is unreliable or invalid (Hair Jr. et al. 2021).

More specifically:

- with the measurement model, the relationships between the latent factors and the observable variables in the survey items are considered (Kline 2011). The measurement model is a part of confirmatory factor analysis (CFA) and if low fit indicators are observed, there is no valid research reason to test the structural model (Civelek 2018).

- the structural model indicates latent variables relationship strengths and the path directions (Kline 2011). The structural model is based on confirmatory approach, by statistical confirmation of the theoretical model (Civelek 2018).

SEM consists of a set of latent variables that reflect theoretical entities, their measures or indicators, and the relationships between them (Kember and Leung 2006). A latent variable represents theoretical constructs that cannot be observed directly and are measured by a set of indicators, such as the survey scales (Ibid). One of the benefits of SEM is the use of multiple regression analysis, which supports the modelling of complex structures even with mediating variables (Weigend Rodríguez et al. 2020).

There are several popular software packages that can be used for SEM, such as AMOS, Mplus, LISREL, Lavaan (R-package), piecewiseSEM (R-package), and Matlab (Fan et al. 2016). For the purpose of this thesis the software Mplus was chosen which is designed for latent variable modelling and is frequently used in social science and psychology to examine latent variable framework (Chang et al. 2020).

Weighted least square (WLS) parameter estimates were calculated, via Mplus, with conventional standard errors and chi-square test statistic that use a full weight matrix (Muthén and Muthén 2017). This method does not require the normality assumption to be met, although all constructs included in estimation must be continuous. In Chapter 4, it was established through Kolmogorov–Smirnov (K-S) tests, that circular packaging, greenwashing, and wishcycling follow the normal distribution, whilst core self-evaluation, business-oriented consumer attributions, and society-oriented consumer attributions do not follow the normal distribution. Consequently, 50 percent of the constructs do not follow the normal distribution, and all constructs, being first-order or second-order constructs, are continuous.

To evaluate the overall model fit, Bollen's (1989) suggestion to consider multiple indices was followed. This is because a model may be acceptable based on one fit index but not on others. To increase the likelihood of rejecting a mis-specified model, it is advisable to use more fit indices (Fan et al. 2016), and at least two fit indices should be considered to accept a SEM (Hu and Bentler 1999). For the purpose of this thesis, the fit indices according to Bentler (1990) have been used:

- the *chi-square test* (with critical significant level $p > 0.05$)
- the *normed-chi-square ratio* (with critical level no more than 5)
- the *Tucker Lewis Index (TLI)* (with critical level not lower than 0.80)
- the *Comparative Fit Index (CFI)* (with critical level not lower than 0.90)
- the *Root Mean Squared Error of Approximation (RMSEA)* (with critical level not more than 0.08)

A chi-square test result that is not statistically significant (i.e., $p > 0.05$) suggests that the proposed model effectively represents all the relationships within the data, i.e. no significant difference between the observed and model's implied data. However, even where this is the case, when the degrees of freedom are high, it is important to consider the normed chi-square value (i.e., the chi-square value divided by the degrees of freedom). The normed chi-square value should ideally not exceed 5 for the model to be considered acceptable (Pedhazur and Pedhazur-Schmelkin 1991).

The TLI and CFI indices are sensitive to the complexity of the model and the size of the sample. Thus, in cases where these indices are lower but close to the indicated values, they may still be accepted (Judge and Hulin 1993). Additionally, the number of observations needed for each parameter estimated in SEM must be at least 15 (Hair et al. 2013). Here, the number of parameters to be estimated is 32, meaning that the sample must be of at least 480 observations (Ibid). This rule has been fulfilled taking into consideration that the number of observations is 537.

5.2.1 The measurement model

Before estimating the theoretical model of the study that is presented in Figure 12, two models were investigated using CFA. The first model, which is the hypothesized model, considers all

six constructs used in the study. The derived fit indices are presented in Table 8, indicating an acceptable fit.

Table 8. Hypothesized Model fit indices and critical levels.

	χ^2	DF	*p*	normed χ^2	RMSEA	CFI	TLI
Hypothesized model	619.498	194	.000	3.193	.064	.739	.690
Critical level	–	–	.05*	< 3: good fit 3-5: mediocre fit	≤ .08	≥ .90	≥ .80

Note. DF = degrees of freedom; RMSEA = root-mean-square error of approximation; CFI = comparative fit index; TLI = Tucker Lewis index.

*for χ^2 the null hypothesis is tested (p>0.05)

The second model considered is the so-called single factor model (i.e., the Harman's type model), where all items were loaded into a single factor. The results are shown in Table 9.

Table 9. Single Factor Model fit indices and critical levels

	χ^2	DF	*p*	normed χ^2	RMSEA	CFI	TLI
Single factor model	969.398	208	.000	4.661	.083	.533	.482
Critical level	–	–	.05*	< 3: good fit 3-5: mediocre fit	≤ .08	≥ .90	≥ .80

Note. DF = degrees of freedom; RMSEA = root-mean-square error of approximation; CFI = comparative fit index; TLI = Tucker Lewis index.

*for χ^2 the null hypothesis is tested (p>0.05)

According to Table 9, the fit indices indicate very poor fit for the single factor model, worse than the hypothesized model. As both models yield poor fit indexes, it is possible to proceed to also check single respondent bias and move to the estimation of the structural model. After observing the above fit indexes, a resulting structural model with better fit indexes will be desired outcome.

Comparing the chi-square results of these two models, it was found that Δchi-square/Δdf = (969.398 - 619.498) / (208 - 194) = 24.993. Because this ratio is much greater that the critical value of 3.84 per degree of freedom it is concluded that single respondent bias is limited, and the latent factors correspond to separate constructs (Podsakoff et al. 2003; Brown 2015).

5.2.2 The Structural Model

Two versions of the theoretical model were estimated, a fully mediated model, reflecting the model presented in Figure 12, and a partially mediated model with directly linked related constructs. However, in the partially mediated model, the estimated coefficients of the direct paths were not significant, so the fully mediated model represents the data better than the partially mediated model. The fit indices of the fully mediated model are presented in Table 10.

Table 10. The Structural Model fit indices and critical levels

	χ^2	DF	*p*	normed χ^2	RMSEA	CFI	TLI
Single factor model	597.278	219	.000	2.727	.057	.840	.803
Critical level	–	–	.05*	< 3: good fit 3-5: mediocre fit	≤ .08	≥ .90	≥ .80

Note. DF = degrees of freedom; RMSEA = root-mean-square error of approximation; CFI = comparative fit index; TLI = Tucker Lewis index.

*for χ^2 the null hypothesis is tested (p>0.05)

From Table 10, it is concluded that the all-fit indices of the Structural Model are better than the models examined earlier, which is the desired outcome of the process.

To visually represent the model, Figure 15 was created. The estimated coefficients or standardised beta (β) value range from -1 to +1, where values closer to +1 indicate a strong positive relationship and values close to -1 indicate a negative relationship (Ahmed and Wang 2019). Figure 15 presents the results of the fully mediated theoretical model where all estimated coefficients (β) are significant and presented in standardised values. However, note that the dimension of 'general packaging' in the circular packaging construct and the dimension of 'decreasing costs' in the business-oriented consumer attributions were not used in estimation because the obtained standardized coefficients (β) were below the cut-off value of 0.40 and they were not significant.

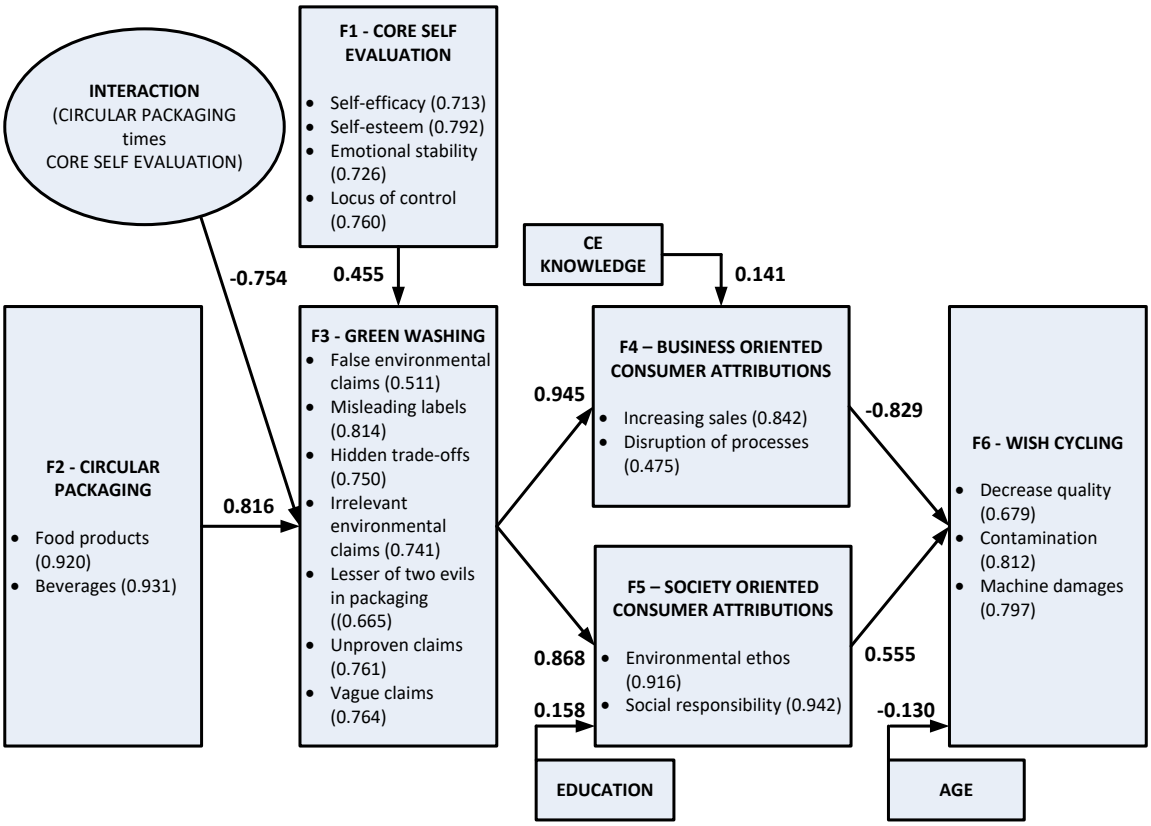

Figure 15. The estimated fully mediated theoretical model

5.3 Testing the research hypotheses

It appears that both core self-evaluations (β=0.455) and consumer engagement with circular packaging (β=0.816) have a positive relationship with consumer's perception of the level of corporate greenwashing practices (Figure 15). However, the interaction variable (CSE x CP) has a negative relationship (β=-0.754). To illustrate the combined effect, the ModGraph software (Jose, 2013) was employed, which allows us to study the moderation effect of CSE.

Using the actual estimations and not the standardized ones, Figure 16 presents the graphical plot of the moderation effects of core self-evaluations on the relationship between CP and corporate GW. The three lines have a negative slope, suggesting a negative correlation between CP and GW.

There are two key parameters when inspecting the lines/relationships presented in Figure 16:

- *The position of the line*. This is a relative measure indicating a shift in the relationship.

By comparing the relative positions of the three lines, participants with greater self-evaluation were less likely to recognise greenwashing across all levels of engagement with circular packaging.

- *The slope of the line*. The higher the self-evaluation, the more strongly negative the relationship is. The steepest slope, indicating the strongest negative association, was found among consumers who scored high on CSEs. This means that core self-evaluations negatively moderate the relationship between consumer engagement in circular food and beverage packaging and consumer perception of corporate greenwashing practices. It is apparent from the graph that the relationship becomes stronger for consumers high in self-evaluation, thus supporting hypothesis 1.

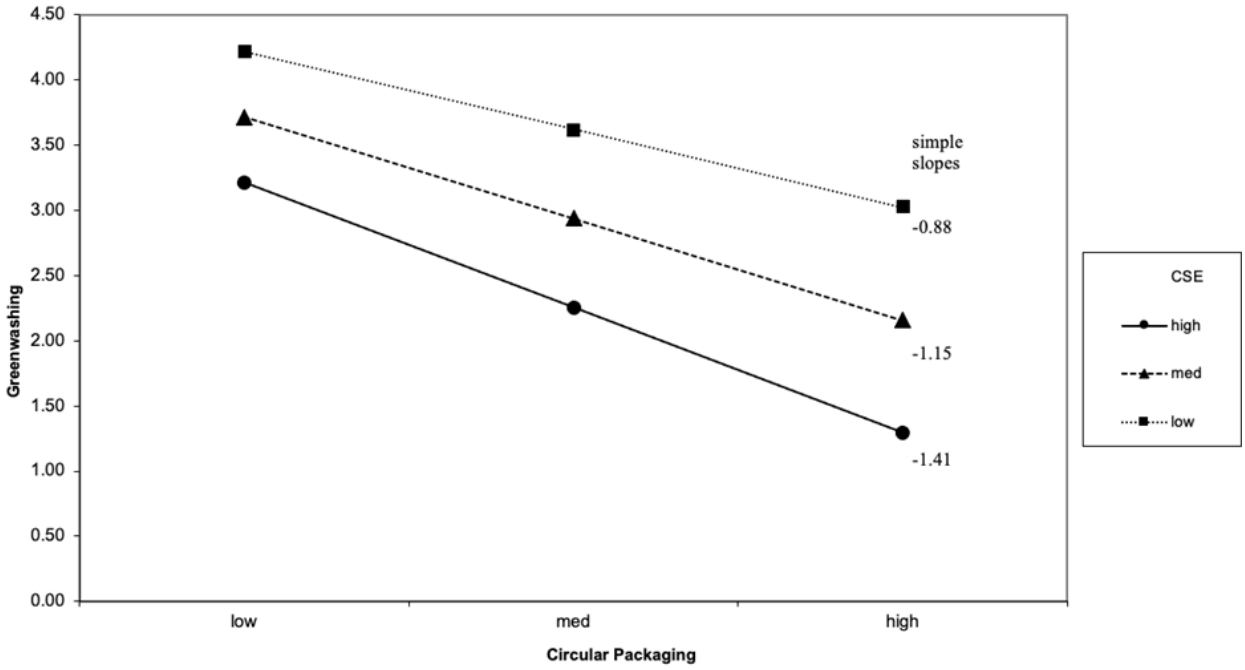

Figure 16. Graphical plot of the moderation effects of CSE on the circular packaging – greenwashing relationship

Furthermore, the model estimation (shown in Fig. 15) indicates that greenwashing produces positive business-oriented consumer attributions (β=0.945) and positive society-oriented consumer attributions (β=0.868), supporting hypotheses 2 and 3. Additionally, the results indicate that business-oriented consumer attributions have a negative effect on wishcycling (β=-0.829), supporting hypothesis 4, and society-oriented consumer attributions have a positive effect on wishcycling (β=0.555), supporting hypothesis 5.

Moreover, the results indicate that the mediation of business-oriented consumer attributions in the relationship between greenwashing and wishcycling is negative and significant, since the standardized estimate of full mediation is -0.782 (p<0.001), supporting the combined hypotheses 2 and 4. The mediation of society-oriented attributions in the relationship between greenwashing and wishcycling is positive and significant since the standardized estimate of full mediation is 0.482 (p=0.011), supporting the combined hypotheses 3 and 5. Combining these two effects, it is found that the total aggregated impact of greenwashing on wishcycling, through consumer attribution, is -0.300 (p<0.001), with confidence interval limits -0.363 [lower 5%] and -0.237 [upper 5%]. This means that overall, consumers who recognise greenwashing more are less likely to engage in wishcycling.

Of the controls used in the study, only three produced significant results. In particular, the results suggest that individuals who self-report higher knowledge of CE issues have a higher score for (β=0.141) business-oriented attributions. Individuals with higher education have a higher score for (β=0.158) society-oriented attributions. Finally, older individuals are less likely to wishcycle (β=-0.130).

5.4 Summary

Chapter 5 presented the outcomes and data analysis of the Structural Equation Model formulated for this thesis. After confirming the validity and reliability of all constructs in Chapter 4, the current chapter evaluates the structural model to examine the hypothesised relationships within the proposed research model. To this end, the *measurement model* was examined, which consists of the *hypothesised* and the *single factor model.* The results of the *measurement model* showed a good fit and allowed the development and study of the *structural model*.

A partially mediated model was also considered. However, the estimated coefficients of this model were found to be not significant, leading to the construction of a fully mediated model. The dimensions of ‘general packaging’ and ‘decreasing costs’ were excluded since they did not meet the cut-off value of 0.40 of the standardised coefficients and were also not significant. The fully mediated theoretical framework was estimated and presented graphically. All

research hypotheses were tested through this SEM. A summary of the hypotheses testing results in terms of supported/ not supported hypothesis is presented in Table 11.

A noteworthy outcome of the structural model is the moderated effect that the combined core self-evaluation and circular packaging constructs have on greenwashing.

Table 11. Summary of Hypothesis testing

Research Hypothesis	Study Results
H1: Core self-evaluations negatively moderate the relationship between consumer engagement in circular food and beverage packaging (CP) and consumer perception of corporate greenwashing practices. This would mean that consumers with high CSE who engage with CP would be less likely to perceive they have been greenwashed.	*Supported*
H2: There is a positive relationship between greenwashing and consumer business-oriented attributions, so that if consumers perceive that the motives behind greenwashing are business-oriented, they are likely to recognise greenwashing.	*Supported*
H3: There is a positive relationship between greenwashing and consumer society-oriented attributions, so that if consumers perceive that the motives behind greenwashing are society-oriented, they are likely to recognise greenwashing.	*Supported*
H4: There is a negative relationship between consumer business-oriented attributions and wishcycling, so that if consumers perceive that the motives behind greenwashing are business-oriented, they are likely to recognise greenwashing and engage in lesser wishcycling.	*Supported*
H5: There is a positive relationship between consumer society-oriented attributions and wish cycling, so that consumers are more likely to be persuaded by society-oriented greenwashing resulting in higher levels of wishcycling.	*Supported*
H2-H4: Consumer business-oriented attributions negatively mediate the relationship between greenwashing and wishcycling.	*Supported*
H3-H5: Consumer society-oriented attributions positively mediate the relationship between greenwashing and wishcycling.	*Supported*

Chapter 6
Discussion

6.1 Introduction

In this thesis, an approach for studying the human aspects of Circular Economy (CE) ecosystems is introduced. This approach is captured by the overarching term “Human-in-the Circular Loop”. HITCL derived from the research domain established in artificial intelligence “Human in the Loop” framework and was introduced to circular economy domain. It creates a roadmap of an amalgamation of established theories and quantitative metrics that can be introduced to circularity research. It envisages to encompass all factors that can potentially influence human decision-makers - be it consumers and employees- when taking actions that may hinder or accelerate the transition to the CE paradigm. By synthesising well-established theories and their quantitative metrics from various fields, including psychology and human resource management, the HITCL framework offers valuable insights into the human acceptance, perception, and decision-making processes. It underscores the necessity to formulate successful strategies and interventions aimed at fostering circular behaviours while enhancing the efficiency of efforts to tackle associated challenges. The first demonstration of HITCL is the application of the approach on the recycling loop. Three key factors of importance have initially been identified, namely the level of CE knowledge, consumer self-evaluation, and consumer attributions when researching the consumer acceptance on circular food and beverage packaging and its effect on wishcycling.

The overarching aim of this application of the HITCL approach is the investigation of the interconnections between corporate greenwashing and consumer wishcycling by integrating societal dimensions of core self-evaluations and consumer attributions. The primary focus lies in shedding light into the complexities of consumer engagement with circular food and beverage packaging within this context. A quantitative research methodology was adopted by developing a theoretical framework that was analysed through structural equation modelling to help in answering the main research questions set out in the introductory chapter of this thesis.

More specifically, through moderation analysis, it was found that consumers’ self-evaluation significantly influences their engagement with circular food and beverage packaging, as well

as their perception of corporate greenwashing (RQ1). Moreover, consumers with high self-esteem and high engagement with circular packaging practices believe that companies conduct less greenwashing, in contrast to those with a lower self-esteem. This finding is in line with prior studies indicating that personal attributes, including attitudes and beliefs in green consumption, have a negative effect on the consumption of environmentally friendly products (Braga Junior et al. 2019). This study complements and strengthens the view that personality features play a significant role when considering green practices (Zarei and Mirzaei 2022) and corporate greenwashing.

Here, the concept of two distinct categories in corporate motives for greenwashing is introduced, namely business-oriented and society-oriented (RQ2). For both categories the relationship with greenwashing is positive (i.e., consumers recognise greenwashing whether it is attributed to business or societal reasons) (RQ3). However, there was a negative correlation with business-oriented consumer attributions and a positive relationship when examining society-oriented attributions concerning wishcycling (RQ4). From the above, it appears that when greenwashing techniques are based on showcasing commitment to environmental and social responsibility, consumers are inclined to place greater trust in them. Consequently, this heightened trust is associated with a rise in wishcycling behaviours.

Furthermore, self-reported knowledge of CE is specifically associated with business-oriented attributions, indicating that consumers who believe they have a higher knowledge of CE are more inclined to support a view that corporate greenwashing is due to a business-oriented agenda. The level of education is uniquely linked to society-oriented attributions, with consumers of a higher educational level subscribing to a more society-oriented corporate agenda. Lastly, age was found to have a negative relation to wishcycling, indicating that younger consumers are more prone to wishcycling.

6.2 Theoretical and research implications

The HITCL framework has been designed so that researchers can make informed decisions on theories and the metrics that should be used depending on their research.
By exploring and adopting this framework, researchers can navigate the complex interplay throughout different domains in the context of circularity. Moving forward, HITCL could serve

as a valuable tool for scholars and practitioners alike, offering a systematic approach to understanding and enhancing the societal aspects of the CE paradigm. As the importance of creating a circular economy based on all three pillars of sustainability continues to gain recognition, HITCL can guide future research to new multidomain pathways within the circular economy initiatives.

Some examples use cases are outlined as follows. In product design, HITCL could bring in aspects of consumer behaviour and specifically show how consumer attitudes, beliefs, and behaviours can influence the design and adoption of circular products. By considering factors such as perceived value, convenience, and social norms, HITCL would help identify strategies to encourage consumers to choose circular products over traditional linear alternatives. Similarly, in the domain of organisational culture, it could explore employee attitudes, motivations, and behaviours that impact the implementation of circular economy practices within organisations. Factors such as employee values, job satisfaction, and organizational culture derived from HITCL, would help identify approaches to enhance employee engagement and promote circularity within the workplace. Another domain that HITCL could be used is the effective creation of communication and marketing strategies to promote circular economy initiatives. Moreover, HITCL could facilitate the development of impactful educational interventions to inspire and empower individuals to embrace circular practices in their daily routines.

Another theoretical outcome of this study is the development of a framework that enhances our understanding of the factors influencing the relationship between consumer engagement in circular food and beverage packaging and wishcycling, particularly within the context of UK consumers. To this end, the research framework underscores two critical consumer factors influencing the relationship. The first is that consumers' personalities moderate the relationship between consumer engagement in circular packaging and consumer perception of corporate greenwashing techniques. The finding that consumers with higher core self-evaluations (self-esteem, self-efficacy and locus of control) perceive that corporate greenwashing is lower than do consumers with lower self-evaluations warrants further investigation, as the relationship between personality traits and circular practices remains relatively underexplored in current literature to date. Further studies into this area would contribute to a deeper understanding of the factors influencing the adoption of circular practices. The second factor involves consumer attributions, differentiated into business-oriented and society-oriented categories, mediating

the relationship between greenwashing and wishcycling. This finding contributes directly to and extends the work by Guerreiro and Pacheco (2021), who identified a number of mediators between greenwashing and purchase intention, including word of mouth and consumer brand engagement. The authors conject that there should be more mediating effects that warrant future research. This contribution is significant as it utilizes individual factors to enhance consumer understanding of circular economy relationships.

Additionally, this thesis provides a theoretical contribution to the well-established field of attribution theory by adopting it to circular studies and transferring the concept from employees to consumers. By separating the consumer attributions into society-oriented and business-oriented, this thesis managed not only to research how consumers perceive corporate greenwashing but also what they believe are the drivers behind it. This contribution also extends knowledge by diversifying the mediating mechanisms between circular packaging and wishcycling based on consumers' attributions. More specifically, it has been supported that consumers engage less in wishcycling when they believe that they are being greenwashed for business-oriented reasons rather than when they believe that companies are engaging in greenwashing to promote their environmental ethos and social responsibility. In addition, it has been observed that higher levels of CE knowledge affect business-oriented consumer attributions and education levels affect society-oriented consumer attributions. However, consumers who are less vigilant towards society-oriented greenwashing corporate techniques are more likely to carry out wishcycling. Based on the above, wishcycling occurs when consumers are making efforts to act sustainably. Consequently, when companies employ greenwashing techniques promoting their environmental ethos and social responsibility, consumers tend to trust them more, leading to increased wishcycling behaviours.

Society-oriented attributions were also found to be related to the consumer's education level. Consumers with higher levels of education tend to place greater trust in corporate claims of promoting circular and ethical practices, believing they are acting in the best interest of the environment. Unfortunately, this frequently results in an increase in wishcycling. Although Debrah et al. (2021), reported that people with higher levels of education are both more concerned about the environment, and are also more likely to participate in actions that promote and support environmental policy decisions, the results suggest that they are also more likely to wishcycle packaging from companies they perceive to have a strong environmental ethos,

believing they are doing the right thing for the environment (as elaborated in Chapter 2). For future work, further research into wishcycling behaviours among consumers with higher education levels who deliberately opt to support companies they perceive to have a strong environmental ethos could be made. Additionally, examining wishcycling behaviours among highly educated consumers with backgrounds in sustainability-related fields (such as geography or environmental science) compared to those in other professions (like medicine or mechanics) could offer valuable insights. Understanding these dynamics could inform efforts to address Sustainable Development Goals (SDGs) across various education levels, aiming to mitigate wishcycling practices and promote circularity.

6.3 Managerial and policy-making implications

In this study, it is demonstrated that core self-evaluation moderates the relationship between consumers' engagement in circular food and beverage packaging and their perception of corporate greenwashing practices. Consumers generally seek circular packaging in goods they are purchasing when they can trust green claims and believe they have not been greenwashed. A confident consumer will actively purchase products in what they believe to be circular packaging when they believe that they are not being greenwashed. However, a consumer with low self-esteem will try to engage in circular packaging in the hope that they are not being greenwashed. From the above, it can be concluded that while policymakers should promote strong, confident consumers, this finding raises a concern and emphasises a critical consideration when applying and implementing policies to tackle greenwashing. The desire of consumers to behave sustainably could potentially be manipulated by unscrupulous companies targeting less confident circular-aware consumers, resulting in "circular washing" (Marrucci et al., 2022), so consumer knowledge of what can be recycled is important. To avoid such practices, policies related to tax on plastic packaging manufacturing have been developed from countries across the world. In the UK, the relevant policy has taken effect from 1st of April 2022 (HM Revenue & Customs 2024) with proposed charge £220/ton for any packaging containing less than 30% recycled material (Kalimo et al. 2015; Ramasubramanian et al. 2023). Although the effectiveness of this policy is yet to be measured, concerns of the availability and quality of recycled materials and the potential increase in price has been raised (Zafarani and Ghandehari 2023). Rewarding measures that would enhance circularity in packaging might be more appropriate to address the issue. For example, in 2025, the UK Department for

Environment Food & Rural Affairs (DEFTA) will introduce a Deposit Return Scheme (DRS) where a 20p deposit will be paid by the consumer at the purchase point and the money will be returned with the packaging to be refilled and reused (Grace 2023). Schemes such as this are creating a culture resembling the pre- "throw away" era which has been discussed in Chapter 2, representing a shift in circular practices. Recent research by Konstantoglou et al. (2023) showed that such policies are highly accepted by consumers and will provide environmental as well as prosperity benefits.

Furthermore, it was revealed that consumers attribute their own wishcycling behaviour differently when assessing greenwashing as a business-oriented motive versus a society-oriented one. Until now, greenwashing has been viewed as a singular concept, but this study underscores distinct variations and their impact on consumer behaviour regarding wishcycling. The findings indicate that consumers display a higher level of awareness concerning business-oriented greenwashing practices, resulting in reduced wishcycling tendencies. Conversely, consumers tend to engage in more wishcycling when companies employ society-oriented greenwashing practices. This highlights a previously unaddressed cognitive bias in human perception, potentially posing a threat to the adoption of circular practices (Engler et al., 2019). More precisely, consumers navigating decision-making scenarios, like determining whether certain packaging is recyclable or not, within uncertain circumstances, are particularly susceptible to cognitive biases (De Vries, 2020). For businesses, this represents a significant factor in leveraging environmental ethos and social responsibility while greenwashing consumers. Policymakers should consider this when working to mitigate corporate greenwashing. At the time of writing, there is a flurry of activity as seen in the recent legislative actions (see for example Speare-Cole (2023) and European Parliament (2023)) to contain and control extensive greenwashing. This finding could be a valuable insight to support and direct such legislative efforts towards efficient and actionable control of greenwashing, particularly towards greenwashing techniques where companies present themselves as environmentally responsible. The European Union has introduced the voluntary EU Ecolabel system, which has been marked of environmental excellence but does not yet include food and beverage packaging due to the complexity of the materials (Kabaja 2023). The introduction of universal logos and initiatives would stop companies from being able to present themselves as environmentally friendly when they are not and would contribute to ending greenwashing practices.

The finding that consumers with higher self-reported knowledge of circular economy are more sceptical of business-oriented corporate greenwashing but educated consumers are more susceptible to societal-oriented greenwashing techniques contributes nuance to the existing body of research on consumer knowledge, which has generally found a positive correlation between the level of education and environmental sensitivity (Wang et al., 2020). In other words, in this thesis it was revealed that an educated consumer who is expected to be more environmentally sensitive, may end up being less resistant to greenwashing. This demonstrates that environmental sustainability consciousness can be a double-edged sword when it comes to wishcycling; the consumer would be less resistant to greenwashing, should the latter be related to a societal-oriented corporate agenda and projection. This phenomenon underscores the complexity of consumer behaviour and the nuanced interactions between education, environmental consciousness, and susceptibility to deceptive marketing practices. While these observations can aid policymakers in fostering circular economy awareness to protect consumers from greenwashing and potentially mitigate wishcycling, there is a concern that businesses might exploit this knowledge by projecting an image of socially responsible consumption. Therefore, the integration of circular economy principles into a wide array of educational curricula and programmes is proposed. This approach aligns with contemporary environmental initiatives like the United Nations' Sustainability Development Goals (SDGs), which are increasingly pervasive (Bourn 2021).

Finally, this study has confirmed that younger consumers tend to engage more in wishcycling, indicating a lesser understanding of recycling contamination. This agrees with Lee et al. (2020), who noted that despite being well-informed and supportive of environmental initiatives, Millennials often exhibit behaviour that contradicts their values. Therefore, managers and policymakers should target campaigns aimed at enhancing recyclability awareness towards younger groups.

6.4 Summary

This thesis introduces the "Human-in-the-Circular Loop" framework for studying human aspects of Circular Economy (CE) ecosystems, adapted from the artificial intelligence domain's "Human in the Loop" framework. This approach combines established theories and quantitative metrics to understand how individuals, as consumers and employees, influence the

transition to the CE paradigm. By synthesising various theories and metrics from psychology, human resource management, and management, HITCL offers insights into human acceptance, perception, and decision-making regarding circular practices. The study demonstrates HITCL's application in analysing consumer engagement with circular food and beverage packaging and its impact on wishcycling, highlighting the interconnections between corporate greenwashing and wishcycling. Through structural equation modelling, it was found that consumers' self-evaluation influences their engagement with circular packaging and perception of greenwashing, while consumer attributions mediate the relationship between greenwashing and wishcycling. The study contributes to attribution theory, extends understanding of consumer behaviours in circular contexts, and offers managerial and policy-making implications for addressing greenwashing and wishcycling behaviours, particularly among different demographic groups. These insights suggest the need for targeted educational interventions, policy measures, and communication strategies to promote circular practices and mitigate wishcycling, ultimately advancing the goals of the circular economy paradigm.

Chapter 7
Contribution to research, limitations and recommendations for future research

7.1 Introduction

The concept of the CE is increasingly gaining interest among policymakers across Europe and the UK, as companies are experiencing intensified pressure to adopt the paradigm and implement it in their products and services. In this thesis, it is argued that to transition to a circular future it is necessary to "put humans in the circular loop". The "human" element for this study is represented by the consumers who can potentially be trapped in an unsustainable loop, a vicious circle that is created by companies' greenwashing practices and consumer wishcycling behaviours. Consumers perform wishcycling with good intentions, but the "out of sight out of mind" culture is causing great problems for councils and recycling companies, with grave consequences for the environment. When recycling gets contaminated, it ends up in landfills or escapes into the environment.

The relationship between circular packaging, greenwashing, and wishcycling involves complex interactions among environmental practices, consumer behaviours, and corporate strategies. Individual personality traits can play a significant role in influencing these dynamics by creating both gaps and contributions in the relationship between circular packaging, greenwashing, and wishcycling. Educating and empowering consumers in making more sustainable choices and fostering a culture of responsibility would enhance the overall effectiveness of circular economy initiatives.

7.2 Contribution to research

This study highlights the important role of consumers in the adoption of circularity. Through the lens of circular food and beverage packaging, the interconnected issues of corporate greenwashing and consumer wishcycling are investigated.

Firstly, this thesis proposes the integration of sustainability research with established fields like Human Resource Management, Psychology, Marketing and Organisational Development. By

merging insights from these diverse fields, it is argued that the CE, a model aimed at minimising waste and maximising resource efficiency, can evolve beyond its current environmental and business focus to encompass broader societal dimensions of sustainability. This integration would enable the CE to not only mitigate environmental impacts but also address social and human-centred aspects, enhancing its overall sustainability.

Secondly, this thesis addresses the role of consumers' personality as a moderating factor in the relationship between circular food and beverage packaging and their perception of companies' greenwashing practices. It discusses how consumers' self-evaluation, including factors like self-esteem, self-efficacy, and locus of control, influences their perception of corporate greenwashing. Specifically, it notes that consumers with higher self-evaluations tend to perceive less corporate greenwashing compared to those with lower self-evaluations. This finding suggests that consumers' personality traits play a significant role in shaping their perception of companies' greenwashing practices, thereby moderating the relationship between their engagement in circular packaging and their perception of greenwashing.

Thirdly, this thesis expands the application of attribution theory, traditionally applied in the context of employee behaviour, to encompass consumer behaviour. By extending the scope of attribution theory to consumers, it examines the mechanisms by which individuals attribute motives and intentions to companies, particularly in the context of greenwashing practices. This expansion allows for a deeper understanding of how consumers interpret and perceive corporate actions, shedding light on their decision-making processes and behaviours in relation to sustainability practices.

Fourthly, this research introduces two types of consumer attribution to sustainability research, business-oriented and society-oriented. Although in both cases consumers recognise greenwashing practices, they are more likely to wishcycle when they attribute greenwashing to societal reasons rather than business motives.

Furthermore, the study highlights the influence of demographic factors such as age and education level on consumer behaviours related to CE practices and wishcycling. Younger consumers are found to be more prone to wishcycling, indicating a potential gap in understanding of recycling practices. Conversely, consumers with higher levels of education tend to trust corporate claims of sustainability more, potentially leading to increased

wishcycling behaviours. These findings underscore the importance of targeted educational campaigns to enhance awareness and understanding of recycling practices among different demographic groups.

Finally, the study identifies the need for novel approaches in addressing greenwashing practices, particularly in distinguishing between business-oriented and society-oriented motives. While consumers may exhibit heightened awareness of business-oriented greenwashing, they may still engage in wishcycling when presented with societal-oriented greenwashing tactics. This underscores the complexity of consumer decision-making and the importance of transparent communication from businesses regarding their environmental and social responsibility efforts.

The focus on consumer behaviour and the wider human aspects encompassing both consumers and employees has been expressed through the introduction of the HITCL framework. This is in line with the recent research efforts to study and systematise the human dimension that can accelerate or hinder the transition to circular economy. A representative work is the recent research by Lu et al. (2023) who deal with the so-called behaviour transition. As circular economy is closely coupled with the notion of sustainability, the former must also be studied across all dimensions – or pillars – of the latter, namely environment, economic and societal. This thesis' emphasis is on the societal aspects of circular economy which are relatively under-researched, compared to the other two. An instantiated model of HITCL was elaborated validating a subset of the framework and showing its potential.

7.3 Limitations

While this study aims to offer valuable insights and contributions, it is important to acknowledge its main limitations.

Firstly, in this study a novel approach placing humans as the centre and protagonist actor in the series of circular loops, by introducing the term "Human-in-the Circular Loop", HITCL was developed. HITCL is a framework, and its applicability and effectiveness in real-world settings are yet to be fully tested. It may not fully account for regional or cultural differences in attitudes towards circular practices, potentially affecting its applicability across diverse contexts.

Research using the framework may also be susceptible to biases in self-reported data, impacting the accuracy of findings related to attitudes and behaviours.

Secondly, the data was collected using an online crowdsourcing platform, which has its own set of limitations. This method can be challenging for reaching individuals with limited or no internet access (Palmer 2016). Furthermore, the demographic homogeneity of the crowd participants may not accurately represent the target population, introducing sampling bias that affects generalizability. The responses were collected within a 3-hour window in one afternoon, which may limit the representativeness of the sample compared to a study conducted over a longer period.

Thirdly, single-respondent bias is probable because both dependent and independent variables were self-reported. Although ex-post tests indicated low common method bias, future research should consider using responses from multiple sources, such as direct measures of knowledge and engagement or household wishcycling, to reduce potential biases.

Fourthly, given the cross-sectional character of the data, the explanation of results with respect to the hypotheses indicates relationships rather than influences or impacts. Therefore, incorporating qualitative methodologies alongside quantitative approaches could help develop the research findings further.

Last but not least, the study's findings may lack generalizability beyond the specific sample and context. Factors such as sampling bias, social desirability bias, and contextual specificity may limit the broader applicability of the results. Given that the study was conducted with the UK population, further validation in different cultural contexts is needed to enhance the robustness and applicability of the findings.

7.4 Recommendations for Future Research

Future empirical research is essential to validate and refine the HITCL framework. The current framework may not encompass all relevant human factors and theories related to the acceptance, attribution, and implementation of circular economy practices. A systematic review of peer-reviewed literature, along with an examination of grey literature such as policy

papers and market studies, could reveal additional theoretical perspectives and dimensions for a more comprehensive understanding of human behaviour in circular economy loops.

Longitudinal studies are also recommended to better understand the relationship between engagement in circular packaging and consumer wishcycling. Such studies could provide dynamic causal inferences that a cross-sectional study cannot offer.

In addition, qualitative research could offer valuable insights. Conducting interviews with companies that have adopted circular packaging in food and beverage products, as well as with local UK councils, could provide practical perspectives. Furthermore, focus groups with citizen organisations, charities, and NGOs could help uncover the reasons behind consumer wishcycling.

7.5 Conclusions

This thesis contributes to the growing body of knowledge surrounding consumer behaviour in the context of circular economy initiatives, providing valuable insights for scholars, practitioners, and policymakers alike. The implications drawn from this study pave the way for future research and practical interventions aimed at fostering sustainable practices and mitigating the challenges associated with greenwashing and wishcycling in consumer behaviour.

Several strategic points were identified that could accelerate a successful and sustainable transition towards an anthropocentric circular economy, and potential pitfalls in policy formulation were highlighted. This research has the potential to cultivate trust among businesses, consumers, and policymakers, paving the way for a circular and sustainable future.

Reflective page

My PhD journey began just months before the onset of the global pandemic, which drastically changed our way of life. During the challenges of adapting to remote work, home schooling, and navigating the uncertainties of the pandemic, maintaining focus on my academic goals proved to be a challenging task, but I am glad I managed to.

My original research idea has been developed around companies and employees, and this is how my first paper developed. This is the time where I got familiar with attribution theory and started to explore its application further.

A significant turning point came during Christmas 2020, when I got involved in writing a bidding proposal on behalf of my, at the time institute, CERC, 'Ecole des Ponts Business School. This is where I got exposed to consumer acceptance, exploring the idea of extending attribution theory to encompass consumer behaviour. The original bidding idea for the circular economy stream that I developed was the basis for this thesis and the proposal was one of the two that got funded out of more than 100 proposals from the European Union's Horizon 2020 research and innovation program with grant agreement No101036640 (https://sharedgreendeal.eu/).

After that great success I got all the confidence I needed to complete my journey and pursue all my goals. I have met amazing people during those years, I manage to travel to conferences and project meetings and meet colleagues who inspired me.

But nothing could be done without the help, support and trust of my supervisors. Their mentorship will be my inspiration for all the academic adventures are still to come.

References

Ahankari, S. S., Subhedar, A. R., Bhadauria, S. S. and Dufresne, A., 2021. Nanocellulose in food packaging: A review. *Carbohydrate Polymers*, 255, 117479.

Ahmad, R., Nawaz, M. R., Ishaq, M. I., Khan, M. M. and Ashraf, H. A., 2023. Social exchange theory: Systematic review and future directions. *Frontiers in Psychology* [online], 13. Available from: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1015921 [Accessed 12 Jan 2024].

Ahmed, Z. and Wang, Z., 2019. Investigating the impact of human capital on the ecological footprint in India: An empirical analysis. *Environmental Science and Pollution Research*, 26 (26), 26782–26796.

Ajwani-Ramchandani, R., Figueira, S., Torres de Oliveira, R. and Jha, S., 2021. Enhancing the circular and modified linear economy: The importance of blockchain for developing economies. *Resources, Conservation and Recycling*, 168, 105468.

Akseki, S., 2022. Evaluation Of Social Media Campaigns In Implementation Of Environmental Sustainability Policies. *Social Mentality And Researcher Thinkers Journal*, 62 (62), 1339–1354.

Alagarsamy, S., Mehrolia, S. and Mathew, S., 2021. How green consumption value affects green consumer behaviour: The mediating role of consumer attitudes towards sustainable food logistics practices. *Vision: The Journal of Business Perspective*, 25 (1), 65–76.

Allen, P., 2022. UK-based Magical Mushroom Company scores €3.4 million for its plant-based sustainable packaging. *EU-Startups* [online]. Available from: https://www.eu-startups.com/2022/06/uk-based-magical-mushroom-company-scores-e3-4-million-for-its-plant-based-sustainable-packaging/ [Accessed 7 Jun 2023].

Allouzi, M. M. A., Tang, D. Y. Y., Chew, K. W., Rinklebe, J., Bolan, N., Allouzi, S. M. A. and Show, P. L., 2021. Micro (nano) plastic pollution: The ecological influence on soil-plant system and human health. *Science of The Total Environment*, 788, 147815.

Ana, E., 2023. *Circular Systems Design: Seeking Outgrowth Based on Disruption* [online]. IntechOpen. Available from: https://www.intechopen.com/online-first/86950 [Accessed 6 Jun 2023].

Antunes, D., Santos, A. and Hurtado, A., 2015. The communication of the LCA: the need for guidelines to avoid greenwashing. *Espacios*, 36 (5), 1.

Antwi-Afari, P., Ng, S. T., Chen, J., Oluleye, B. I., Antwi-Afari, M. F. and Ababio, B. K., 2023. Enhancing life cycle assessment for circular economy measurement of different case scenarios of modular steel slab. *Building and Environment*, 239, 110411.

Arambepola, N. and Munasinghe, L., 2021. Human in the loop design for intelligent interactive systems: A systematic review. [online]. Available from: http://repository.kln.ac.lk/handle/123456789/24082 [Accessed 11 Jan 2024].

Arrieta, M. P., Díez García, A., López, D., Fiori, S. and Peponi, L., 2019. Antioxidant Bilayers Based on PHBV and Plasticized Electrospun PLA-PHB Fibers Encapsulating Catechin. *Nanomaterials*, 9 (3), 346.

Ashaduzzaman, M., Jebarajakirthy, C., Weaven, S. K., Maseeh, H. I., Das, M. and Pentecost, R., 2022. Predicting collaborative consumption behaviour: a meta-analytic path analysis on the theory of planned behaviour. *European Journal of Marketing*, 56 (4), 968–1013.

Bai, M. and Li, D., 2020. Quantity of plastic waste input into the ocean from China based on a material flow analysis model. *Anthropocene Coasts*, 3 (1), 1–5.

Baran, B., 2019. The circular economy in EU policy as a response to contemporary ecological challenges. *Gospodarka Narodowa*, 300 (4), 31–51.

Bartl, A., 2014. Moving from recycling to waste prevention: A review of barriers and enables. *Waste Management & Research: The Journal for a Sustainable Circular Economy*, 32 (9_suppl), 3–18.

Beitzen-Heineke, E. F., Balta-Ozkan, N. and Reefke, H., 2017. The prospects of zero-packaging grocery stores to improve the social and environmental impacts of the food supply chain. *Journal of Cleaner Production*, 140, 1528–1541.

Bentler, P. M., 1990. Comparative fit indexes in structural models. *Psychological Bulletin*, 107 (2), 238–246.

Benton, R., Jr, 2020. Victor Lebow: An unknown critical marketer. *Journal of Historical Research in Marketing*, 12 (2), 219–238.

Berry, B., Farber, B., Rios, F. C., Haedicke, M. A., Chakraborty, S., Lowden, S. S., Bilec, M. M. and Isenhour, C., 2022. Just by design: exploring justice as a multidimensional concept in US circular economy discourse. *Local Environment*, 27 (10–11), 1225–1241.

Bi, N. C. and Zhang, R., 2023. "I will buy what my 'friend' recommends": the effects of parasocial relationships, influencer credibility and self-esteem on purchase intentions. *Journal of Research in Interactive Marketing*, 17 (2), 157–175.

Binns, R., Van Kleek, M., Veale, M., Lyngs, U., Zhao, J. and Shadbolt, N., 2018. 'It's Reducing a Human Being to a Percentage': Perceptions of Justice in Algorithmic

Decisions. *In*: *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* [online]. New York, NY, USA: Association for Computing Machinery, 1–14. Available from: https://dl.acm.org/doi/10.1145/3173574.3173951 [Accessed 11 Jan 2024].

Blanco, C., Spanbauer, C. and Stienecker, S., 2023. America's Broken Recycling System. *California Review Management*.

Blettler, M. C. M. and Mitchell, C., 2021. Dangerous traps: Macroplastic encounters affecting freshwater and terrestrial wildlife. *Science of The Total Environment*, 798, 149317.

Blomsma, F., 2018. Collective 'action recipes' in a circular economy – On waste and resource management frameworks and their role in collective change. *Journal of Cleaner Production*, 199, 969–982.

Blomsma, F. and Brennan, G., 2017. The Emergence of Circular Economy: A New Framing Around Prolonging Resource Productivity. *Journal of Industrial Ecology*, 21 (3), 603–614.

Boesen, S., Bey, N. and Niero, M., 2019. Environmental sustainability of liquid food packaging: Is there a gap between Danish consumers' perception and learnings from life cycle assessment? *Journal of Cleaner Production*, 210, 1193–1206.

Bolanča, S., Mrvac, N. and Hajdek, M., 2018. Packaging through time. *Acta Gpaphica*, 29 (4), 29–37.

Bollen, K., 1989. *Structural equations with latent variables*. John Wiley & Sons.

Boncinelli, F., Gerini, F., Piracci, G., Bellia, R. and Casini, L., 2023. Effect of executional greenwashing on market share of food products: An empirical study on green-coloured packaging. *Journal of Cleaner Production*, 391, 136258.

Borrello, M., Pascucci, S. and Cembalo, L., 2020a. Three propositions to unify circular economy research: a review. *Sustainability*, 12 (10), 4069.

Bottinelli, S., 2021. The history of food packaging: how packaging design has changed through the years. *Food matters live* [online]. Available from: https://foodmatterslive.com/article/the-history-of-food-packaging-how-packaging-design-has-changed-through-the-years/.

Bourn, D., 2021. Pedagogy of Hope: Global Learning and the Future of Education. *International Journal of Development Education and Global Learning*, 13 (2), 65–78.

Boz, Z., Korhonen, V. and Koelsch Sand, C., 2020. Consumer considerations for the implementation of sustainable packaging: A review. *Sustainability*, 12 (6), 2192.

Braga Junior, S., Martínez, M. P., Correa, C. M., Moura-Leite, R. C. and Da Silva, D., 2019. Greenwashing effect, attitudes, and beliefs in green consumption. *RAUSP Management Journal*, 54 (2), 226–241.

Brandão, A. S., Gonçalves, A. and Santos, J. M. R. C. A., 2021. Circular bioeconomy strategies: From scientific research to commercially viable products. *Journal of Cleaner Production*, 295, 126407.

Braungart, M., McDonough, W. and Bollinger, A., 2007. Cradle-to-cradle design: creating healthy emissions – a strategy for eco-effective product and system design. *Journal of Cleaner Production*, 15 (13–14), 1337–1348.

Brennan, L., Langley, S., Verghese, K., Lockrey, S., Ryder, M., Francis, C., Phan-Le, N. T. and Hill, A., 2021. The role of packaging in fighting food waste: A systematised review of consumer perceptions of packaging. *Journal of Cleaner Production*, 281, 125276.

Brondizio, E. S., Settele, J., Díaz, S. and Ngo, H. T., 2019. Global assessment report on biodiversity and ecosystem services of the intergovernmental science-policy platform on biodiversity and ecosystem services. [online]. Available from: https://www.ipbes.net/global-assessment [Accessed 10 Jan 2024].

Brooks, A. L., Wang, S. and Jambeck, J. R., 2018. The Chinese import ban and its impact on global plastic waste trade. *Science Advances*, 4 (6), eaat0131.

Brouwer, A., 2016. Revealing greenwashing: A consumers' perspective. *In*: [online]. International Association for Development of the Information Society. Available from: https://files.eric.ed.gov/fulltext/ED571577.pdf.

Brown, T. A., 2015. *Confirmatory factor analysis for applied research*. London: Guilford publications.

Brundell, N., 2022. What is wishcycling? The dos and don'ts of recycling. *Lochtree* [online]. Available from: https://lochtree.com/blogs/blog/what-is-wishcycling [Accessed 1 Jun 2023].

Brusso, B. C., 2021. Development of stone writing and packaging materials [history]. *IEEE Industry Applications Magazine*, 27 (6), 8–11.

Bulut, C., Nazli, M., Aydin, E. and Haque, A. U., 2021. The effect of environmental concern on conscious green consumption of post-millennials: The moderating role of greenwashing perceptions. *Young Consumers*, 22 (2), 306–319.

Byrne, B. M., 2016. *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming, Third Edition*. Routledge.

Calisto Friant, M., Vermeulen, W. J. V. and Salomone, R., 2023. Transition to a Sustainable Circular Society: More than Just Resource Efficiency. *Circular Economy and*

Sustainability [online]. Available from: https://doi.org/10.1007/s43615-023-00272-3 [Accessed 10 Jan 2024].

Camacho-Otero, J., Pettersen, I. N. and Boks, C., 2017. Consumer and user acceptance in the circular economy: What are researchers missing? *In*: *PLATE: Product Lifetimes And The Environment* [online]. IOS Press, 65–69. Available from: https://ebooks.iospress.nl/doi/10.3233/978-1-61499-820-4-65 [Accessed 1 Jun 2023].

Carlton, J. T., Chapman, J. W., Geller, J. B., Miller, J. A., Carlton, D. A., McCuller, M. I., Treneman, N. C., Steves, B. P. and Ruiz, G. M., 2017. Tsunami-driven rafting: Transoceanic species dispersal and implications for marine biogeography. *Science*, 357 (6358), 1402–1406.

Catlin, J. R., Leonhardt, J. M., Wang, Y. and Manuel, R. J., 2021. Landfill or Recycle? Pro-Environmental Receptacle Labeling Increases Recycling Contamination. *Journal of Consumer Psychology*, 31 (4), 765–772.

Chakori, S., Aziz, A. A., Smith, C. and Dargusch, P., 2021. Untangling the underlying drivers of the use of single-use food packaging. *Ecological Economics*, 185, 107063.

Chakraborty, L., Rus, H., Henstra, D., Thistlethwaite, J. and Scott, D., 2020. A place-based socioeconomic status index: Measuring social vulnerability to flood hazards in the context of environmental justice. *International Journal of Disaster Risk Reduction*, 43, 101394.

Chang, C., Gardiner, J., Houang, R. and Yu, Y.-L., 2020. Comparing multiple statistical software for multiple-indicator, multiple-cause modeling: an application of gender disparity in adult cognitive functioning using MIDUS II dataset. *BMC Medical Research Methodology*, 20 (1), 275.

Charef, R., Ganjian, E. and Emmitt, S., 2021. Socio-economic and environmental barriers for a holistic asset lifecycle approach to achieve circular economy: A pattern-matching method. *Technological Forecasting and Social Change*, 170, 120798.

Charles, K., 2021. Recycled capitalism: greenwashing & elitism in the environmental movement. *Sankofa Sustainability Collective* [online]. Available from: https://www.sankofasustainability.org/post/recycled-capitalism-greenwashing-elitism-in-the-environmental-movement [Accessed 7 Jun 2023].

Chau, C. K., Xu, J. M., Leung, T. M. and Ng, W. Y., 2017. Evaluation of the impacts of end-of-life management strategies for deconstruction of a high-rise concrete framed office building. *Applied Energy*, 185, 1595–1603.

Chauhan, K., 2021. Consumer protection law developments: An overview. *Himachal Pradesh University Journal*, 9 (1), 113–128.

Chen, P.Y., Pavlou, P., Wu, S. and Yang, Y., 2021. Attracting high-quality contestants to contest in the context of crowdsourcing contest platform. *Production and Operations Management, 30*(6), pp.1751-1771.

Cheng, H., Xu, H., Julian McClements, D., Chen, L., Jiao, A., Tian, Y., Miao, M. and Jin, Z., 2022. Recent advances in intelligent food packaging materials: Principles, preparation and applications. *Food Chemistry*, 375, 131738.

Cheung, C., 2021. Managing food storage in the Roman Empire. *Quaternary International*, 597, 63–75.

Chin, K. K. C., Mahanta, J. and Nath, T. K., 2023. Knowledge, attitude, and practices toward plastic pollution among malaysians: Implications for minimizing plastic use and pollution - proquest. *Sustainability*, 15 (2), 1164.

Cho, M., Park, S.-Y. and Kim, S., 2021. When an organization violates public expectations: A comparative analysis of sustainability communication for corporate and nonprofit organizations. *Public Relations Review*, 47 (1), 101928.

Chowdhury, H., 2023. Circular Economy Integration in Additive Manufacturing. [online]. Available from: https://www.preprints.org/manuscript/202310.0087/v1 [Accessed 10 Jan 2024].

Christensen, D. E., 2023. "The Father[s] of Canning"? Narrating Nicolas Appert/American Industry. *Journal of American Folklore*, 136 (539), 16–47.

Christopher Paul, 2021. The Role of the Fundamental Attribution Error in the Context of Human Resource Management. *Journal of Psychology Research* [online], 11 (1). Available from: http://www.davidpublisher.org/index.php/Home/Article/index?id=45402.html [Accessed 8 Jun 2023].

Civelek, M. E., 2018. Comparison of covariance-based and partial least square structural equation modeling methods under non-normal distribution and small sample size limitations. [online]. Available from: https://papers.ssrn.com/abstract=3332989 [Accessed 10 Jun 2023].

Číž, J., 2022. Sustainability of food packaging in the bevarege industry. *International Days of Science*, 7 (18), 18–26.

Cook, L. A., Fitzgerald, M. P. and Sadeghein, R., 2021. Consumer effort in service encounters: the overlooked impact of surface acting. *Journal of Services Marketing*, 36 (2), 297–309.

Corona, B., Shen, L., Reike, D., Rosales Carreón, J. and Worrell, E., 2019. Towards sustainable development through the circular economy—A review and critical assessment on current circularity metrics. *Resources, Conservation and Recycling*, 151, 104498.

Coutinho, V., Domingues, A. R., Caeiro, S., Painho, M., Antunes, P., Santos, R., Videira, N., Walker, R. M., Huisingh, D. and Ramos, T. B., 2018. Employee-Driven Sustainability Performance Assessment in Public Organisations. *Corporate Social Responsibility and Environmental Management*, 25 (1), 29–46.

Crespo-Rosas, N. and Franco-García, L., 2023. Improving Gender Equality with Social Entrepreneurship and Circular Economy: A Mexican Case. *In*: de Souza Campos, L. M. and Vázquez-Brust, D. A., eds. *The Social Dimensions of the Circular Economy* [online]. Cham: Springer International Publishing, 241–263. Available from: https://doi.org/10.1007/978-3-031-25436-9_11 [Accessed 22 Jan 2024].

Cristofaro, M., 2017. Candidates' attractiveness in selection decisions: a laboratory experiment. *Baltic Journal of Management*, 12 (4), 390–407.

Crocker, J. and Park, L. E., 2004. The Costly Pursuit of Self-Esteem. *Psychological Bulletin*, 130 (3), 392–414.

Cronin, J., Hadley, C. and Skandalis, A., 2022. Plastic: A passengerial marketplace icon. *Consumption Markets & Culture*, 25 (5), 485–497.

Cullen, J. M., 2017. Circular economy: theoretical benchmark or perpetual motion machine?

Cvetkovic, A. A., Jovanovic, A. and Canev, I., 2022. VESSELS FOR STORAGING WINE IN ANCIENT ROME AND TODAY. *Journal of Agricultural, Food and Environmental Sciences, JAFES*, 76 (4), 17–26.

De Fruyt, F. and Salgado, J. F., 2003. Editorial: Personality and IWO applications: introducing personality at work. *European Journal of Personality*, 17 (1_suppl), S1–S3.

De Jong, M. D. T., Huluba, G. and Beldad, A. D., 2020. Different shades of greenwashing: Consumers' reactions to environmental lies, half-lies, and organizations taking credit for following legal obligations. *Journal of Business and Technical Communication*, 34 (1), 38–76.

De Pascale, A., Arbolino, R., Szopik-Depczyńska, K., Limosani, M. and Ioppolo, G., 2021. A systematic review for measuring circular economy: The 61 indicators. *Journal of Cleaner Production*, 281, 124942.

deBortoli, A., Greenacre, L. and Brady, E., 2022. A typology of overinclusive recycling. *In*: [online]. Presented at the Australian and New Zealand Marketing Academy Conference 2022: Reconnect & Reimagine. Available from: https://research.monash.edu/en/publications/a-typology-of-overinclusive-recycling [Accessed 12 Jan 2024].

DEFRA, 2018, 2018. *Our waste, our resources: a strategy for England* [online]. UK: HM Government. Policy paper. Available from:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765914/resources-waste-strategy-dec-2018.pdf.

DEFRA, 2020, 2020. *Circular Economy Package policy statement* [online]. UK: Department of Environment, Food & Rural Affairs, UK Government. Policy paper. Available from: https://www.gov.uk/government/publications/circular-economy-package-policy-statement/circular-economy-package-policy-statement [Accessed 6 Jun 2023].

Defruyt, S., 2019. Towards a New Plastics Economy. *Field Actions Science Reports. The journal of field actions*, (Special Issue 19), 78–81.

Deschamps, J., Simon, B., Tagnit-Hamou, A. and Amor, B., 2018. Is open-loop recycling the lowest preference in a circular economy? Answering through LCA of glass powder in concrete. *Journal of Cleaner Production*, 185, 14–22.

Dey, A., Dhumal, C. V., Sengupta, P., Kumar, A., Pramanik, N. K. and Alam, T., 2021. Challenges and possible solutions to mitigate the problems of single-use plastics used for packaging food items: a review. *Journal of Food Science and Technology*, 58 (9), 3251–3269.

Dhayef, Q. A. and Al-Zubaidi, R. T. A., 2021. Multimodal critical discourse analysis of woman representation in iraqi social media platforms. *The Asian ESP Journal*, 273–289.

Di Vaio, A., Varriale, L., Lekakou, M. and Pozzoli, M., 2023. SDGs disclosure: evidence from cruise corporations' sustainability reporting. *Corporate Governance: The International Journal of Business in Society*, 23 (4), 845–866.

Eberly, M. B., Holley, E. C., Johnson, M. D. and Mitchell, T. R., 2011. Beyond internal and external: A dyadic theory of relational attributions. *Academy of Management Review*, 36 (4), 731–753.

Econie, A. and Dougherty, M. L., 2019. Contingent work in the US recycling industry: Permatemps and precarious green jobs. *Geoforum*, 99, 132–141.

Elisha, O. D., 2020. Moving Beyond Take-Make-Dispose to Take-Make- Use for Sustainable Economy. *International Journal of Scientific Research in Education*, 13 (3), 497–516.

Elmore, B., 2009. True green or a pale imitation? *Baylor Business Review*, 27 (2), 48.

Elzinga, R., Reike, D., Negro, S. O. and Boon, W. P. C., 2020. Consumer acceptance of circular business models. *Journal of Cleaner Production*, 254, 119988.

EPA, 2020. *Report on Blended Commodity Vlues- EPA Regions 1, 2 and 3* [online]. Available from: https://nerc.org/documents.

EPA, 2021. *National recycling strategy- What is a circular economy?* [online]. United States Environmental Protection Agency. Overviews and Factsheets. Available

from: https://www.epa.gov/circulareconomy/what-circular-economy [Accessed 2 Jun 2023].

Erdiaw-Kwasie, M. O., Abunyewah, M., Yusif, S. and Erdiaw-Kwasie, A., 2023. Does circular economy knowledge matter in sustainable service provision? A moderation analysis. *Journal of Cleaner Production*, 383, 135429.

Espiner, T., 2022. Notpla: UK plastic-alternative developer among £1m Earthshot Prize winners. *BBC News* [online]. Available from: https://www.bbc.com/news/business-63841761 [Accessed 1 Jun 2023].

Etxabide, A., Young, B., Bremer, P. J. and Kilmartin, P. A., 2022. Non-permanent primary food packaging materials assessment: Identification, migration, toxicity, and consumption of substances. *Comprehensive Reviews in Food Science and Food Safety*, 21 (5), 4130–4145.

European Commission, 2011. *Plastic waste: ecological and human health impacts.* European Commission.

European Commission, 2017. *Are you #ReadyToChange ? THE SEDUCTIVE POWER OF SINGLE USE PLASTICS* [online]. European Commission. Available from: https://bereadytochange.eu/en/ [Accessed 17 Jan 2023].

European Commission, 2017. *Strategy on Plastics in a Circular Economy* [online]. European Commission. Communication. Available from: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://ec.europa.eu/smart-regulation/roadmaps/docs/plan_2016_39_plastic_strategy_en.pdf.

European Commission, 2022. *Packaging waste. EU rules on packaging and packaging waste, including design and waste management.* [online]. European Commission. Policy paper. Available from: https://environment.ec.europa.eu/topics/waste-and-recycling/packaging-waste_en [Accessed 1 Jun 2023].

European Commission, 2023. *Green claims* [online]. Available from: https://environment.ec.europa.eu/topics/circular-economy/green-claims_en [Accessed 3 Jun 2023].

European Parliament, 2023a. *EU to ban greenwashing and improve consumer information on product durability | News | European Parliament* [online]. News European Parliament. Available from: https://www.europarl.europa.eu/news/en/press-room/20230918IPR05412/eu-to-ban-greenwashing-and-improve-consumer-information-on-product-durability [Accessed 13 Dec 2023].

European Parliament, 2023b. Circular economy: definition, importance and benefits. [online]. Available from: https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits [Accessed 6 Jun 2023].

Evans, G., 2021. The history of paper. *Ken Bromley Art Supplies* [online]. Available from: https://www.artsupplies.co.uk/blog/the-history-of-paper/ [Accessed 1 Jun 2023].

Evans, L. S., Buchan, P. M., Fortnam, M., Honig, M. and Heaps, L., 2023. Putting coastal communities at the center of a sustainable blue economy: A review of risks, opportunities, and strategies. [online]. Available from: https://ore.exeter.ac.uk/repository/handle/10871/132521 [Accessed 6 Jun 2023].

Eyal, P., David, R., Andrew, G., Zak, E. and Ekaterina, D., 2021. Data quality of platforms and panels for online behavioral research. *Behavior research methods*, pp.1-20.

Fan, Y., Chen, J., Shirkey, G., John, R., Wu, S. R., Park, H. and Shao, C., 2016. Applications of structural equation modeling (SEM) in ecological studies: an updated review. *Ecological Processes*, 5 (1), 19.

FAO, 2009. *How to feed the world in 2050*. Rome: FAO Headquarters.

FAO, 2017. *The future of food and agriculture: Trends and challenges*. Fao.

Farčić, N., Barać, I., Plužarić, J., Ilakovac, V., Pačarić, S., Gvozdanović, Z. and Lovrić, R., 2020. Personality traits of core self-evaluation as predictors on clinical decision-making in nursing profession. *PLOS ONE*, 15 (5), e0233435.

Feier, I., Migała, A., Pietruszka, M. and Jackowski, M., 2019. Roman wine in barbaricum. preliminary studies on ancient wine recreation. *Heritage*, 2 (1), 331–338.

Fogt Jacobsen, L., Pedersen, S. and Thøgersen, J., 2022. Drivers of and barriers to consumers' plastic packaging waste avoidance and recycling – A systematic literature review. *Waste Management*, 141, 63–78.

Fomunyam, K. G., 2019. Education and the fourth industrial revolution: Challenges and possibilities for engineering education. *International Journal of Mechanical Engineering and Technology (IJMET)*, 10 (8), 271–284.

Food Standards Agency, 2022. *The FSA strategy for 2022 to 2027* [online]. Food Standards Agency. Available from: https://www.food.gov.uk/node/8851 [Accessed 1 Jun 2023].

Franz, R. and Welle, F., 2022. Recycling of Post-Consumer Packaging Materials into New Food Packaging Applications—Critical Review of the European Approach and Future Perspectives. *Sustainability*, 14 (2), 824.

Fraser, C., 2022. Recycled misrepresentation: Plastic products, consumer protection law and attorneys general. [online]. Available from: https://papers.ssrn.com/abstract=4346171 [Accessed 7 Jun 2023].

de Freitas Netto, S. V., Sobral, M. F. F., Ribeiro, A. R. B. and Soares, G. R. da L., 2020. Concepts and forms of greenwashing: a systematic review. *Environmental Sciences Europe*, 32 (1), 19.

Friends of the Earth, 2018. *Plastic-free Easter eggs* [online]. Available from: https://friendsoftheearth.uk/sustainable-living/plasticfree-easter-eggs.

Frith, L., 2022. The concise argument – choice, choices and the choice agenda. *Journal of Medical Ethics*, 48 (1), 1–2.

Frohlich, X., 2022. Making food standard: The U.S. food and drug administration's food standards of identity, 1930s–1960s. *Business History Review*, 96 (1), 145–176.

Frommeyer, B., Wagner, E., Hossiep, C. R. and Schewe, G., 2022. The utility of intention as a proxy for sustainable buying behavior – A necessary condition analysis. *Journal of Business Research*, 143, 201–213.

Furlow, N. E., 2010. Greenwashing in the new millennium. *The Journal of Applied Business and Economics*, 10 (6), 22.

Gahleitner, M. and Paulik, C., 2017. Chapter 11 - Polypropylene and Other Polyolefins. *In*: Gilbert, M., ed. *Brydson's Plastics Materials (Eighth Edition)* [online]. Butterworth-Heinemann, 279–309. Available from: https://www.sciencedirect.com/science/article/pii/B9780323358248000116 [Accessed 1 Jun 2023].

Galic, K., Kurek, M., Benbettaieb, N., Debeaufort, F. and Scetar, M., 2021. *Packaging Materials and Processing for Food, Pharmaceuticals and Cosmetics*. John Wiley & Sons.

Garcia, J. M. and Robertson, M. L., 2017. The future of plastics recycling. *Science*, 358 (6365), 870–872.

Garcia-Garcia, D., Quiles-Carrillo, L., Balart, R., Torres-Giner, S. and Arrieta, M. P., 2022. Innovative solutions and challenges to increase the use of Poly(3-hydroxybutyrate) in food packaging and disposables. *European Polymer Journal*, 178, 111505.

Gaskin, J., 2023. MyEducator - Structural Equation Modeling - General Course. *MyEducator* [online]. Available from: https://app.myeducator.com/reader/web/1381b/ [Accessed 5 Jun 2023].

Gatzert, N., 2015. The impact of corporate reputation and reputation damaging events on financial performance: Empirical evidence from the literature. *European Management Journal*, 33 (6), 485–499.

Geissdoerfer, M., Morioka, S. N., de Carvalho, M. M. and Evans, S., 2018. Business models and supply chains for the circular economy. *Journal of Cleaner Production*, 190, 712–721.

Geng, Y., Sarkis, J., Ulgiati, S. and Zhang, P., 2013. Measuring China's Circular Economy. *Science*, 339 (6127), 1526–1527.

Geyer, R., Jambeck, J. R. and Law, K. L., 2017. Production, use, and fate of all plastics ever made. *Science Advances*, 3 (7), e1700782.

Geyer, R., Kuczenski, B., Zink, T. and Henderson, A., 2016. Common misconceptions about recycling. *Journal of Industrial Ecology*, 20 (5), 1010–1017.

Ghitti, M., Gianfrate, G. and Palma, L., 2020. The agency of greenwashing. [online]. Available from: https://papers.ssrn.com/abstract=3629608 [Accessed 1 Jun 2023].

GlobalData, 2018. *Impact of evolving consumer attitudes towards plastic packaging: how consumer goods companies, retailers, and foodservice providers are responding to the plastic packaging issue* [online]. Market Research Reports & Consulting | GlobalData UK Ltd. Available from: https://www.globaldata.com/store/report/impact-of-evolving-consumer-attitudes-towards-plastic-packaging-how-consumer-goods-companies-retailers-and-foodservice-providers-are-responding-to-the-plastic-packaging-issue/ [Accessed 1 Jun 2023].

Grace, R., 2023. U.K. Testing Digital Deposit Return Schemes for Plastic Milk Bottles. *Plastics Engineering*, 1–3.

Grieco, A., Caricato, P., Gianfreda, D. and Pierpaoli, A., 2020. The role of technical information in scheduling problems with sequence dependent setup times. *Procedia Manufacturing*, 51, 1508–1514.

Grönman, K., Soukka, R., Järvi-Kääriäinen, T., Katajajuuri, J.-M., Kuisma, M., Koivupuro, H.-K., Ollila, M., Pitkänen, M., Miettinen, O., Silvenius, F., Thun, R., Wessman, H. and Linnanen, L., 2013. Framework for sustainable food packaging design. *Packaging Technology and Science*, 26 (4), 187–200.

Guerreiro, J. and Pacheco, M., 2021. How green trust, consumer brand engagement and green word-of-mouth mediate purchasing intentions. *Sustainability*, 13 (14), 7877.

Guest, D. E., 2017. Human resource management and employee well-being: towards a new analytic framework. *Human Resource Management Journal*, 27 (1), 22–38.

Guillard, V., Gaucel, S., Fornaciari, C., Angellier-Coussy, H., Buche, P. and Gontard, N., 2018. The next generation of sustainable food packaging to preserve our environment in a circular economy context. *Frontiers in Nutrition* [online], 5. Available from: https://www.frontiersin.org/articles/10.3389/fnut.2018.00121 [Accessed 1 Jun 2023].

Gürlich, U., Hummelberger, D., Kladnik, V. and Tacker, M., 2020. *Circular packaging design guideline design recommendations for recyclable packaging* [online]. No. FH Circular Packaging Design Guideline Version 3.0. Available from: https://www.researchgate.net/publication/344405043_Circular_Packaging_Design_Guideline_Design_Recommendations_for_Recyclable_Packaging.

Hafsa, F., Dooley, K. J., Basile, G. and Buch, R., 2022. A typology and assessment of innovations for circular plastic packaging. *Journal of Cleaner Production*, 369, 133313.

Hahladakis, J. N., Velis, C. A., Weber, R., Iacovidou, E. and Purnell, P., 2018. An overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal and recycling. *Journal of Hazardous Materials*, 344, 179–199.

Hair, J. F., Black, W. C., Babin, B. J. and Anderson, R. E., 2013. *Multivariate data analysis*. Pearson Education Limited.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P. and Ray, S., 2021. An Introduction to Structural Equation Modeling. *In*: Hair Jr., J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., and Ray, S., eds. *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook* [online]. Cham: Springer International Publishing, 1–29. Available from: https://doi.org/10.1007/978-3-030-80519-7_1 [Accessed 9 Feb 2024].

Hair Jr., J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P. and Ray, D., 2021. *Partial least squares structural equation modeling (PLS- SEM) using R: A workbook*. Springer Cham.

Hajjar, S. T. E., 2018. Statistical analysis: Internal-consistency reliability and construct validity, 6 (1), 46–57.

Hansen, J., Winzeler, S. and Topolinski, S., 2010. When the death makes you smoke: A terror management perspective on the effectiveness of cigarette on-pack warnings. *Journal of Experimental Social Psychology*, 46 (1), 226–228.

Harman, H. H., 1967. *Modern factor analysis*. Chicago, IL: University of Chicago Press.

Harutyunyan, M. and Malfeito-Ferreira, M., 2022. Historical and heritage sustainability for the revival of ancient wine-making techniques and wine styles. *Beverages*, 8 (1), 10.

Hashem, N. M., Hassanein, E. M., Hocquette, J.-F., Gonzalez-Bulnes, A., Ahmed, F. A., Attia, Y. A. and Asiry, K. A., 2021. Agro-livestock farming system sustainability during the COVID-19 era: A cross-sectional study on the role of information and communication technologies. *Sustainability*, 13 (12), 6521.

Heidbreder, L. M., Bablok, I., Drews, S. and Menzel, C., 2019. Tackling the plastic problem: A review on perceptions, behaviors, and interventions. *Science of The Total Environment*, 668, 1077–1093.

Heider, F., 1958. *The psychology of interpersonal relations*. Eastford: CT: Martino Publishing.

Helbig, C., Huether, J., Joachimsthaler, C., Lehmann, C., Raatz, S., Thorenz, A., Faulstich, M. and Tuma, A., 2022. A terminology for downcycling. *Journal of Industrial Ecology*, 26 (4), 1164–1174.

Henkel, O. and Hills, L., 2023, July. Leveraging Human Feedback to Scale Educational Datasets: Combining Crowdworkers and Comparative Judgement. *In Proceedings of the Tenth ACM Conference on Learning@ Scale* (pp. 411-415).

Heras-Saizarbitoria, I., Boiral, O. and Díaz de Junguitu, A., 2020. Environmental management certification and environmental performance: Greening or greenwashing? *Business Strategy and the Environment*, 29 (6), 2829–2841.

Hernandez, C. S., Ayo, S. and Panagiotakopoulos, D., 2021. An Explainable Artificial Intelligence (xAI) Framework for Improving Trust in Automated ATM Tools. *In*: *2021 IEEE/AIAA 40th Digital Avionics Systems Conference (DASC)* [online]. Presented at the 2021 IEEE/AIAA 40th Digital Avionics Systems Conference (DASC), 1–10. Available from: https://ieeexplore.ieee.org/abstract/document/9594341?casa_token=21cJT3CKlsoAAAAA:nfLOQrngdbewfzcHK9jgYTd_A3czhnpxFg3b9-huuDKhjpZ90eFDTTdVGlk4Hc0bFjN2Wh0e [Accessed 11 Jan 2024].

Herrmann, C., Blume, S., Kurle, D., Schmidt, C. and Thiede, S., 2015. The positive impact factory–transition from eco-efficiency to eco–effectiveness strategies in manufacturing. *Procedia CIRP*, 29, 19–27.

Herrmann, T. and Pfeiffer, S., 2023. Keeping the organization in the loop: a socio-technical extension of human-centered artificial intelligence. *AI & SOCIETY*, 38 (4), 1523–1542.

Héry, M. and Malenfer, M., 2020. Development of a circular economy and evolution of working conditions and occupational risks—a strategic foresight study. *European Journal of Futures Research*, 8 (1), 8.

Hewett, R., Shantz, A., Mundy, J. and Alfes, K., 2018. Attribution theories in Human Resource Management research: a review and research agenda. *The International Journal of Human Resource Management*, 29 (1), 87–126.

Hirschfeld, D. and Wagner, M., 2022. The Interplay of Attitudes, Norms and Control in Sustainable Entrepreneurship: An Experimental Analysis. *Sustainability*, 14 (15), 9317.

HM Revenue & Customs, 2024. *Plastic Packaging Tax* [online]. GOV.UK. Available from: https://www.gov.uk/government/collections/plastic-packaging-tax [Accessed 18 Mar 2024].

Hobson, K. and Lynch, N., 2016. Diversifying and de-growing the circular economy: Radical social transformation in a resource-scarce world. *Futures*, 82, 15–25.

Holzinger, A., 2016. Interactive machine learning for health informatics: when do we need the human-in-the-loop? *Brain Informatics*, 3 (2), 119–131.

Houghton, F., Houghton, S., Doherty, D. O., McInerney, D. and Duncan, B., 2018. 'Greenwashing' tobacco products through ecological and social/equity labelling: A potential threat to tobacco control. *Tobacco Prevention & Cessation*, 4, 37.

Hu, L. and Bentler, P. M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6 (1), 1–55.

Igbani, F., Ayo, G. O. and Ikponmwen, E. G., 2021. A REVIEW ON THE EFFECTS OF PLASTIC DEBRIS ON AQUATIC LIFE (FISH AND WILDLIFE) IN AQUATIC ECOSYSTEMS. *International Journal of Environment and Pollution Research*, 9 (3), 51–60.

ILO, 2018. 24 million jobs to open up in the green economy. *International Labour Organization* [online]. Available from: http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_628644/lang--en/index.htm [Accessed 1 Jun 2023].

Innovate UK, 2018. KTN issues new report on UK Packaging Industry - Innovate UK KTN. [online]. Available from: https://iuk.ktn-uk.org/news/ktn-issues-new-report-on-uk-packaging-industry/ [Accessed 1 Jun 2023].

Ivonie, R. N. and Mardiastuti, A., 2020. Plastic litter distribution in Pulau Rambut Wildlife Sanctuary. *E3S Web of Conferences*, 211, 03020.

Jansen, J. J. P., Van den Bosch, F. A. J. and Voldera, H. W., 2006. Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators. *Management Science*, 52 (11), 1661–1674.

Jeswani, H. K., Figueroa-Torres, G. and Azapagic, A., 2021. The extent of food waste generation in the UK and its environmental impacts. *Sustainable Production and Consumption*, 26, 532–547.

Jeyavishnu, K., Thulasidharan, D., Shereen, M. F. and Arumugam, A., 2021. Increased Revenue with High Value-Added Products from Cashew Apple (Anacardium occidentale L.)—Addressing Global Challenges. *Food and Bioprocess Technology*, 14 (6), 985–1012.

Ji, T., De Jonge, J., Peeters, M. C. W. and Taris, T. W., 2021. Employee Sustainable Performance (E-SuPer): Theoretical Conceptualization, Scale Development, and Psychometric Properties. *International Journal of Environmental Research and Public Health*, 18 (19), 10497.

Jones, B., Rasha, A., Dyczkowska, J. and Dyczkowski, T., 2023. Sustainable performance management in the EU SME sector. A review and analysis of concepts and methods of strategic management accounting. *Zeszyty Teoretyczne Rachunkowości*, 47 (4), 191–215.

Jones, D. G. B. and Tadajewski, M., 2016. *The Routledge Companion to Marketing History*. Routledge.

Jones, E., 2019. Rethinking Greenwashing: Corporate Discourse, Unethical Practice, and the Unmet Potential of Ethical Consumerism. *Sociological Perspectives*, 62 (5), 728–754.

Jones, E. E. and Nisbett, R. E., 1987. The actor and the observer: Divergent perceptions of the causes of behavior. *In*: *Attribution: Perceiving the causes of behavior*. Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc, 79–94.

Jones, M., Weiland, K., Kujundzic, M., Theiner, J., Kählig, H., Kontturi, E., John, S., Bismarck, A. and Mautner, A., 2019. Waste-Derived Low-Cost Mycelium Nanopapers with Tunable Mechanical and Surface Properties. *Biomacromolecules*, 20 (9), 3513–3523.

Joo, B.-K. and Jo, S. J., 2017. The effects of perceived authentic leadership and core self-evaluations on organizational citizenship behavior: The role of psychological empowerment as a partial mediator. *Leadership & Organization Development Journal*, 38 (3), 463–481.

Jørgensen, S. and Pedersen, L. J. T., 2018. The circular rather than the linear economy. *In*: Jørgensen, S. and Pedersen, L. J. T., eds. *RESTART Sustainable Business Model Innovation* [online]. Cham: Springer International Publishing, 103–120. Available from: https://doi.org/10.1007/978-3-319-91971-3_8 [Accessed 1 Jun 2023].

Jotterand, F. and Bosco, C., 2020. Keeping the "Human in the Loop" in the Age of Artificial Intelligence. *Science and Engineering Ethics*, 26 (5), 2455–2460.

Judge, T. A., 2009. Core Self-Evaluations and Work Success. *Current Directions in Psychological Science*, 18 (1), 58–62.

Judge, T. A., Erez, A., Bono, J. E. and Thoresen, C. J., 2002. Are measures of self-esteem, neuroticism, locus of control, and generalized self-efficacy indicators of a common core construct? *Journal of Personality and Social Psychology*, 83 (3), 693–710.

Judge, T. A., Erez, A., Bono, J. E. and Thoresen, C. J., 2006. The core self-evaluations scale: development of a measure. *Personnel Psychology*, 56 (2), 303–331.

Judge, T. A. and Hulin, C. L., 1993. Job satisfaction as a reflection of disposition: A multiple source causal analysis. *Organizational Behavior and Human Decision Processes*, 56 (3), 388–421.

Judge, T. A., Van Vianen, A. E. M. and De Pater, I. E., 2004. Emotional Stability, Core Self-Evaluations, and Job Outcomes: A Review of the Evidence and an Agenda for Future Research. *Human Performance*, 17 (3), 325–346.

Kabaja, B., 2023. The EU Ecolabel as a mark of environmental excellence – a literature review. *Modern Management Review*, 28 (1), 71–81.

Kaiser, H. F., 1974. An index of factorial simplicity. *Psychometrika*, 39 (1), 31–36.

Kalimo, H., Lifset, R., Atasu, A., Van Rossem, C. and Van Wassenhove, L., 2015. What Roles for Which Stakeholders under Extended Producer Responsibility? *Review of European, Comparative & International Environmental Law*, 24 (1), 40–57.

Kang, H., 2021. Sample size determination and power analysis using the G* Power software. *Journal of educational evaluation for health professions*, 18.

Karmaus, A. L., Osborn, R. and Krishan, M., 2018. Scientific advances and challenges in safety evaluation of food packaging materials: Workshop proceedings. *Regulatory Toxicology and Pharmacology*, 98, 80–87.

Katajajuuri, J.-M., Silvenius, F., Koivupuro, H.-K., Thun, R., Grönman, K., Soukka, R., Järvi-Kääriäinen, T., Ollila, M., Kuisma, M., Miettinen, O., Pitkänen, M. and Wessman, H., 2010. Preventing environmental impacts of products by proper packaging: 17th IAPRI World Conference on Packaging. *Proceedings of the 17th IAPRI World Conference on Packaging*, 480–483.

Katou, A., 2021. Employee high-performance work systems-experience attributions of well-being and exploitation: a multilevel study of Greek workplaces. *Employee Relations: The International Journal*, 44 (5), 1030–1047.

Katou, A. A., Budhwar, P. S. and Patel, C., 2021. Line manager implementation and employee HR attributions mediating mechanisms in the HRM system—Organizational performance relationship: A multilevel and multipath study. *Human Resource Management Journal*, 31 (3), 775–795.

Katou, A., Kafetzopoulos, D. and Vayona, A., 2023. Investigating the Serially Mediating Mechanisms of Organizational Ambidexterity and the Circular Economy in the Relationship between Ambidextrous Leadership and Sustainability Performance. *Sustainability*, 15 (10), 7937.

Kelly, H., 1973. The processes of causal attribution. *American Psychologist*, 28, 107–128.

Kember, D. and Leung, D. Y. P., 2006. Characterising a teaching and learning environment conducive to making demands on students while not making their workload excessive. *Studies in Higher Education*, 31 (2), 185–198.

Khandelwal, U., Kulshreshtha, K. and Tripathi, V., 2019. Importance of Consumer-based Green Brand Equity: Empirical Evidence. *Paradigm*, 23 (1), 83–97.

Khuc, Q. V., Dang, T., Tran, M., Nguyen, D. T., Nguyen, T., Pham, P. and Tran, T., 2023. Household-level strategies to tackle plastic waste pollution in a transitional country. *Urban Science*, 7 (1), 20.

Kirchherr, J., Reike, D. and Hekkert, M., 2017. Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, 127, 221–232.

Kirchherr, J., Yang, N.H.N., Schulze-Spüntrup, F., Heerink, M.J. and Hartley, K., 2023. Conceptualizing the circular economy (revisited): an analysis of 221 definitions. Resources, *Conservation and Recycling,* 194, p.107001.

Klein, N., Ramos, T. B. and Deutz, P., 2022. Advancing the Circular Economy in Public Sector Organisations: Employees' Perspectives on Practices. *Circular Economy and Sustainability*, 2 (2), 759–781.

Kline, R., 2011. *Principles and practice of structural equation modeling* [online]. New York: The Guilford Press. Available from: https://www.guilford.com/books/Principles-and-Practice-of-Structural-Equation-Modeling/Rex-Kline/9781462551910 [Accessed 1 Jun 2023].

Knorr, D. and Augustin, M. A., 2023. Preserving the food preservation legacy. *Critical Reviews in Food Science and Nutrition*, 63 (28), 9519–9538.

Kong, F., Wang, X. and Zhao, J., 2014. Dispositional mindfulness and life satisfaction: The role of core self-evaluations. *Personality and Individual Differences*, 56, 165–169.

Konstantoglou, A., Folinas, D. and Fotiadis, T., 2020. Investigating Food Packaging Elements from a Consumer's Perspective. *Foods*, 9 (8), 1097.

Konstantoglou, A., Folinas, D. and Fotiadis, T., 2020. Exploring the Multi-Function Nature of Packaging in the Food Industry. *Logistics,* 4(3), p.21.

Konstantoglou, A., Fotiadis, T., Folinas, D., Falaras, A. and Rotsios, K., 2023. Accessing Consumer Perceptions of the Effectiveness of the Deposit Refund System. *Sustainability*, 15 (12), 9429.

Köppe, C. and Schütz, A., 2019. Healthy Leaders: Core Self-Evaluations Affect Leaders' Health Behavior Through Reduced Exhaustion. *Frontiers in Psychology* [online], 10. Available from: https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00998 [Accessed 30 Jul 2023].

Korhonen, J., Honkasalo, A. and Seppälä, J., 2018. Circular Economy: The concept and its limitations. *Ecological Economics*, 143, 37–46.

Kozlowski, S. W. J. and Klein, K. J., 2000. A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. *In*: *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions*. Hoboken, NJ, US: Jossey-Bass/Wiley, 3–90.

Kramer, E., Yoeli, E. and Rand, D., 2023. Counterproductive norms can be addressed via informational interventions: The case of 'aspirational recycling'.

Lahtinen, J., 2023. The making of the western affluent working class: Class and affluence through postwar public discussions and academic interpretations. *In*: Haapala, P.,

Harjula, M., and Kokko, H., eds. *Experiencing Society and the Lived Welfare State* [online]. Cham: Springer International Publishing, 255–277. Available from: https://doi.org/10.1007/978-3-031-21663-3_12 [Accessed 5 Jun 2023].

LaVine, W., 2023. *In a glamourous fashion: The fabulous years of hollywood costume design*. Taylor & Francis.

Law, K. L., 2017. Plastics in the Marine Environment. *Annual Review of Marine Science*, 9 (1), 205–229.

Lebow, V., 1955. Price competition in 1955. *Journal of retailing*, 31 (1), 5–10.

Lee, D. N., Hutchens, M. J. and Krieger, J. L., 2022. Resolving the do/do not debate: communication perspective to enhance sustainable lifestyles. *Sustainability*, 14 (2), 796.

Lee, Y.-J., Haley, E. and Mark, A. Y., 2012. The Effects of Corporate Social Responsibility Orientation on the Consumer's Perception of Advertisers' Intention. *Journal of Current Issues & Research in Advertising*, 33 (2), 192–209.

Leighninger, R., 2019. Families, the family, and the new deal. *Families in Society*, 100 (4), 341–350.

Leonidou, C. N. and Skarmeas, D., 2017. Gray shades of green: Causes and consequences of green skepticism. *Journal of Business Ethics*, 144 (2), 401–415.

Lewandowski, M., 2016. Designing the Business Models for Circular Economy—Towards the Conceptual Framework. *Sustainability*, 8 (1), 43.

Lewis, C., 2023. Plastic and the Ocean. *In*: Obaidullah, F., ed. *The Ocean and Us* [online]. Cham: Springer International Publishing, 113–121. Available from: https://doi.org/10.1007/978-3-031-10812-9_11 [Accessed 6 Jun 2023].

Li, Q., Guan, X., Shi, T. and Jiao, W., 2020. Green product design with competition and fairness concerns in the circular economy era. *International Journal of Production Research*, 58 (1), 165–179.

Lieder, M. and Rashid, A., 2016. *Journal of Cleaner Production*, 115, 36–51.

Lin, X., Zhan, Z., Zhang, X. and Xiong, J., 2023. Exploring the effectiveness of a SPOC Learning Analytics System Based on Attribution Theory: Evaluation Framework and Educational Experiment. *IEEE Transactions on Learning Technologies*, 1–14.

Lindh, H., Williams, H., Olsson, A. and Wikström, F., 2016. Elucidating the indirect contributions of packaging to sustainable development: A terminology of packaging functions and features. *Packaging Technology and Science*, 29 (4–5), 225–246.

Lomartire, S., Marques, J. C. and Gonçalves, A. M. M., 2022. An Overview of the Alternative Use of Seaweeds to Produce Safe and Sustainable Bio-Packaging. *Applied Sciences*, 12 (6), 3123.

Lopes, J. M., Gomes, S. and Trancoso, T., 2023. The Dark Side of Green Marketing: How Greenwashing Affects Circular Consumption? *Sustainability*, 15 (15), 11649.

Lowe, E. A. and Evans, L. K., 1995. Industrial ecology and industrial ecosystems. *Journal of Cleaner Production*, 3 (1), 47–53.

Lowery, P. G. and Burrow, J. D., 2019. Concentrated disadvantage, racial disparities, and juvenile institutionalization within the context of attribution theory. *Criminal Justice Studies*, 32 (4), 330–355.

ltd, R. and M., 2022. *Food Packaging Films Market Share, Size, Trends, Industry Analysis Report, By Type; By Material; By Application; By Region; Segment Forecast, 2022-2030* [online]. Global: Polaris Market Research. Available from: https://www.researchandmarkets.com/reports/5692285/food-packaging-films-market-share-size-trends [Accessed 7 Jul 2023].

Lu, S., Ngo, T. and Tran, H., 2023. Exploring a hierarchical model for circular economy transition through launching green marketing. *Sustainable Development.*

Luft, J. A., Jeong, S., Idsardi, R. and Gardner, G., 2022. Literature reviews, theoretical frameworks, and conceptual frameworks: An introduction for new biology education researchers. *CBE—Life Sciences Education*, 21 (3), rm33.

Luna-Arocas, R. and Camps, J., 2008. A model of high performance work practices and turnover intentions. *Personnel Review*, 37 (1), 26–46.

Luzi, F., Torre, L., Kenny, J. M. and Puglia, D., 2019. Bio- and Fossil-Based Polymeric Blends and Nanocomposites for Packaging: Structure–Property Relationship. *Materials*, 12 (3), 471.

Lyle, J. T., 2008. *Regenerative design for sustainable development*. 1st edition. John Wiley & Sons.

Lyon, T. P. and Montgomery, A. W., 2015. The means and end of greenwash. *Organization & Environment*, 28 (2), 223–249.

Mabrok, M. A., Mohamed, H. K., Abdel-Aty, A.-H. and Alzahrani, A. S., 2020. Human models in human-in-the-loop control systems. *Journal of Intelligent & Fuzzy Systems*, 38 (3), 2611–2622.

MacLeod, M., Arp, H. P. H., Tekman, M. B. and Jahnke, A., 2021. The global threat from plastic pollution. *Science*, 373 (6550), 61–65.

Magnier, L. and Schoormans, J., 2017. How do packaging material, colour and environmental claim influence package, brand and product evaluations? *Packaging Technology and Science*, 30 (11), 735–751.

Maitre-Ekern, E. and Dalhammar, C., 2019. Towards a hierarchy of consumption behaviour in the circular economy. *Maastricht Journal of European and Comparative Law*, 26 (3), 394–420.

Markevičiūtė, Z. and Varžinskas, V., 2022. Smart material choice: the importance of circular design strategy applications for bio-based food packaging preproduction and end-of-life life cycle stages. *Sustainability*, 14 (10), 6366.

Markham, D., Khare, A. and Beckman, T., 2014. Greenwashing: a proposal to restrict its spread. *Journal of Environmental Assessment Policy and Management*, 16 (04), 1450030.

Markuz, A., Plećaš, M. and Ban, D., 2022. The generation Z sustainable fashion concept. *Acta economica et turistica*, 8 (2), 169–193.

Marquis, C., Toffel, M. W. and Bird, Y., 2015. Scrutiny, norms, and selective disclosure: A global study of greenwashing. [online]. Available from: https://papers.ssrn.com/abstract=1836472 [Accessed 1 Jun 2023].

Marriya, S., 2017. Green washing: A consumer's perspective. *International Journal of Management, IT and Engineering*, 7 (4), 460–468.

Martínez, M. P., Cremasco, C. P., Gabriel Filho, L. R. A., Braga Junior, S. S., Bednaski, A. V., Quevedo-Silva, F., Correa, C. M., da Silva, D. and Moura-Leite Padgett, R. C., 2020. Fuzzy inference system to study the behavior of the green consumer facing the perception of greenwashing. *Journal of Cleaner Production*, 242, 116064.

Martinko, M. J. and Mackey, J. D., 2019. Attribution theory: An introduction to the special issue. *Journal of Organizational Behavior*, 40 (5), 523–527.

Mathews, J. A. and Tan, H., 2016. Circular economy: Lessons from China. *Nature*, 531 (7595), 440–442.

Matthews, C., Moran, F. and Jaiswal, A. K., 2021. A review on European Union's strategy for plastics in a circular economy and its impact on food safety. *Journal of Cleaner Production*, 283, 125263.

McDonough, W. and Braungart, M., 2010. Cradle to cradle: Remaking the way we make things. *In*: . Farrar, Straus and Giroux, 208.

McDonough, W. and Braungart, M., 2013. *The upcycle: Beyond sustainability—designing for abundance* [online]. London: Macmillan. Available from: https://mcdonough.com/writings/the-upcycle/ [Accessed 1 Jun 2023].

McKinsey, 2015. *Growth within: A circular economy vision for a competitive Europe*. McKinsey Center for Business and Environment.

Meira, J. V. de S. and Hancer, M., 2021. Using the social exchange theory to explore the employee-organization relationship in the hospitality industry. *International Journal of Contemporary Hospitality Management*, 33 (2), 670–692.

Mies, A. and Gold, S., 2021. Mapping the social dimension of the circular economy. *Journal of Cleaner Production*, 321, 128960.

Milios, L., 2018. Advancing to a Circular Economy: three essential ingredients for a comprehensive policy mix. *Sustainability science*, 13 (3), 861–878.

Misra, N. N., Koubaa, M., Roohinejad, S., Juliano, P., Alpas, H., Inácio, R. S., Saraiva, J. A. and Barba, F. J., 2017. Landmarks in the historical development of twenty first century food processing technologies. *Food Research International*, 97, 318–339.

Mittal, M., 2014. The Evolution of Packaging. *Digital Packaging Experiences* [online]. Available from: https://medium.com/digital-packaging-experiences/the-evolution-of-packaging-57259054792d [Accessed 5 Jun 2023].

Mocioiu, O. C., Mocioiu, A.-M., Marin, A. and Zaharescu, M., 2017. Study of historical lead silicate glasses and their preservation by silica coating. *Ceramics International*, 43 (1, Part A), 77–83.

Molenveld, K. and Slaghek, T. M., 2022. Recent developments in biodegradable cellulose-based plastics. *In*: *Biodegradable polymers in the circular plastics economy* [online]. John Wiley & Sons, Ltd, 273–298. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1002/9783527827589.ch8 [Accessed 5 Jun 2023].

de Morais, L. H. L., Pinto, D. C. and Cruz-Jesus, F., 2021. Circular economy engagement: Altruism, status, and cultural orientation as drivers for sustainable consumption. *Sustainable Production and Consumption*, 27, 523–533.

Morseletto, P., 2020. Targets for a circular economy. *Resources, Conservation and Recycling*, 153, 104553.

Moshood, T. D., Nawanir, G., Mahmud, F., Mohamad, F., Ahmad, M. H. and AbdulGhani, A., 2022. Sustainability of biodegradable plastics: New problem or solution to solve the global plastic pollution? *Current Research in Green and Sustainable Chemistry*, 5, 100273.

Mulrow, J. S., Derrible, S., Ashton, W. S. and Chopra, S. S., 2017. Industrial symbiosis at the facility scale. *Journal of Industrial Ecology*, 21 (3), 559–571.

Murray, A., Skene, K. and Haynes, K., 2017. The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context. *Journal of Business Ethics*, 140 (3), 369–380.

Muschetto, T. and Siegel, J., 2021. Bibliometric review of attribution theory: Document cocitation analysis. *Motivation Science*, 7 (4), 439.

Muthén, L. K. and Muthén, B. O., 2017. *Mplus User's Guide*. Eighth. Los Angeles, CA: Muthén & Muthén.

Nagal, V., 2022. The history of packaging: from ancient times to the future. *PackagingGURUji* [online]. Available from: https://packagingguruji.com/the-history-of-packaging/ [Accessed 5 Jun 2023].

National Zero Waste Council, 2018. *Packaging and the Circular Economy: A Case Study on Compostables in Canada*.

Ncube, L. K., Ude, A. U., Ogunmuyiwa, E. N., Zulkifli, R. and Beas, I. N., 2021. An overview of plastic waste generation and management in food packaging industries. *Recycling*, 6 (1), 12.

Neuninger, R., 2019. The effect of concentration of retail power on the specialist knowledge of retail staff in the food and beverage sector: A case study of wine retail. *Case studies in food retailing and distribution*, 25.

New Zealand Infrastructure Commission, 2021. Sector state of play: resource recovery and waste. [online]. Available from: https://apo.org.au/node/311259.

Nguyen, H., 2020. Global: Consumer willingness to pay for environmentally friendly products \textbar YouGov. *YouGov* [online]. Available from: https://yougov.co.uk/topics/consumer/articles-reports/2021/04/29/global-willingness-pay-for-sustainability [Accessed 1 Jun 2023].

Nikmard, F., Tavassoli, K. and Pourdana, N., 2023. Designing and validating a scale for evaluating the sources of unreliability of a high-stakes test. *Language Testing in Asia*, 13 (1), 2.

Nishii, L. H., Lepak, D. P. and Schneider, B., 2008. Employee attributions of the "why" of HR practices: Their effects on employee attitudes and behaviors, and customer satisfaction. *Personnel Psychology*, 61 (3), 503–545.

Noor, S., Tajik, O. and Golzar, J., 2022. Simple Random Sampling. *International Journal of Education and Language Studies* [online], 1 (2). Available from: https://doi.org/10.22034/ijels.2022.162982 [Accessed 12 Oct 2023].

Norgren, A. and Moss, E., 2021. *Reducing Plastic Pollution: Campaigns That Work* [online]. SEI and One Planet. Insights and examples to maximize the effectiveness of campaigns for sustainable plastic consumption. Available from: https://www.campaignsthatwork.org/ [Accessed 16 Jan 2024].

Northen, S., Nieminen, L., Cunsolo, S., Iorfa, K. S., Roberts, K. and Fletcher, S., 2023. From shops to bins: a case study of consumer attitudes and behaviours towards plastics in a UK coastal city. *Sustainability Science*.

Nunnally, J. C., 1978. *Psychometric theory*. 2d ed. New York: McGraw-Hill.

Nyambane, E. N., Mwaura, C. and Kamau, L., 2022. Use of a Robot to Clean Drainage Structures. *Proceedings of the Sustainable Research and Innovation Conference*, 186–191.

OECD, 2022. *Annual global plastic waste generation by industrial sector* [online]. OurWorldinData.org. Available from: https://ourworldindata.org/grapher/plastic-waste-by-sector [Accessed 23 Jan 2024].

OED, 2023. *Oxford English Dictionary, s.v. "greenwash (v.)* [online]. Available from: https://doi.org/10.1093/OED/4891715166.

Oikonomopoulou, F., DeBrincat, G. and Fuhrmann, S., 2023. Glass and circularity. *Glass Structures & Engineering*, 8 (2), 165–166.

Oliveira, M., Miguel, M., van Langen, S. K., Ncube, A., Zucaro, A., Fiorentino, G., Passaro, R., Santagata, R., Coleman, N., Lowe, B. H., Ulgiati, S. and Genovese, A., 2021. Circular Economy and the Transition to a Sustainable Society: Integrated Assessment Methods for a New Paradigm. *Circular Economy and Sustainability*, 1 (1), 99–113.

Omar, S. R., Noh, A. A. and Rohaizan, A. N., 2022. The Potential Use of Anthocyanin in Butterfly Pea (Clinoteria ternatea) Petals as Colorimetric Indicator in Intelligent Food Packaging Article. *Malaysian Journal of Science Health & Technology*, 8 (1), 71–76.

Ortega Alvarado, I. A., Pettersen, I. N. and Berker, T., 2022. Contesting Consumerism with a Circular Economy? *Circular Economy and Sustainability* [online]. Available from: https://doi.org/10.1007/s43615-022-00218-1 [Accessed 6 Jun 2023].

Osafo, E., Paros, A. and Yawson, R. M., 2021. Valence–Instrumentality–Expectancy Model of Motivation as an Alternative Model for Examining Ethical Leadership Behaviors. *SAGE Open*, 11 (2), 21582440211021896.

Owusu-Apenten, R. and Vieira, E., 2023. Why food science? *In*: Owusu-Apenten, R. and Vieira, E. R., eds. *Elementary Food Science* [online]. Cham: Springer International Publishing, 3–28. Available from: https://doi.org/10.1007/978-3-030-65433-7_1 [Accessed 5 Jun 2023].

Padilla-Rivera, A., Russo-Garrido, S. and Merveille, N., 2020. Addressing the Social Aspects of a Circular Economy: A Systematic Literature Review. *Sustainability*, 12 (19), 7912.

Palazzo, M., Vollero, A. and Siano, A., 2023. Intelligent packaging in the transition from linear to circular economy: Driving research in practice. *Journal of Cleaner Production*, 388, 135984.

Palmer, J.C., 2016. A beginner's guide to crowdsourcing—strengths, limitations and best practice for psychological research. *Psychological Science Agenda June*.

Panda, D., Masani, S. and Dasgupta, T., 2022. Packaging-influenced-purchase decision segment the bottom of the pyramid consumer marketplace? Evidence from West Bengal, India. *Asia Pacific Management Review*, 27 (2), 145–153.

Panneels, I., 2019. Glass—A Material Practice in the Anthropocene. *Arts*, 8 (1), 7.

Parguel, B., Benoit-Moreau, F. and Russell, C. A., 2015. Can evoking nature in advertising mislead consumers? The power of 'executional greenwashing'. *International Journal of Advertising*, 34 (1), 107–134.

Pascall, M. A., DeAngelo, K., Richards, J. and Arensberg, M. B., 2022. Role and Importance of Functional Food Packaging in Specialized Products for Vulnerable Populations: Implications for Innovation and Policy Development for Sustainability. *Foods*, 11 (19), 3043.

Patel, P., 2019. Edible Packaging. Can you really have your cake and eat the wrapper, too? *American Chemical Society*, 5 (12), 1907–1910.

Paty, A., 2021. See Your Trash: What are we to make of what we throw out? *The Baffler*, (60), 48–57.

Pawaskar, U. S., Raut, R. D. and Gardas, B. B., 2018. Assessment of consumer behavior towards environmental responsibility: A structural equations modeling approach. *Business Strategy and the Environment*, 27 (4), 560–571.

PDA, 2016, 2016. Packaging Statistics that Might Surprise You. *Packaging Distributors of America* [online]. Available from: https://www.pdachain.com/2016/11/30/packaging-statistics-that-might-surprise-you/ [Accessed 6 Jun 2023].

Pearce, D. W. and Turner, R. K., 1990. *Economics of natural resources and the environment*. Johns Hopkins University Press.

Pedhazur, E.J. and Pedhazur-Schmelkin, L., 1991. *Measurement, design, and analysis: An integrated approach.* Hillsdale, NJ: Lawrence Erlbaum.

Phelan, A. (Anya), Meissner, K., Humphrey, J. and Ross, H., 2022. Plastic pollution and packaging: Corporate commitments and actions from the food and beverage sector. *Journal of Cleaner Production*, 331, 129827.

Planing, P., 2018. Towards a circular economy - how business model innovation will help to make the shift. *International Journal of Business and Globalisation*, 20 (1), 71–83.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y. and Podsakoff, N. P., 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879–903.

Popp, N., Sattler, L. A., Pierce, D. and Shreffler, M. B., 2022. Why sport ticket salespeople leave their jobs: applying attribution theory to employee turnover. *International Journal of Sport Management and Marketing*, 22 (3–4), 265–286.

Pou, K. R. J., Raghavan, V. and Packirisamy, M., 2022. Microfluidics in smart packaging of foods. *Food Research International*, 161, 111873.

Powell, M., 2012. From Feed Sack to Clothes Rack: The Use of Commodity Textile Bags in American Households from 1890 – 1960. *Textile Society of America Symposium Proceedings*, 732.

Prakash, G. and Pathak, P., 2017. Intention to buy eco-friendly packaged products among young consumers of India: A study on developing nation. *Journal of Cleaner Production*, 141, 385–393.

Price, K. R., 2020. The millennial wish-cycler: Best practices for reducing recycling contamination. *WordPress* [online]. Available from: https://www. jou. ufl. edu/wp-content/uploads/2020/09/The-Millennial-Wish-cycler-Kaitlin-Robb-Price. pdf.

Puntillo, P., 2023. Circular economy business models: Towards achieving sustainable development goals in the waste management sector—Empirical evidence and theoretical implications. *Corporate Social Responsibility and Environmental Management*, 30 (2), 941–954.

Qayyum, A., Jamil, R. A. and Sehar, A., 2022. Impact of green marketing, greenwashing and green confusion on green brand equity. *Spanish Journal of Marketing - ESIC*, 27 (3), 286–305.

Office of National Statistics, 2023. Gender identity: age and sex, England and Wales: Census 2021. Gender identity by age and sex of usual residents aged 16 years and over in England and Wales, Census 2021 data [online]. Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/culturalidentity/genderidentity/articles/genderidentityageandsexenglandandwalescensus2021/2023-01-25. [Accessed 7 August 2024].

Office of National Statistics, 2023. Male and female populations. England and Wales 2021 Census [online]. Available from: https://www.ethnicity-facts-figures.service.gov.uk/uk-population-by-ethnicity/demographics/male-and-female-populations/latest/. [Accessed 7 August 2024].

Qiu, J., Zhang, X. and Zhang, X., 2023. Analyzing Emotional Motivations Influencing Consumer Purchase Behavior in the Post-Epidemic Era Based on Data Analysis. *Journal of Education, Humanities and Social Sciences*, 13, 67–73.

Qolbi, W., 2023. Bisphenol A (BPA) Content in Food and Beverage Plastic Packaging Perspective of Food Law and Consumer Protection. *Veteran Law Review*, 6 (1), 61–73.

Quinete, N. and Hauser-Davis, R. A., 2021. Drinking water pollutants may affect the immune system: concerns regarding COVID-19 health effects. *Environmental Science and Pollution Research*, 28 (1), 1235–1246.

Rahardiyan, D., Moko, E. M., Tan, J. S. and Lee, C. K., 2023. Thermoplastic starch (TPS) bioplastic, the green solution for single-use petroleum plastic food packaging – A review. *Enzyme and Microbial Technology*, 168, 110260.

Ramakanth, D., Singh, S., Maji, P. K., Lee, Y. S. and Gaikwad, K. K., 2021. Advanced packaging for distribution and storage of COVID-19 vaccines: A review. *Environmental Chemistry Letters*, 19 (5), 3597–3608.

Ramasubramanian, B., Tan, J., Chellappan, V. and Ramakrishna, S., 2023. Recent Advances in Extended Producer Responsibility Initiatives for Plastic Waste Management in Germany and UK. *Materials Circular Economy*, 5 (1), 6.

Redding, M., Bolten, S., Gu, G., Luo, Y., Micallef, S. A., Millner, P. and Nou, X., 2023. Growth and inactivation of Listeria monocytogenes in sterile extracts of fruits and vegetables: Impact of the intrinsic factors pH, sugar and organic acid content. *International Journal of Food Microbiology*, 386, 110043.

Regattieri, A., Santarelli, G. and Piana, F., 2019. *Operations, logistics and supply chain management*. Springer Cham.

Reuters, 2019. *A plateful of plastic. Visualising the amount of microplastic we eat* [online]. Available from: https://www.reuters.com/graphics/ENVIRONMENT-PLASTIC/0100B4TF2MQ/index.html [Accessed 23 Jan 2024].

Rhein, S. and Schmid, M., 2020. Consumers' awareness of plastic packaging: More than just environmental concerns. *Resources, Conservation and Recycling*, 162, 105063.

Rhim, J.-W., Park, H.-M. and Ha, C.-S., 2013. Bio-nanocomposites for food packaging applications. *Progress in Polymer Science*, 38 (10), 1629–1652.

Risch, S. J., 2009. Food packaging history and innovations. *Journal of Agricultural and Food Chemistry*, 57 (18), 8089–8092.

Rizos, V., Tuokko, K. and Behrens, A., 2017. The Circular Economy: A review of definitions, processes and impacts. *CEPS Papers* [online]. Available from: https://ideas.repec.org//p/eps/cepswp/12440.html [Accessed 1 Jun 2023].

Robertson, G. L., 2005a. *Food Packaging: Principles and Practice, Second Edition*. 2nd ed. Boca Raton: CRC Press.

Robertson, G. L., 2005b. *Food Packaging: Principles and Practice, Second Edition*. 2nd ed. Boca Raton: CRC Press.

Rogers, P., 2021. Rented But MINE! Application of Psychological Ownership Theory to Access-Based Consumption and the Circular Economy. *Circular Economy and Sustainability*, 1 (2), 719–744.

Rothman, R. and Ryan, A., 2023. *The history and future of plastics*. Singapore: Plastic Pollution In The Global Ocean.

Ruiz-Blanco, S., Romero, S. and Fernandez-Feijoo, B., 2022. Green, blue or black, but washing–What company characteristics determine greenwashing? *Environment, Development and Sustainability*, 24 (3), 4024–4045.

Ryan, P. G., Cole, G., Spiby, K., Nel, R., Osborne, A. and Perold, V., 2016. Impacts of plastic ingestion on post-hatchling loggerhead turtles off South Africa. *Marine Pollution Bulletin*, 107 (1), 155–160.

Sadeghi, M., Mahmoudi, A., Deng, X. and Luo, X., 2023. Prioritizing requirements for implementing blockchain technology in construction supply chain based on circular economy: Fuzzy Ordinal Priority Approach. *International Journal of Environmental Science and Technology*, 20 (5), 4991–5012.

Sæter, F., Alvarado, I. O. and Pettersen, I. N., 2020. Reuse principle for primary packaging circularity in the food system. *In*: *DS 101: Proceedings of NordDesign 2020, Lyngby, Denmark, 12th - 14th August 2020* [online]. Presented at the NordDesign 2020, 1–12. Available from: https://www.designsociety.org/publication/42503/Reuse+principle+for+primary+packaging+circularity+in+the+food+system [Accessed 1 Jun 2023].

Saidani, M., Yannou, B., Leroy, Y., Cluzel, F. and Kendall, A., 2019. A taxonomy of circular economy indicators. *Journal of Cleaner Production*, 207, 542–559.

Samaraweera, K. G., 2020. Factors influencing consumer purchase intention towards fresh milk packets: Special reference to colombo district. *In*: . Presented at the International Research Conference of Uva Wellassa University, Wellassa.

Samsudin, S. B. and Hasanan, N. B., 2017. Strengthen the Critical Success Factors (CSFs) implementing total productive maintenance in power generation industry. *International Journal of Accounting & Business Management*, 5 (2), 53–67.

Sánchez-Bravo, P., Chambers, E., Noguera-Artiaga, L., López-Lluch, D., Chambers IV, E., Carbonell-Barrachina, Á.A. and Sendra, E., 2020. Consumers' attitude towards the sustainability of different food categories. *Foods, 9*(11), p.1608.

Sarkar, S. and Aparna, K., 2020. Food Packaging and Storage. *In*: 27–51.

Sarkis, J., Dewick, P., Cohen, M. J., Hofstetter, J. S. and Schröder, P., 2022. Coordinating circular & degrowth systems for strong sustainability. *by Andrew J. Hoffman and Nicholas Poggioli, Guest Editors*, 12.

Sayed, A. and Peng, B., 2020. The income inequality curve in the last 100 years: What happened to the Inverted-U? *Research in Economics*, 74 (1), 63–72.

Schmuck, D., Matthes, J. and Naderer, B., 2018. Misleading consumers with green advertising? An affect–reason–involvement account of greenwashing effects in environmental advertising. *Journal of Advertising*, 47 (2), 127–145.

Schröder, P., Lemille, A. and Desmond, P., 2020. Making the circular economy work for human development. *Resources, Conservation and Recycling*, 156, 104686.

Schroeder, P., Anggraeni, K. and Weber, U., 2019. The Relevance of Circular Economy Practices to the Sustainable Development Goals. *Journal of Industrial Ecology*, 23 (1), 77–95.

Seele, P. and Gatti, L., 2017. Greenwashing revisited: In search of a typology and accusation-based definition incorporating legitimacy strategies. *Business Strategy and the Environment*, 26 (2), 239–252.

Senathirajah, K. and Palanisami, T., 2019. How much microplastics are we ingesting?: estimation of the mass of microplastics ingested. *The University of Newcastle, Australia* [online]. Available from: https://www.newcastle.edu.au/newsroom/featured/plastic-ingestion-by-people-could-be-equating-to-a-credit-card-a-week/how-much-microplastics-are-we-ingesting-estimation-of-the-mass-of-microplastics-ingested [Accessed 6 Jun 2023].

Shaw, G., Curth, L. and Alexander, A., 2004. Selling Self-Service and the Supermarket: The Americanisation of Food Retailing in Britain, 1945–60. *Business History*, 46 (4), 568–582.

Shennib, F. and Schmitt, K., 2021. Data-driven technologies and artificial intelligence in circular economy and waste management systems: a review. *In*: *2021 IEEE International Symposium on Technology and Society (ISTAS)* [online]. Presented at the 2021 IEEE International Symposium on Technology and Society (ISTAS), 1–5. Available from: https://ieeexplore.ieee.org/abstract/document/9629183?casa_token=3D8c5ORlEHEAAAAA:izyAoW7n0rqoxppaAYBceAEe7g1AMRy9Ed8pEDeFdHfWP9TOMPXmgJGyXeqWlOf0JEbDuyV- [Accessed 26 Jan 2024].

Shenoy, P. and Aithal, P. S., 2016. A Study on History of Paper and Possible Paper Free World. [online]. Available from: https://papers.ssrn.com/abstract=2779181 [Accessed 22 Jan 2024].

Shephard, S., 2006. *Pickled, potted, and canned: How the art and science of food preserving changed the world*. Simon and Schuster.

Siano, A., Vollero, A., Conte, F. and Amabile, S., 2017. “More than words”: Expanding the taxonomy of greenwashing after the Volkswagen scandal. *Journal of Business Research*, 71, 27–37.

Slijepcevic, D., 2023. Functions, power and future of consumerism. *International Journal of Multidisciplinary Research and Growth Evaluation*, 4 (6), 582–592.

Sløgedal, T. S. S. and Starling, R. E., 2020. A Story of separation: Exploring systems of household waste, looking for opportunities for regenerative change. Master’s Thesis. [online]. OsloMet - storbyuniversitetet. Institutt for produktdesign. Available from: https://oda.oslomet.no/oda-xmlui/handle/10642/9216 [Accessed 4 Jun 2023].

Sokolova, T., Krishna, A. and Döring, T., 2023. Paper meets plastic: the perceived environmental friendliness of product packaging. *Journal of Consumer Research*, ucad008.

Sotirovic, M., 2003. How Individuals Explain Social Problems: The Influences of Media Use. *Journal of Communication*, 53 (1), 122–137.

Spiro, J., 2021. TripleW receives $2.6 million grant from EU for its lactic acid for food waste. *CTECH* [online]. Available from: https://www.calcalistech.com/ctech/articles/0,7340,L-3912891,00.html [Accessed 7 Jun 2023].

Stahel, W., 2006. *The Performance Economy*. Palgrave Macmillan London.

Stopgreenwashing, 2020. *Green or greed?* [online]. Available from: https://stopgreenwashing.net/.

Strähle, J. and Hauk, K., 2017. Impact on sustainability: Production versus consumption. *In*: Strähle, J., ed. *Green Fashion Retail* [online]. Singapore: Springer, 49–75. Available from: https://doi.org/10.1007/978-981-10-2440-5_4 [Accessed 2 Jun 2023].

Sulich, A. and Sołoducho-Pelc, L., 2022. The circular economy and the Green Jobs creation. *Environmental Science and Pollution Research*, 29 (10), 14231–14247.

Sundarabharathi, M. and Muthulakshmi, C., 2023. American supermarkets – past, present vs. future trends and technologies. *Resmilitaris*, 13 (2), 6269–6277.

Swetha, T. A., Bora, A., Mohanrasu, K., Balaji, P., Raja, R., Ponnuchamy, K., Muthusamy, G. and Arun, A., 2023. A comprehensive review on polylactic acid (PLA) – Synthesis, processing and application in food packaging. *International Journal of Biological Macromolecules*, 234, 123715.

Szaky, T., 2019. *The future of packaging: From linear to circular*. Berrett-Koehler Publishers.

Ta, A. H., Aarikka-Stenroos, L. and Litovuo, L., 2022. Customer Experience in Circular Economy: Experiential Dimensions among Consumers of Reused and Recycled Clothes. *Sustainability*, 14 (1), 509.

Tan, J., Tiwari, S. K. and Ramakrishna, S., 2021. Single-Use Plastics in the Food Services Industry: Can It Be Sustainable? *Materials Circular Economy,* 3 (1), 7.

Tandon, A., Jabeen, F., Talwar, S., Sakashita, M. and Dhir, A., 2021. Facilitators and inhibitors of organic food buying behavior. *Food Quality and Preference, 88*, p.104077.

Tarangini, K., Huthaash, K., Nandha Kumar, V., Kumar, S. T., Jayakumar, O. D., Wacławek, S., Rao, K. J. and Padil, V. V. T., 2023. Eco-Friendly Bioplastic Material Development *Via* Sustainable Seaweed Biocomposite. *Ecological Chemistry and Engineering S*, 30 (3), 333–341.

Telzer, R., 1989. The Silent Salesman. *Marketing Communications*, 14 (5), 20–24.

Teodorescu, M., Morse, L., West Virginia University, Awwad, Y., Center for Complex Systems, King Abdulaziz City for Science & Technology, Massachusetts Institute of Technology, Kane, G., and Boston College, 2021. Failures of Fairness in Automation Require a Deeper Understanding of Human-ML Augmentation. *MIS Quarterly*, 45 (3), 1483–1500.

TerraChoice, 2010. *Terrachoice: The Sins of Greenwashing - Home and Family Edition 2010: Report on environmental claimsmade in the North American consumer market* [online]. Two Sides. Available from: https://www.twosides.info/UK/terrachoice-the-sins-of-greenwashing-home-and-family-edition-2010/ [Accessed 4 Jun 2023].

Testa, F., Iovino, R. and Iraldo, F., 2020. The circular economy and consumer behaviour: The mediating role of information seeking in buying circular packaging. *Business Strategy and the Environment*, 29 (8), 3435–3448.

The Ellen Macarthur Foundation, 2012. *Towards the circular economy Vol. 1: an economic and business rationale for an accelerated transition* [online]. Cowes, Isle of Wight, UK: Ellen MacArthur Foundation. Available from: https://ellenmacarthurfoundation.org/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an [Accessed 2 Jun 2023].

The Ellen Macarthur Foundation, 2015. *Growth within: A circular economy vision for a competitive Europe* [online]. Cowes, Isle of Wight, UK: Ellen MacArthur Foundation. Available from: https://ellenmacarthurfoundation.org/growth-within-a-circular-economy-vision-for-a-competitive-europe [Accessed 2 Jun 2023].

The Ellen MacArthur Foundation, 2019. *The butterfly diagram: visualising the circular economy* [online]. Cowes, Isle of Wight, UK: Ellen MacArthur Foundation.

Available from: https://ellenmacarthurfoundation.org/circular-economy-diagram [Accessed 2 Jun 2023].

Thurber, H. and Curtzwiler, G. W., 2020. Suitability of poly(butylene succinate) as a coating for paperboard convenience food packaging. *International Journal of Biobased Plastics*, 2 (1), 1–12.

Toledano, N., 2022. Restoring the Garden of Eden: A Ricoeurian view of the ethics of environmental entrepreneurship. *Business Ethics, the Environment & Responsibility*, 31 (4), 1174–1184.

Torraco, R. J., 2005. Writing Integrative Literature Reviews: Guidelines and Examples. *Human Resource Development Review*, 4 (3), 356–367.

Torro, O., Pirkkalainen, H. and Li, H., 2022. Media synchronicity in organizational social exchange. *Information Technology & People*, 35 (8), 162–180.

Totaro, A. I., 2023. Startup: biobased and home compostable plastics with Traceless Materials. *Renewable Matter* [online]. Available from: https://www.renewablematter.eu/articoli/article/Startup-biobased-plastic-home-compostable-plastics-Traceless-Materials [Accessed 7 Jun 2023].

Treasury, H. M., 2021. *New independent group to help tackle 'greenwashing'* [online]. UK. Policy paper. Available from: https://www.gov.uk/government/news/new-independent-group-to-help-tackle-greenwashing [Accessed 7 Jun 2023].

Turna, G. B., 2022. How "dieselgate" changed Volkswagen: rushing to erase the traces of greenwashing. *In*: Bhattacharyya, J., Balaji, M. S., Jiang, Y., Azer, J., and Hewege, C. R., eds. *Socially responsible consumption and marketing in practice: Collection of case studies* [online]. Singapore: Springer Nature, 255–273. Available from: https://doi.org/10.1007/978-981-16-6433-5_16 [Accessed 2 Jun 2023].

Turner, A., 2018. Mobilisation kinetics of hazardous elements in marine plastics subject to an avian physiologically-based extraction test. *Environmental Pollution*, 236, 1020–1026.

UN, 2018, 2018. *'A line in the sand' – Global Commitment to eliminate plastic pollution at the source* [online]. United Nations Environment. Press Release. Available from: http://www.unep.org/news-and-stories/press-release/line-sand-global-commitment-eliminate-plastic-pollution-source [Accessed 2 Jun 2023].

UNEP, 2018. *Our planet is choking on plastic* [online]. UN Environment Programme. Available from: https://www.unep.org/interactives/beat-plastic-pollution/.

UNEP, 2021. *UNEP Food Waste Index Report 2021* [online]. Available from: http://www.unep.org/resources/report/unep-food-waste-index-report-2021 [Accessed 22 Jan 2024].

UNIDO, 2017. Circular Economy. [online]. Available from: https://www.unido.org/sites/default/files/2017-07/Circular_Economy_UNIDO_0.pdf.

Valencia, M., Bocken, N., Loaiza, C. and De Jaeger, S., 2023. The social contribution of the circular economy. *Journal of Cleaner Production*, 408, 137082.

Valtonen, L. and Makinen, S. J., 2022. Human-in-the-loop: Explainable or accurate artificial intelligence by exploiting human bias? *In*: *2022 IEEE 28th International Conference on Engineering, Technology and Innovation (ICE/ITMC) & 31st International Association For Management of Technology (IAMOT) Joint Conference* [online]. Presented at the 2022 IEEE 28th International Conference on Engineering, Technology and Innovation (ICE/ITMC) & 31st International Association For Management of Technology (IAMOT) Joint Conference, Nancy, France: IEEE, 1–8. Available from: https://ieeexplore.ieee.org/document/10033225/ [Accessed 11 Jan 2024].

Van de Nadort, A., 2018. Opinion of the European committee of the Regions—Communication on a European strategy for plastics in a circular economy. *OJEU C*, 461, 30–36.

Varpio, L., Paradis, E., Uijtdehaage, S. and Young, M., 2020. The distinctions between theory, theoretical framework, and conceptual framework. *Academic Medicine*, 95 (7), 989–994.

Vayona, A. and Demetriou, G., 2020. Towards an operating model for attribution in circular economy. *In*: *2020 16th International Conference on Distributed Computing in Sensor Systems (DCOSS)*. 490–495.

Velenturf, A. P. M., Purnell, P., Macaskie, L. E., Mayes, W. M. and Sapsford, D. J., 2019. A new perspective on a global circular economy, 444.

Verma, V. K., Chandra, B. and Kumar, S., 2019. Values and ascribed responsibility to predict consumers' attitude and concern towards green hotel visit intention. *Journal of Business Research*, 96, 206–216.

Vroom, V., 1964. Expectancy theory. *Work and motivation*, 964.

Wahab, S., 2018. Sustaining the environment through green marketing. *Review of Integrative Business and Economics Research*, 7 (2), 71–77.

Walzberg, J., Sethuraman, S., Ghosh, T., Uekert, T. and Carpenter, A., 2023. Think before you throw! An analysis of behavioral interventions targeting PET bottle recycling in the United States. *Energy Research & Social Science*, 100, 103116.

Wang, J., Guo, B. and Chen, L., 2022. Human-in-the-loop Machine Learning: A Macro-Micro Perspective. [online]. Available from: http://arxiv.org/abs/2202.10564 [Accessed 11 Jan 2024].

Wanke, M., 2008. *Social Psychology of Consumer Behavior*. Psychology Press.

Warren, D., Scharding, T., Lewin, L. D. and Pandya, U., 2020. Making sure corporate social innovations do social good. *Rutgers Business Review*, 5 (2), 166–184.

Wastling, T., Charnley, F. and Moreno, M., 2018. Design for circular behaviour: considering users in a circular economy. *Sustainability*, 10 (6), 1743.

WEF, 2016. *The New Plastics Economy: Rethinking the future of plastics* [online]. World Economic Forum. Available from: https://www.weforum.org/reports/the-new-plastics-economy-rethinking-the-future-of-plastics/ [Accessed 2 Jun 2023].

Weigend Rodríguez, R., Pomponi, F., Webster, K. and D'Amico, B., 2020. The future of the circular economy and the circular economy of the future. *Built Environment Project and Asset Management*, 10 (4), 529–546.

Weiner, B., 1979. A theory of motivation for some classroom experiences. *Journal of Educational Psychology*, 71, 3–25.

Wikström, F., Williams, H., Trischler, J. and Rowe, Z., 2019. The importance of packaging functions for food waste of different products in households. *Sustainability*, 11 (9), 2641.

Williams, H., Wikström, F., Wetter-Edman, K. and Kristensson, P., 2018. Decisions on recycling or waste: how packaging functions affect the fate of used packaging in selected Swedish households. *Sustainability*, 10 (12), 4794.

Wohner, B., Pauer, E., Heinrich, V. and Tacker, M., 2019. Packaging-related food losses and waste: An overview of drivers and issues. *Sustainability*, 11 (1), 264.

Wood, M. J., Ross-Kerr, J. C. and Brink, P. J., 2006. *Basic Steps in Planning Nursing Research: From Question to Proposal*. Jones & Bartlett Publishers.

WRAP, 2020. *Strategies to achieve economic and environmental gains by reducing food waste.* [online]. WRAP. The Waste and Resources Action Programme. Available from: https://wrap.org.uk/resources/report/strategies-achieve-economic-and-environmental-gains-reducing-food-waste.

Wright, S. B., 2013. Alabama Cotton and Bemis Bags Pieced into Quilt History. *Uncoverings*, 34, 133–159.

Yadav, R. and Pathak, G. S., 2017. Determinants of consumers' green purchase behavior in a developing nation: Applying and extending the theory of planned behavior. *Ecological Economics*, 134, 114–122.

Yan, M. R., Hsieh, S. and Ricacho, N., 2022. Innovative food packaging, food quality and safety, and consumer perspectives. *Processes*, 10 (4), 747.

Yang, Z., Nguyen, T. T. H., Nguyen, H. N., Nguyen, T. T. N. and Cao, T. T., 2020. Greenwashing behaviours: Causes, taxonomy and consequences based on a

systematic literature review. *Journal of Business Economics and Management*, 21 (5), 1486–1507.

Yildirim, S., 2023. Greenwashing: a rapid escape from sustainability or a slow transition? *LBS Journal of Management & Research* [online], ahead-of-print (ahead-of-print). Available from: https://doi.org/10.1108/LBSJMR-11-2022-0077 [Accessed 7 Jun 2023].

Yotapukdee, S., Lin, C., Wang, J.-P., Huang, W.-Y., Kaewlaoyoong, A., Mao, W.-M. and Chang, S.-H., 2017. Use of green washing fluids in a washing process for dioxin contaminated soils. *Engineering and Applied Science Research*, 44 (3), 193–195.

Yu, E. P., Van Luu, B. and Chen, C. H., 2020. Greenwashing in environmental, social and governance disclosures. *Research in International Business and Finance*, 52, 101192.

Yuille, A., Rothwell, S., Blake, L., Forber, K. J., Marshall, R., Rhodes, R., Waterton, C. and Withers, P. J. A., 2022. UK Government Policy and the Transition to a Circular Nutrient Economy. *Sustainability*, 14 (6), 3310.

Zafarani, E. and Ghandehari, M., 2023. A game theoretic framework for post-consumer recycled and new packaging industries. *Computers & Industrial Engineering*, 181, 109305.

Zarei, G. and Mirzaei, K., 2022. Impact of Perceived Social Responsibility on Consumers' Green Perception and Green Behavior: The Moderating Role of Personality Traits: Impact of Perceived Social Responsibility on Consumers' Green Perception and Green Behavior: The Moderating Role of Personality Traits. *Journal of Consumer Sciences*, 7 (2), 168–188.

Zaremohzzabieh, Z., Ahrari, S., Krauss, S. E., Samah, A. A., Meng, L. K. and Ariffin, Z., 2019. Predicting social entrepreneurial intention: A meta-analytic path analysis based on the theory of planned behavior. *Journal of Business Research*, 96, 264–276.

Zhang, L., Li, D., Cao, C. and Huang, S., 2018. The influence of greenwashing perception on green purchasing intentions: The mediating role of green word-of-mouth and moderating role of green concern. *Journal of Cleaner Production*, 187, 740–750.

Zhang, M., Biesold, G. M., Choi, W., Yu, J., Deng, Y., Silvestre, C. and Lin, Z., 2022. Recent advances in polymers and polymer composites for food packaging. *Materials Today*, 53, 134–161.

Zhu, Z., Liu, W., Ye, S. and Batista, L., 2022. Packaging design for the circular economy: A systematic review. *Sustainable Production and Consumption*, 32, 817–832.

Zikmund, W. G., 2003. *Business research methods*. Thomson/South-Western.

Zikmund-Fisher, B. J., Fagerlin, A. and Ubel, P. A., 2010. A Demonstration of '"Less Can Be More"' in Risk Graphics. *Medical Decision Making*, 30 (6), 661–671.

Zrnić, M., Brdar, I. and Kilibarda, N., 2021. The importance of traditional food quality — the viewpoint of the tourism. *Scientific journal 'Meat Technology'*, 62 (1), 69–76.

Appendix A: Questionnaire items

All items are answered in a 5-point Likert scale (*strongly disagree* to *strongly agree*)

F1: Core self-evaluation (based on Judge et al. 2003)

Self-efficacy

I complete tasks successfully [EFF_1]

I am capable of coping with most of my problems [EFF_2]

I never have doubts about my competence [EFF_3]

Self-esteem

I am confident I will receive the success I deserve in life [EST_1]

When I try, I generally succeed [EST_2]

Overall, I am satisfied with myself [EST_3]

Emotional Stability

There are never times when things look bleak and hopeless to me [STAB_1]

I feel useful most of the time [STAB_2]

I never feel depressed [STAB_3]

Locus of control

I determine what will happen in my life [CONTR_1]

I feel in control of my success in my career [CONTR_2]

I always feel in control of my work [CONTR_3]

F2: Circular packaging (based on Testa et al. 2020)

Packaging (general)

Compostable packaging is more sustainable than biodegradable packaging [PACK_1]

Circular packaging should be designed and produced in a way that it permits the reuse or recovery of raw materials, and the use of materials from renewable raw materials [PACK_2]

Excessive packaging is a big problem, e.g., individually packed apples in plastic film [PACK_3]

Food packaging

When I buy a food product, I usually look for reusable packaging [FOOD_1]

When I buy a food product, I usually look for packaging made from recycled material [FOOD_2]

When I buy a food product, I usually look for packaging that is easily separated into recyclable components [FOOD_3]

When I buy a food product, I usually check the recyclability information [FOOD_3]

Beverages packaging (tea, coffee, etc.)

When I buy beverages, I usually look for packaging that can be reused, e.g., bring my own cup for coffee/tea [BEV_1]

When I buy beverages, I usually look for packaging made from recycled material [BEV_2]

When I buy beverages, I usually look for packaging that has a simple design that can be easily recycled [BEV_3]

When I buy beverages, I usually check the recyclability information [BEV_4]

F3: Greenwashing (based on Testa et al., 2020 and Leonidou and Skarmeas, 2017)

False Environmental claims (sin1)

Companies use made-up concerns about the environmental features of their products, e.g., false Energy star rating [GW_FIB_1]

Companies use made-up concerns referring to the waste recycling of their products, e.g., use of the TerraCycle logo in areas where TerraCycle does not operate [GW_FIB_2]

Companies use made-up research findings to enhance the sustainability of their product, e.g., claims such as "according to recent research, cars do not produce CO2" [GW_FIB_3]

Misleading labels (sin 2)

Companies use misleading visuals about the environmental features of their products, e.g., visuals with animals, leaves, and nature [GW_MIS_1]

Companies use misleading graphics about the environmental features of their products, e.g., green colour banners, and circular arrows[GW_MIS_2]

Companies use a combination of environmental-related words although the company is not interested in the environment, e.g., the use of pretending like nature-, eco-.,…[GW_MIS_3]

Hidden trade-offs (sin 3)

Companies hide important information about the environmental features of their products, e.g., clothing companies that use green coloured labels and language like "conscious" [GW_HID_1]

Companies leave out important information about the environmental consequences of their products, e.g., for a battery company that uses recyclable plastic for their packaging ignoring the raw materials used for the batteries [GW_HID_2]

Companies concentrate on a narrow set of attributes of their product without paying attention to other important environmental issues, e.g., airline companies advertise themselves as having "lower emissions" [GW_HID_3]

Irrelevant environmental claims (sin 4)

Companies provide vague information about the environmental features of their products, e.g., when apple packaging has a "green vegan" logo is more sustainable [GW_IRR_1]

Companies provide seemingly un-provable information about the environmental features of their products, e.g. when packaging is claiming to have 70% less plastic [GW_IRR_2]

Companies promote an environmental claim that is technically true but irrelevant to their products, e.g., when apple packaging has a CFC- free logo is more sustainable [GW_IRR_3]

Lesser of two evils (sin 5)

Companies make environmental claims for their product although this product has no environmental benefits, e.g., organic cigarettes made from non-bleached paper in traditional packaging are better for the environment [GW_EV_1]

Companies make environmental claims within the product category although their product has nothing to do with environmental benefits, e.g., plastic-wrapped apples are a more sustainable choice because they last longer [GW_EV_2]

Companies make environmental claims for their product by distracting consumers from other major environmental impacts, e.g., Fairtrade bananas in plastic packaging are more sustainable [GW_EV_3]

Unproven claims (sin 6)

Companies are using environmental claims that cannot be easily verified by the customer, e.g., using statistics without providing a source [GW_CL_1]

Companies are using environmental claims that are not verified by a certification body [GW_CL_2]
Companies claim they have eco-friendly products but give no proof of the raw materials, processes, and supply chain they use [GW_CL_3]

Vague claims (sin 7)

Companies use broad claims to be deliberately misunderstood by buyers, e.g., "All-natural" claims that nature can be also poisonous ingredients [GW_VA_1]
Companies use poorly defined claims to be deliberately misunderstood by buyers, e.g., "eco-conscious", and "eco-friendly" claims without elaboration are meaningless [GW_VA_2]
Companies use vague graphics to be deliberately misunderstood by buyers, e.g., the use of graphics that resembles the universal recycling logo [GW_VA_3]

F4: Consumer attributions (based on Nishii et al. 2008)

The following questions were repeatedly asked for each sin (sin1 to sin7)

Companies use {*sin name here*} on their packaging for:

Increasing their sales [AT_FIB_1] [AT_MIS _1] [AT_HID _1] [AT_IRR _1] [AT_EV _1] [AT_CL _1] [AT_VA _1]
Keeping costs down [AT_FIB_2[[AT_MIS _2] [AT_HID _2] [AT_IRR _2] [AT_EV _2] [AT_CL _2] [AT_VA _2]
Minimum disruption of their processes [AT_FIB_3] [AT_MIS _3] [AT_HID _3] [AT_IRR _3] [AT_EV _3] [AT_CL _3] [AT_VA _3]
Demonstrating environmental ethos [AT_FIB_4] [AT_MIS _4] [AT_HID _4] [AT_IRR _4] [AT_EV _4] [AT_CL _4] [AT_VA _4]
Signifying social responsibility [AT_FIB_5] [AT_MIS _5] [AT_HID _5] [AT_IRR _5] [AT_EV _5] [AT_CL _5] [AT_VA _4]

F5: Wishcycling (based on Sløgedal and Starling, 2020)

Quality

I usually put items in the recycling bin that do not belong there, hoping that they will be recycled. [W_QUAL_1]
When I am not sure if the packaging is recyclable, I put it in the recycling bin hoping that somebody else down the line knows better [W_QUAL_2]
I usually put items in the recycling bin that do not belong there, hoping that they will not lead to waste [W_QUAL_3]
I throw in the recycle bin whatever I wish would be recycled [W_QUAL_4]

Contamination

I usually put soft plastic in the recycling bin, hoping that it will not cause down-cycling, e.g., meat container lids [W_CONT_1]
If the packaging is not easy to clean, e.g., a toothpaste tube, I put it in the recycling bin with the leftovers of the product [W_CONT_2]
I usually put dirty/ oily paper in the recycle bin, hoping that it will not cause big trouble, e.g., empty pizza boxes [W_CONT_3]
I usually put plastic bottles and tins in the recycling bin without first washing them, hoping that they will not cause a big problem [W_CONT_4]

Machine damage

I usually put pressurized aerosol cans in the recycling bin, hoping that they will not damage the recycling machinery [W_DAM_1]

I usually put film plastic in the recycling bin, hoping that it will not damage the recycling machinery [W_DAM_2]

I usually put ceramics in the recycling bin, hoping that they will not damage the recycling machinery [W_DAM_3]

Appendix B: Participant consent form

The consent form was presented as a first question in the questionnaire implemented in Qualtrics, branching directly to the end of survey if the participant did not explicitly consent.

Title of the research project: Greenwashing, Wishcycling, and the Circular Economy

What is the purpose of the research/questionnaire?
Circular Economy (CE) is a relatively new concept that is increasingly gaining interest from both individuals and decision-makers. EU and the UK are adapting their policies toward the Circular Economy with numerous directives on how the concept will be implemented and support citizens' everyday life. In this study, we recognise packaging as a major area where CE concept could contribute to sustainability, and we are researching the citizens' perception/attributions towards greenwashing and wish-cycling.

Why have I been chosen?
We have selected individuals who are over the age of 18 and are permanent residents in the UK

Do I have to take part? It is up to you to decide whether or not to take part. If you do decide to take part, you will have access to this information sheet to read. You can withdraw from participation at any time and without giving a reason simply by closing the browser page. Please note that once you have completed and submitted your survey responses, we are unable to remove your anonymised responses from the study.

How long will the questionnaire/online survey take to complete?
Approximately 9 min

What are the advantages and possible disadvantages or risks of taking part? Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will help our understanding of the complexity of circular food/beverage packaging and the mistakes we all make as consumers. Participating in the research is not anticipated to cause you any disadvantages or discomfort.

What type of information will be sought from me and why is the collection of this information relevant for achieving the research project's objectives?
The questionnaire will ask you a few questions about yourself, Circular Economy, Wish-cycling, and Greenwashing. Your views and experiences are just what the project is interested in exploring.

Use of my information
Participation in this study is on the basis of consent: you do not have to complete the survey, and you can change your mind at any point before submitting the survey responses, however, you will only receive payment if you complete the study. We put safeguards in

place to ensure that your responses are kept secure and only used as necessary for this research study and associated activities such as a research audit. Once you have submitted your survey response it will not be possible for us to remove it from the study analysis because you will not be identifiable. The anonymous information collected may be used to support other research projects in the future and access to it in this form will not be restricted. It will not be possible for you to be identified from this data.

Contact for further information

If you have any questions or would like further information, please contact **Anastasia Vayona** at avayona@bournemouth.ac.uk.

Appendix C: Tables of frequences and percentages of responses by items.

CSE: Self-Efficacy	**EFF_1**		**EFF_2**		**EFF_3**	
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	0	0	1	0.186	41	7.635
Disagree	6	1.117	12	2.235	217	40.410
Neither agree/disagree	37	6.890	59	10.987	118	21.974
Agree	341	63.501	338	62.942	121	22.533
Strongly agree	153	28.492	127	23.650	40	7.449
Total	537	100	537	100	537	100

CSE: Self-Esteem	**EST_1**		**EST_2**		**EST_3**	
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	13	2.421	0	0	16	2.980
Disagree	71	13.222	18	3.352	77	14.339
Neither agree/disagree	197	36.685	96	17.877	91	16.946
Agree	208	38.734	347	64.618	298	55.493
Strongly agree	48	8.939	76	14.153	55	10.242
Total	537	100	537	100	537	100

CSE: Emotional Stability	**STAB_1**		**STAB_2**		**STAB_3**	
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	79	14.711	24	4.469	102	18.994
Disagree	229	42.644	70	13.035	236	43.948
Neither agree/disagree	105	19.553	112	20.857	98	18.250
Agree	99	18.436	286	53.259	82	15.270
Strongly agree	25	4.655	45	8.380	19	3.538
Total	537	100	537	100	537	100

CSE: Locus Of Control	**CONTR_1**		**CONTR _2**		**CONTR _3**	
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	9	1.676	19	3.538	11	2.048
Disagree	59	10.987	76	14.153	96	17.877
Neither agree/disagree	201	37.430	184	34.264	190	35.382
Agree	230	42.831	226	42.086	208	38.734
Strongly agree	38	7.076	32	5.959	32	5.959
Total	537	100	537	100	537	100

CIRCULAR PACKAGING:	PACK_1		PACK_2		PACK_3	
General						
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	1	0.186	3	0.559	1	0.186
Disagree	17	3.166	25	4.655	4	0.745
Neither agree/disagree	49	9.125	190	35.382	60	11.173
Agree	217	40.410	220	40.968	310	57.728
Strongly agree	253	47.114	99	18.436	162	30.168
Total	537	100	537	100	537	100

CIRCULAR PACKAGING:	FOOD_1		FOOD_2		FOOD_3		FOOD_4	
Food Packaging								
Response	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	30	5.587	33	6.145	24	4.469	42	7.821
Disagree	151	28.119	144	26.816	134	24.953	144	26.816
Neither agree/disagree	150	27.933	139	25.885	127	23.650	118	21.974
Agree	159	29.609	177	32.961	192	35.754	172	32.030
Strongly agree	47	8.752	44	8.194	60	11.173	61	11.359
Total	537	100	537	100	537	100	537	100

CIRCULAR PACKAGING:	BEV_1		BEV _2		BEV _3		BEV _4	
Beverages Packaging								
Response	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	28	5.214	29	5.400	34	6.331	43	8.007
Disagree	139	25.885	154	28.678	119	22.160	147	27.374
Neither agree/disagree	111	20.670	129	24.022	116	21.601	115	21.415
Agree	185	34.451	185	34.451	200	37.244	177	32.961
Strongly agree	74	13.780	40	7.449	68	12.663	55	10.242
Total	537	100	537	100	537	100	537	100

GREENWASHING:	False	GW_FIB_1		GW_FIB_2		GW_FIB_3	
Environmental claims							
Response		Frequency	%	Frequency	%	Frequency	%
Strongly disagree		29	5.400	24	4.469	21	3.911
Disagree		107	19.926	90	16.760	99	18.436
Neither agree/disagree		214	39.851	228	42.458	173	32.216
Agree		159	29.609	158	29.423	199	37.058
Strongly agree		28	5.214	37	6.890	45	8.380
Total		537	100	537	100	537	100

CONSUMER ATTRIBUTIONS: **False Environmental claims**	**AT _FIB_1**		**AT _FIB_2**		**AT _FIB_3**		**AT _FIB_4**		**AT _FIB_5**	
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	10	1.862	20	3.724	15	2.793	11	2.048	11	2.048
Disagree	40	7.449	126	23.464	71	13.222	42	7.821	26	4.842
Neither agree/disagree	101	18.808	167	31.099	179	33.333	117	21.788	106	19.739
Agree	258	48.045	172	32.030	205	38.175	243	45.251	260	48.417
Strongly agree	128	23.836	52	9.683	67	12.477	124	23.091	134	24.953
Total	537	100	537	100	537	100	537	100	537	100

GREENWASHING: **Misleading labels**	**GW_MIS_1**		**GW_MIS_2**		**GW_MIS_3**	
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	10	1.862	8	1.490	5	0.931
Disagree	32	5.959	33	6.145	24	4.469
Neither agree/disagree	101	18.808	113	21.043	108	20.112
Agree	244	45.438	245	45.624	252	46.927
Strongly agree	150	27.933	138	25.698	148	27.561
Total	537	100	537	100	537	100

CONSUMER ATTRIBUTIONS: **Misleading labels**	**AT_MIS _1**		**AT_MIS _2**		**AT_MIS _3**		**AT_MIS _4**		**AT_MIS _5**	
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	9	1.676	21	3.911	17	3.166	9	1.676	8	1.490
Disagree	23	4.283	114	21.229	73	13.594	26	4.842	23	4.283
Neither agree/disagree	58	10.801	192	35.754	187	34.823	104	19.367	93	17.318
Agree	264	49.162	157	29.236	201	37.430	254	47.300	258	48.045
Strongly agree	183	34.078	53	9.870	59	10.987	144	26.816	155	28.864
Total	537	100	537	100	537	100	537	100	537	100

GREENWASHING: **Hidden trade-offs**	**GW_HID_1**		**GW_HID_2**		**GW_HID_3**	
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	4	0.745	4	0.745	3	0.559
Disagree	38	7.076	25	4.655	17	3.166
Neither agree/disagree	104	19.367	90	16.760	96	17.877
Agree	296	55.121	255	47.486	258	48.045
Strongly agree	95	17.691	163	30.354	163	30.354
Total	537	100	537	100	537	100

CONSUMER ATTRIBUTIONS: Hidden trade-offs	AT_HID _1		AT_HID _2		AT_HID _3		AT_HID _4		AT_HID _5	
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	3	0.559	8	1.490	5	0.931	6	1.117	7	1.304
Disagree	17	3.166	53	9.870	37	6.890	29	5.400	27	5.028
Neither agree/disagree	88	16.387	154	28.678	181	33.706	109	20.298	111	20.670
Agree	274	51.024	228	42.458	221	41.155	257	47.858	245	45.624
Strongly agree	155	28.864	94	17.505	93	17.318	136	25.326	147	27.374
Total	537	100	537	100	537	100	537	100	537	100

GREENWASHING: Irrelevant environmental claims	GW_IRR _1		GW_IRR _2		GW_IRR _3	
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	4	0.745	5	0.931	4	0.745
Disagree	28	5.214	31	5.773	28	5.214
Neither agree/disagree	103	19.181	92	17.132	141	26.257
Agree	296	55.121	274	51.024	267	49.721
Strongly agree	106	19.739	135	25.140	97	18.063
Total	537	100	537	100	537	100

CONSUMER ATTRIBUTIONS: Irrelevant environmental claims	AT_IRR _1		AT_IRR _2		AT_IRR _3		AT_IRR _4		AT_IRR _5	
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	5	0.931	12	2.235	10	1.862	7	1.304	8	1.490
Disagree	19	3.538	90	16.760	57	10.615	16	2.980	18	3.352
Neither agree/disagree	76	14.153	171	31.844	188	35.009	87	16.201	80	14.898
Agree	284	52.886	203	37.803	210	39.106	296	55.121	291	54.190
Strongly agree	153	28.492	61	11.359	72	13.408	131	24.395	140	26.071
Total	537	100	537	100	537	100	537	100	537	100

GREENWASHING: Lesser of two evils	GW_EV _1		GW_EV _2		GW_EV _3	
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	6	1.117	6	1.117	6	1.117
Disagree	37	6.890	51	9.497	29	5.400
Neither agree/disagree	127	23.650	142	26.443	102	18.994
Agree	271	50.466	256	47.672	277	51.583
Strongly agree	96	17.877	82	15.270	123	22.905
Total	537	100	537	100	537	100

CONSUMER ATTRIBUTIONS:	AT_EV _1		AT_EV _2		AT_EV _3		AT_EV _4		AT_EV _5	
Lesser of two evils										
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	4	0.745	12	2.235	8	1.490	10	1.862	8	1.490
Disagree	20	3.724	59	10.987	45	8.380	26	4.842	26	4.842
Neither agree/disagree	91	16.946	167	31.099	175	32.588	107	19.926	104	19.367
Agree	266	49.534	217	40.410	222	41.341	265	49.348	257	47.858
Strongly agree	156	29.050	82	15.270	87	16.201	129	24.022	142	26.443
Total	537	100	537	100	537	100	537	100	537	100

GREENWASHING:	GW_CL _1		GW_CL _2		GW_CL _3	
Unproven claims						
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	6	1.117	6	1.117	3	0.559
Disagree	32	5.959	40	7.449	27	5.028
Neither agree/disagree	92	17.132	132	24.581	81	15.084
Agree	236	43.948	240	44.693	268	49.907
Strongly agree	171	31.844	119	22.160	158	29.423
Total	537	100	537	100	537	100

CONSUMER ATTRIBUTIONS:	AT_CL _1		AT_CL _2		AT_CL _3		AT_CL _4		AT_CL _5	
Unproven claims										
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	5	0.931	11	2.048	8	1.490	8	1.490	10	1.862
Disagree	19	3.538	64	11.918	55	10.242	19	3.538	19	3.538
Neither agree/disagree	70	13.035	171	31.844	185	34.451	98	18.250	86	16.015
Agree	269	50.093	212	39.479	212	39.479	272	50.652	274	51.024
Strongly agree	174	32.402	79	14.711	77	14.339	140	26.071	148	27.561
Total	537	100	537	100	537	100	537	100	537	100

GREENWASHING:	GW_VA _1		GW_VA _2		GW_VA _3	
Vague claims						
Response	Frequency	%	Frequency	%	Frequency	%
Strongly disagree	6	1.117	7	1.304	7	1.304
Disagree	26	4.842	20	3.724	28	5.214
Neither agree/disagree	114	21.229	64	11.918	109	20.298
Agree	248	46.182	287	53.445	248	46.182
Strongly agree	143	26.629	159	29.609	145	27.002
Total	537	100	537	100	537	100

CONSUMER ATTRIBUTIONS:	AT_VA _1		AT_VA _2		AT_VA _3		AT_VA _4		AT_VA _5	
Vague claims										
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	6	1.117	17	3.166	13	2.421	8	1.490	9	1.676
Disagree	17	3.166	70	13.035	51	9.497	20	3.724	19	3.538
Neither agree/disagree	72	13.408	170	31.657	184	34.264	76	14.153	88	16.387
Agree	261	48.603	192	35.754	197	36.685	275	51.210	263	48.976
Strongly agree	181	33.706	88	16.387	92	17.132	158	29.423	158	29.423
Total	537	100	537	100	537	100	537	100	537	100

WISHCYCLING:	W_QUAL _1		W_QUAL _2		W_QUAL _3		W_QUAL _5	
Quality								
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	232	43.203	129	24.022	240	44.693	252	46.927
Disagree	208	38.734	183	34.078	213	39.665	200	37.244
Neither agree/disagree	38	7.076	71	13.222	31	5.773	37	6.890
Agree	52	9.683	136	25.326	45	8.380	37	6.890
Strongly agree	7	1.304	18	3.352	8	1.490	11	2.048
Total	537	100	537	100	537	100	537	100

WISHCYCLING:	W_CONT _1		W_CONT _2		W_CONT _3		W_CONT _5	
Contamination								
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	194	36.127	131	24.395	176	32.775	163	30.354
Disagree	187	34.823	135	25.140	149	27.747	168	31.285
Neither agree/disagree	75	13.966	67	12.477	54	10.056	54	10.056
Agree	71	13.222	171	31.844	140	26.071	124	23.091
Strongly agree	10	1.862	33	6.145	18	3.352	28	5.214
Total	537	100	537	100	537	100	537	100

WISHCYCLING:	W_DAM _1		W_DAM _2		W_DAM _3	
Machine damage						
Response	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	194	36.127	131	24.395	176	32.775
Disagree	187	34.823	135	25.140	149	27.747
Neither agree/disagree	75	13.966	67	12.477	54	10.056
Agree	71	13.222	171	31.844	140	26.071
Strongly agree	10	1.862	33	6.145	18	3.352
Total	537	100	537	100	537	100