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# Consumer Behavior and Circular Economy - Bibliometric and Content Analysis

Carolina Martínez-Infante Salazar  
Christoph P.Kiefer  
Javier Carrillo-Hermosilla

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### ABSTRACT

Climate Change is a reality that causes serious environmental problems on a global scale. It is caused by human action, specifically by the current economic model that is inefficient with regards to resource and energy use, and it causes harm to the environment. Searching for a solution for these problems, the Circular Economy (CE) mindset has gained importance over the last years. It provides an outline of an economic system based on models of production and consumption where cycles dominate. The shift towards CE cannot occur without considering Consumer Behavior (CB), i.e., the acceptance of circular products and services is a prerequisite for changing CB, which will in turn lead to an increase in circular consumption.

The rise of environmental problems and the solutions offered by the implementation of Circular Business Models (CBM) have drawn the attention of many researchers from various disciplines, including CB. This study systematizes the knowledge generated by 111 research papers on CE and CB gathered from the Scopus and WoS databases. It employs a content analysis focusing on the co-occurrence of keywords obtained in the bibliometric analysis, highlighting the importance of using quantitative methods, as well as that of China and the US as research settings. Co-occurrence analysis further identified three clearly differentiated clusters among the studies. Cluster 1. represents the attitudes and human traits that are a (pre-)condition to CB and decision making; Cluster 2. treats the topics of CB and decision making themselves in more in depth; and Cluster 3. represents issues related to Sustainable Development and CE. The above-outlined topic has been gaining attention in the recent years, yet there is still a broad gap for researchers to further investigate and propose valuable solutions and ideas to promote CBMs and circular consumption, to which this paper provides a contribution.

**Key words:** Circular Economy, Consumer Behavior, Bibliometric Analysis, Literature Review, Waste Management.

### RESUMEN

El Cambio Climático es una realidad que provoca graves problemas ambientales a escala global. Es causado por la acción humana, específicamente por el modelo económico actual, que es ineficiente en el uso de recursos y energía, y daña al medio ambiente. En la búsqueda de una solución a estos problemas, la perspectiva de la Economía Circular (EC) ha ganado importancia en los últimos años. Proporciona un esbozo de un sistema económico basado en modelos de producción y consumo donde dominan los ciclos. El cambio hacia la EC no puede ocurrir sin considerar el Comportamiento del Consumidor (CC), es decir, la aceptación de productos y

servicios circulares es un requisito previo para cambiar el CC, lo que a su vez conducirá a un aumento en el consumo circular.

El auge de los problemas ambientales y las soluciones que ofrece la implementación de Modelos de Negocio Circulares (MNC) han llamado la atención de muchos investigadores de diversas disciplinas, incluida la relativa al CC. El presente estudio sistematiza el conocimiento generado por 111 trabajos de investigación sobre EC y CC recopilados de las bases de datos Scopus y WoS. Emplea un análisis de contenido centrándose en la co-ocurrencia de palabras clave obtenidas en el análisis bibliométrico, destacando la importancia del uso de métodos cuantitativos, así como el uso de China y Estados Unidos como escenarios de investigación. El análisis de co-ocurrencia identificó, además, tres clusters o grupos claramente diferenciados entre los estudios. El grupo 1 representa las actitudes y rasgos humanos que son una (pre)condición para el CC y la toma de decisiones. El grupo 2 trata los temas de CC y la toma de decisiones en sí mismos con mayor profundidad. Por último, el grupo 3 representa temas relacionados con el desarrollo sostenible y la CE. El tema descrito anteriormente ha ido ganando atención en los últimos años; sin embargo, todavía existe un gran espacio para nuevas investigaciones y para proponer soluciones e ideas valiosas que promuevan los MNC y el consumo circular, a lo cual contribuye este documento.

**Palabras clave:** Economía Circular, Comportamiento del Consumidor, Análisis Bibliométrico, Revisión de Literatura, Gestión de Residuos.

## AUTORÍA

**CAROLINA MARTÍNEZ-INFANTE SALAZAR** Master's Degree in Management and Change Management, University of Alcalá (Spain)

**CHRISTOPH P.KIEFER** PhD. Senior Researcher at Fraunhofer Institute for Systems and Innovation Research (ISI)

**JAVIER CARRILLO-HERMOSILLA** PhD. Professor, Department of Economics and Business, University of Alcalá

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## 1. Introduction

Climate Change is a reality that causes serious environmental problems on a global scale. It is caused by human action, specifically by the current economic model that is not only inefficient with regards to resource and energy use, but also directly harmful to the environment. Increasingly, these environmental problems translate into tangible business problems because natural resource and energy supply become less stable, and markets change due to policy intervention and changing (greening) customer preferences. According to Kaza et al. (2018), global waste is projected to grow by 70% compared to today, all given by rapid urbanization and population growth. These facts jeopardize the environment and the natural resources, which are limited and becoming more and more difficult to extract.

The concept of Circular Economy (CE) has become prominent over the last decades, as it provides an outline of an ideal economic system based on models of production and consumption where cycles dominate. It is restorative and regenerative by design, it aims to produce goods and services that are designed in such a way that at the end of their useful life, their waste can be reused or recycled either in biological or technical cycles and to reduce the use of natural resources as an input (Ellen MacArthur Foundation, 2017). The objective is to minimize waste as much as possible combined with the aim of reducing the need to buy new products by introducing the term of refurbishment or reutilization of components, all while seeking to improve sustainability through greater use of renewable energy. The CE is based on the principle that economic value of resources and energy is maintained throughout cascading uses and the decoupling of new value creation from natural resource use and waste generation. Many authors have shown that the CE is able to alleviate environmental problems and improve business competitiveness simultaneously (i.e., Carrillo-Hermosilla et al., 2009; Del Río et al., 2021; Pieroni et al., 2021; Van Schoubroeck et al., 2022). Transition-related studies in the context of CE have looked at mechanisms to achieve the CE, i.e., by firms introducing eco-innovations as a motor of change (i.e., Kiefer et al., 2021), by developing new business models (i.e., Ferrasso et al., 2020; Asgari and Asgari, 2021; Kim, Kuah and Thirumaran, 2022) or through a technical perspective based on different closed/closing loop processes (the R-framework) (i.e., Reike et al., 2018). These studies have in common that they address the supply side in the sense that new solutions are developed and introduced into the market and that their uptake generates traction towards achieving

the CE. Considering that such an uptake of solutions is not simply “given”, it is surprising to find a much lesser number of studies addressing circular consumption and end-user behavior from a demand-side perspective (i.e., Testa et al., 2020 or Camacho-Otero et al., Parajuly et al., 2020). Circular consumption is the process of acquisition, appropriation, appreciation, devaluation, divestment and disposal of products and services that allows for reducing, reusing, recycling, or recovering the materials within the CE (Kircherr et al., 2017). According to Camacho-Otero and Chamberlin (2019), CE purchase behavior does not mean to simply swap one type of product purchase for an equivalent more ‘sustainable’ or ‘green’ one, but it requires deep changes in behavior shifting away from acquisition orientation and towards repair, reuse or resale orientation; in other words, to drift away from linear systems of consumption. Consumer acceptance of circular products and services is a prerequisite for changing customer behavior leading in turn to an increase in circular consumption. Therefore, businesses that offer circular products and services should highlight the environmental benefits of their products and services to increase consumer acceptance (Boyer et al., 2020; de Moraes, Pinto and Cruz-Jesus, 2021). In short, this paper addresses the intersection between consumer behavior as a prerequisite for an increase in circular consumption of products and services provided under (new) circular business models (CBMs).

This paper is structured as follows. Section 2 provides an overview of business models, and CB in the context of CE. Section 3 provides details on the methodology. Section 4 presents the results. Section 5 concludes with some implications for future research.

## **2. Business models and consumer behavior in the context of the CE**

According to Geissdoerfer et al. (2020, p.123741), circular business models are defined as “*business models that are cycling, extending, intensifying, and/or organizational material and energy loops to reduce the resource inputs into and the waste and emission leakage out of an organizational system*”. As per Bocken et al. (2019, p.2210), “*to embed circular practices in the business model, firms can design products for longevity, provide offers aligned with preserving product integrity or recover material resources at end of life (i.e., recycling, industrial symbiosis)*”, and in order to close the loop firms have to figure out how to materialize key factors such as marketing strategies and reverse logistics that involve the consumers in the process.

To be successful, new CBMs need to be attractive to consumers, who have the desire to consume in a sustainable way if they have easy opportunities and tools to make better consumption choices through consumer markets (Lammi et al., 2011). According to Rakic and Rakic (2015), the consumers' barriers to sustainable consumption that occur more frequently are lack of information and awareness, culture, habits, lack of trust in quality and/or functionality, poor availability, and price. CBMs can propose the design of circular products and materials that are suitable for the technical cycle, this means that they can be used/redistributed, maintained/prolonged, refurbished/remanufactured, or recycled (Ellen MacArthur Foundation, 2017). According to Lacy and Rutqvist (2015) the main CMBs can be categorized as: (1) Circular supply, where companies look forward substituting linear resources and at the same time reduce waste and eliminate inefficiencies; (2) Refurbishing and recycling, which enables the reduction of material loss and the maximization of economic value coming from the return inflow of the products; (3) Extending product life cycle, by updating, refurbishing or repairing techniques; (4) the concept of product-as-a-service where the ownership of the product remains with the manufacturer, which is an incentive for longer product life, easier refurbishment, and better recycling; and finally, (5) the sharing platforms in which a business promotes collaboration among users to increase the usage and value derived from products, an example of this are the car-sharing platforms, (Lacy and Rutqvist, 2015; Ellen MacArthur Foundation, 2017).

Delmas and Colgan (2018) propose to link benefits to customers through circular consumption with advantages that appeal to consumers' personal values more generally such as quality, health, status, wealth, and positive emotions. Transparency from the firms on the other hand, can suppose an opening path towards sustainability since this will be a solution to the lack of trust from consumers. Consumer behavior (CB) is a consequence of the acceptance of circular products and services. From the firm's perspective, generating an understanding of consumer buying behavior is a key parameter to reach and engage consumers. CB comprises the study of consumers and the processes they use to choose, use (consume), and dispose of products and services, including consumers' emotional, mental, and behavioral responses (Ajzen, 2008). It involves the use and disposal of products as well as the study of how they are purchased, it involves services and ideas as well as tangible products. The environmental impact of consumer behavior is highly relevant, since consumption certainly has environmental

costs, such waste levels increasing, pollution and climate change which are dangerous threats for sustainable development (Barmola and Srivastava, 2010; Velenturf and Purnell, 2021). Consumers together with Governments and producers need to play an active role in supporting more sustainable models. There needs to be a shift from optimizing on lowest initial cost towards maximizing the total value and total cost of ownership while at the same time taking the health and wellbeing of people into account (Houten, 2014).

According to Huang and Rust (2010), consumption inequity is a significant impediment to sustainability and is a source of global conflict. Consumers who live in the developed countries account for about 20% of the human population and consume more than 80% of the resources and they are willing to pay a higher price for materials than low-income countries.

It does not surprise then that the developed countries produce more than a third of the waste, while East Asia and the Pacific generate about a quarter of the total. In the case of Africa and South Asia their production is expected to triple and double respectively in the next thirty years. On the other hand, it should be noted that, although in the most developed countries more than a third of waste is recycled and recovered, in low-income countries only 4% is recycled (Kaza et al. 2018).

Putting together both concepts of CBMs and CB in the context of CE, a significant overlap becomes clearly visible. The much-needed transformation towards the CE depends on both CBMs (with firms as main actors) and CB (with consumers as main actors). Only if both are addressed, that transformation of economic systems and their contribution to sustainable development can be understood. However, according to Camacho-Otero et al. (2019) the existing literature has focused mainly on the supply-side of how production can become circular via innovative business models, processes, and products. Also, Duke et al. (2018) remarks some research gaps on CB with respect to the CE products and services, such as, how quality and price-related characteristics can promote or hinder consumers' circular behavior, which other important factors besides price and quality can drive consumers' purchasing patterns, to what extent expected innovations and product improvements play a role in consumers' perceptions and what are the drivers of consumers' desire for new products.



Even though the interest on the topic of consumption regarding CE practices is growing, not many researchers even acknowledge CB when talking about circular products and services (Kirchherr et al. 2017). Some researchers have highlighted the need for more detailed investigations into the implications of the CE for the consumers (Hobson and Lynch, 2016; Welch et al., 2017). Since the evidence shows that much less research has centered around the aspects regarding the consumer side rather than the production side, this is the focus of this paper.

As far as we are aware, very few literature reviews in this context exist. Chamberlin and Boks (2018) have researched on the marketing approaches for a CE which includes research on both CE and CB concepts, but it does not involve a bibliometric analysis, as in this paper. On the other hand, Pisitsankkhakarn and Vassanadumrongdee (2020) also approach research on both concepts, but they focus on CE and consumer responses to it only in emerging countries. After performing broad research, and to the best of our knowledge, there aren't any bibliometric studies regarding focusing on both terms CE and CB.

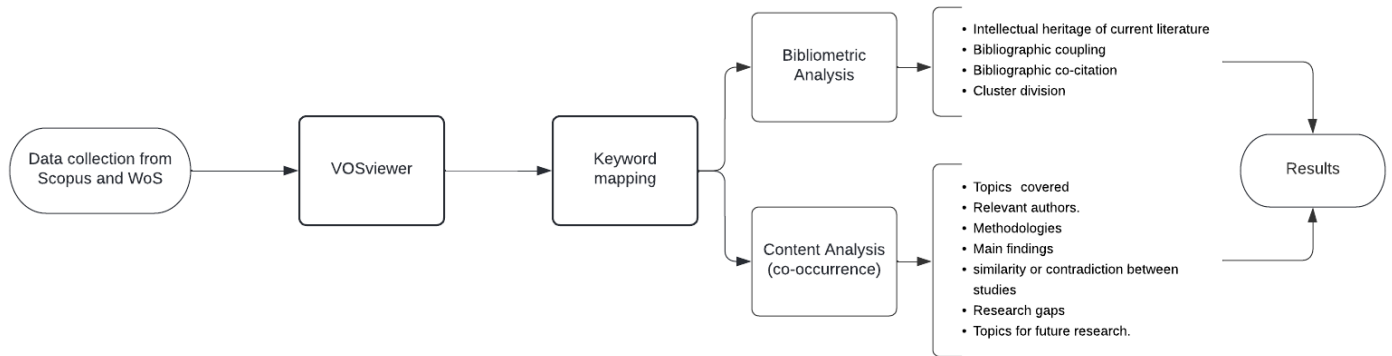
Consequently, the aim of this paper is addressing this lack of previous research and to perform a bibliometric and a content analysis, which will be organized in the following manner. First, the methodology for the bibliometric analysis followed by the methodology for the content analysis will be described to explain the rationale of the procedures we will follow to obtain the results of this study. Secondly, the results of both analyses will be stated following the same order: first a bibliometric analysis, and then a content analysis, to represent the core findings derived from the methodology applied to gather and analyze information. Lastly, the results of both analyses will be put together in the discussion section, where the findings and limitations of this research interpreted and evaluated.

### **3. Methodology**

In this paper, we will perform a two-tier analysis consisting of a bibliometric and a content analysis. Through the bibliometric study the intellectual structure of the existing research concerning CE and CB will be mapped. With that mapping, the topics that are the least studied are also identified in order to propose future areas of research. Additionally,

through the content analysis it is sought to find out whether previous research is consistent on the definitions of CE and CB.

**Figure 1. Methodology flowchart.**



### 3.1. Methodology of the bibliometric analysis

A bibliometric analysis is a method to describe, evaluate, and monitor the existing research on a particular topic. It serves as well as an evaluation method, and it can help determine the impact of a specific technology or the effectiveness of an author or research organization. It is also a monitoring tool that can help to track the level of activity in a research field over time (Ziegler, 2009).

We based this research on publications included in two databases, Web of Science (WoS) and Scopus. We have selected all the research done containing "Consumer\* behavior" AND "Circular Economy", where we use the asterisk (\*) to include all the different variations from the word "consumer" such as "consumption". We focused on CB to differentiate it from consumer attitude, which is the tendency, favorable or unfavorable, of the consumers' response to a product or service (Ajzen, 2008). The data has been selected in English language and it ranges from the year 2000 up to the year 2020.

**Figure 2. Data collection.**

Database	Keyword search	Result
Web of Science (Thomson Reuters)	<< TOPIC: ("Consumer* behavior" AND "Circular Economy") AND LANGUAGE: (English) Time frame: 2000-2020 >>	45 documents including journal articles, book chapters and conference papers
Scopus (Elsevier)	<< TITLE-ABS-KEY ("Consumer* behavior" AND "Circular Economy") AND LANGUAGE ( English )) AND PUBYEAR > 999 AND PUBYEAR < 2021 >>	91 documents including journal articles, book chapters and conference papers.

First, we reviewed the results to eliminate the duplicates and proceeded to analyze all the information together by manually merging the results from WoS and Scopus into a unique database.

To draw the conceptual maps, we used VOSviewer ([www.vosviewer.com](http://www.vosviewer.com)), a software tool for building and interpreting bibliometric networks. These networks may include, for example, individual journals, researchers, or publications, and can be built based on citation, bibliographic coupling, co-citation, or co-authorship relationships (Liu et al., 2015). VOSviewer also offers text mining functionality that can be used to build and visualize co-occurrence networks of important terms extracted from a body of scientific literature. Being the objective to find out the following:

- The intellectual heritage of current literature. To trace the trajectory of the research regarding both topics, CE and CB, we will analyze the citations to detect and visualize the disciplinary distributions, which journals and institutions are more involved, authors from which countries have more interest on the topic and on the cited, and also the time frame development on the topic.
- The bibliographic coupling between the existing research. This is premised on the concept that two documents are related if they have at least one reference in common, the higher the number of references to the same texts, the greater the similarity between the citing texts (Jarneving, 2007).
- The bibliographic co-citation between texts. Two documents are said to be co-cited when they both appear together referenced in the same text. In other words, it is the frequency with which two documents are cited together (Egghe et al., 2002).

- By using the VOSviewer tool we get the different clusters that conform all the bibliographic network. These clusters are just the data classified into homogeneous groups. Clusters are non-overlapping in VOSviewer and cannot be set exogenously. In other words, an item will belong to only one cluster. Clusters do not need to exhaustively cover all items in a map. Hence, there may be items that do not belong to any cluster. Clusters are labeled using cluster numbers. If there is only one cluster, this cluster usually has cluster number 1, if there are two clusters, these clusters usually have cluster numbers 1 and 2, and so on.

The result of the study leaves us with different maps conformed by clusters of items, which are the objects of interest, for example the publications, researchers, or keywords, depending on the data analysis we want to focus on (Nees Van Eck and Waltman, 2018).

### 3.2. Methodology of the content analysis

For the content analysis we will focus on the co-occurrence of keywords we obtained from the bibliometric analysis.

Keywords provide a concise and precise high-level summarization of a document. They therefore constitute an important feature for document retrieval, classification, topic search and other tasks (Wartena et al. 2010)

Co-occurrence refers to the common presence, frequency of occurrence, and proximity of similar keywords present across several documents. It can include keywords that are similar to each other and based on the same topic but are not exactly the same (Eck and Waltman, 2018).

The co-occurrence of keywords analysis will provide a map in which our keywords, being the objects of interest, will be grouped into different clusters.

We will set a threshold of a minimum of five mentions per keyword which is a common practice for these kind of analyses in order to have clearly differentiated and consistent clusters (Zhang et al., 2019; Uriona and Vaz, 2017; Pesta, Fuerst and Kirkegaard, 2018). Then we will identify all the papers that form each cluster in order to address the following scopes of the research:

- The topics that have been covered.
- The most relevant authors.
- The methodologies applied to perform the research.
- Main findings of the research.
- The similarity between the studies or if they contradict.
- The research gaps
- Possible topics to direct future research.

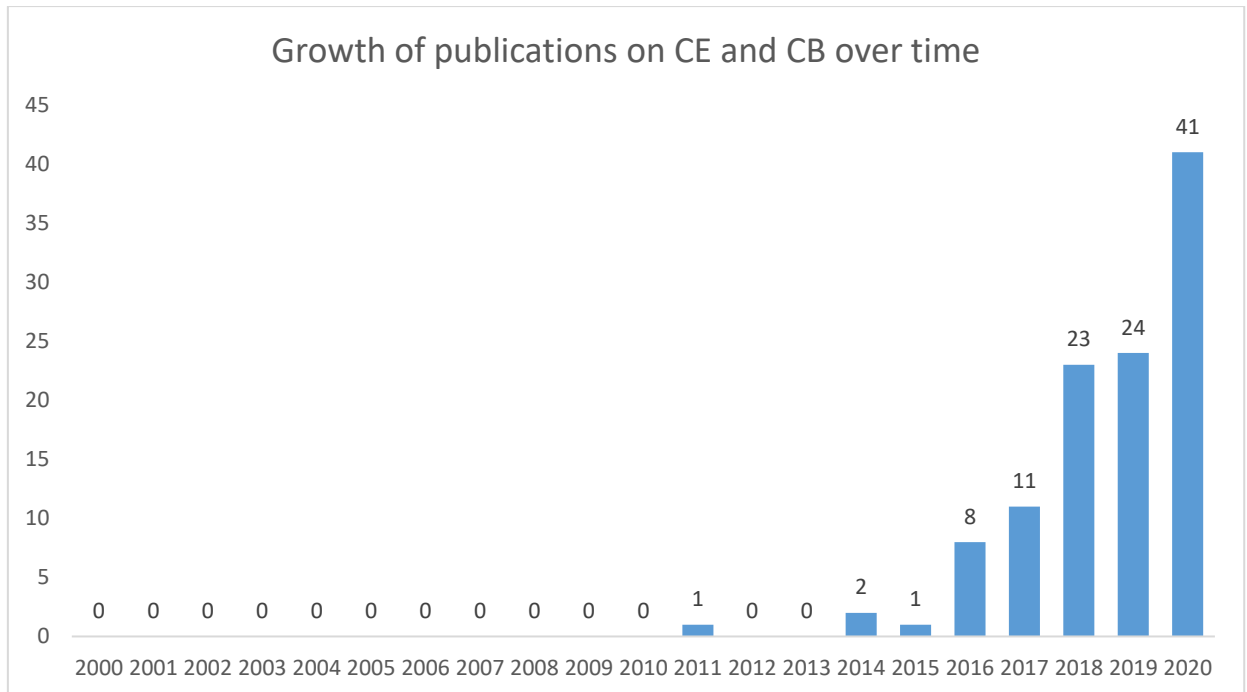
## 4. Results

### 4.1. Results of the bibliometric study

After merging the information found on both databases (91 documents in Scopus and 45 in WoS, for details see the previous section) we encountered a total of 111 research documents, without having into account a total of 25 articles that both sites had in common (See Annex 1).

The first research question we want to solve is about the growth of the research on this topic over time. We have selected the time frame ranging between the year 2000 and 2021:

**Figure 3. Growth of publications on CE and CB over time.**



Source: Self elaborated with data obtained from WoS and Scopus. (March, 2021)

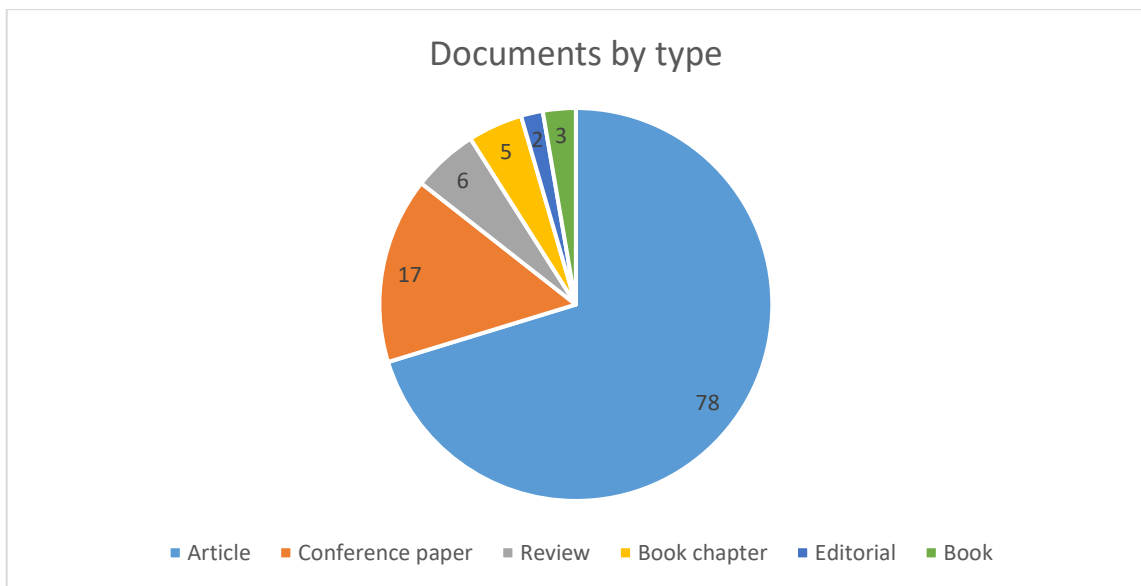
As we can see although we selected a twenty-year time frame, the first publication on this topic according to our results took place only 10 years ago: Zhilei, Y. and Wei, W. (2011).

After this article, there were no other publications until 2014 and 2015, when we find just 3 documents on these topics (Conti *et al.*, 2014; Ferdousi *et al.*, 2014; Ferdousi *et al.*, 2016).

It is not until 2016 that we see an increase on the interest of researchers on this topic, which is in line with the research done on the topic of CE itself. This literature addressed in the most recent years even recommends relevant future CE research directions, including the topic of consumption (Van Welden *et al.*, 2016; Lakatos *et al.*, 2018; Goyal, *et al.*, 2020).

As per the documents by type, we encounter that most of them are articles (70,27%), followed by conference papers (15,32%), review articles (5,41%), book chapters (4,50%), books (2,79%) and finally editorials (1,8%).

**Figure 4. Documents by type.**



Source: Self elaborated with data obtained from WoS and Scopus. (March 2021)

The authors that are more involved in the research of this topic are Mugge, R. with 5 articles, and Behdad S. and Bakker C., both with 3 articles, while most authors involved in this topic have an average of 2 documents already published (see Annex II.).

The research is divided among the following topics:

**Figure 5. Percentage of research by topic.**

Topic	Percentage of research by
Environmental Science	25,8%
Energy	12,7%
Engineering	12,3%
Business Management and Accounting	12,3%
Economics, Econometrics, and Finance	8,1%
Social Sciences	7,2%
Computer Science	6,4%
Materials Science	3,0%
Decision Sciences	2,5%

Agricultural and Biological Sciences	2,1%
Arts and Humanities	1,7%
Chemical Engineering	0,8%
Chemistry	0,8%
Mathematics	0,8%
Multidisciplinary	0,8%
Physics and Astronomy	0,8%
Biochemistry, Genetics and Molecular Biology	0,4%
Earth and Planetary Sciences	0,4%
Medicine	0,4%
Psychology	0,4%

Source: Self elaborated with data obtained from WoS and Scopus. (March 2021)

As we can see on the table, mainly research is focused on environmental science, particularly on the topic related to sustainability.

The most influential institutions that promote research on this topic are Delft University of Technology located in the Netherlands with 9 publications, Faculty of Industrial Design (Faculteit Industrieel Ontwerpen – TU) Delft which is also located in the Netherlands with 5 publications, and the State University of New York at Buffalo with 4 publications. As we can see in Figure 6., this is in line with the publications by country.

In the following table we have identified the most influential journals on this topic and the number of publications that each one englobes:

**Figure 6. Most influential journals.**

Source	Publisher	Number of publications
Sustainability	MDPI	13
Journal of Cleaner Production	Elsevier	9
Resources, Conservation & Recycling.	Elsevier	9
Sustainable Production and Consumption	Elsevier	3
Advances in Intelligent Systems and Computing	Springer	2

Source: Self elaborated with data obtained from WoS and Scopus. (March 2021)



We have detailed in the table below the list of the ten most cited articles:

**Figure 7. Most cited articles.**

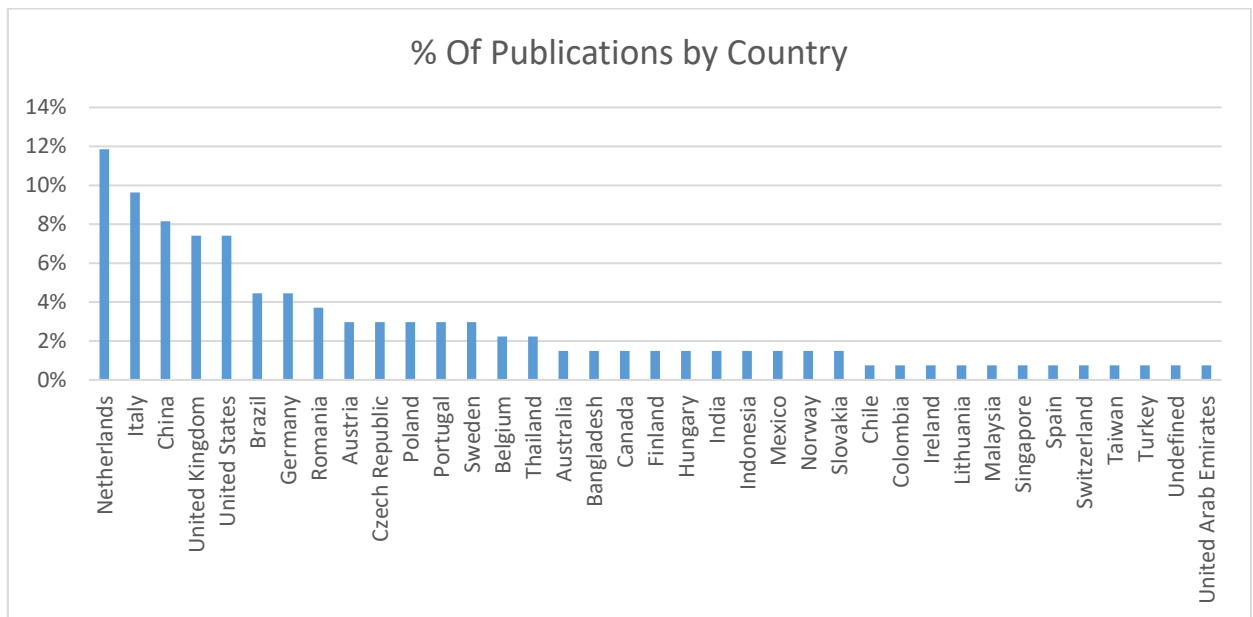
Article	Times Cited
Smol, M., Kulczycka, J., Henclik, A., Gorazda, K. and Wzorek, Z. (2015). The possible use of sewage sludge ash (SSA) in the construction industry as a way towards a circular economy. <i>Journal of Cleaner Production</i> , 95, pp.45–54.	192
Nobre, G.C. and Tavares, E. (2017). Scientific literature analysis on big data and internet of things applications on circular economy: a bibliometric study. <i>Scientometrics</i> , 111(1), pp.463–492.	109
van Weelden, E., Mugge, R. and Bakker, C. (2016). Paving the way towards circular consumption: exploring consumer acceptance of refurbished mobile phones in the Dutch market. <i>Journal of Cleaner Production</i> , 113, pp.743–754.	106
Hazen, B.T., Mollenkopf, D.A. and Wang, Y. (2016). Remanufacturing for the Circular Economy: An Examination of Consumer Switching Behavior. <i>Business Strategy and the Environment</i> , 26(4), pp.451–464.	103
Dalhammar, C. (2016). Industry attitudes towards ecodesign standards for improved resource efficiency. <i>Journal of Cleaner Production</i> , 123, pp.155–166.	54
De Meester, S., Nachtergaele, P., Debaveye, S., Vos, P. and Dewulf, J. (2019). Using material flow analysis and life cycle assessment in decision support: A case study on WEEE valorization in Belgium. <i>Resources, Conservation and Recycling</i> , 142, pp.1–9.	30
Lakatos, E., Cioca, L.-I., Dan, V., Ciomos, A., Crisan, O. and Barsan, G. (2018). Studies and Investigation about the Attitude towards Sustainable Production, Consumption and Waste Generation in Line with Circular Economy in Romania. <i>Sustainability</i> , 10(3), p.865.	29
Guo, B., Geng, Y., Sterr, T., Zhu, Q. and Liu, Y. (2017). Investigating public awareness on circular economy in western China: A case of Urumqi Midong. <i>Journal of Cleaner Production</i> , 142, pp.2177–2186.	28

Borrello, M., Lombardi, A., Pascucci, S. and Cembalo, L. (2016). The Seven Challenges for Transitioning into a Bio-based Circular Economy in the Agri-food Sector. <i>Recent Patents on Food, Nutrition &amp; Agriculture</i> , 8(1), pp.39–47.	25
Makov, T. and Font Vivanco, D. (2018). Does the Circular Economy Grow the Pie? The Case of Rebound Effects From Smartphone Reuse. <i>Frontiers in Energy Research</i> , 6.	24

Source: Self elaborated with data obtained from WoS and Scopus. (March 2021)

In the country analysis we can identify Netherlands, Italy, and China as the countries whose researchers are most interested about this topic. In the following graph we can see the percentage of publications by country:

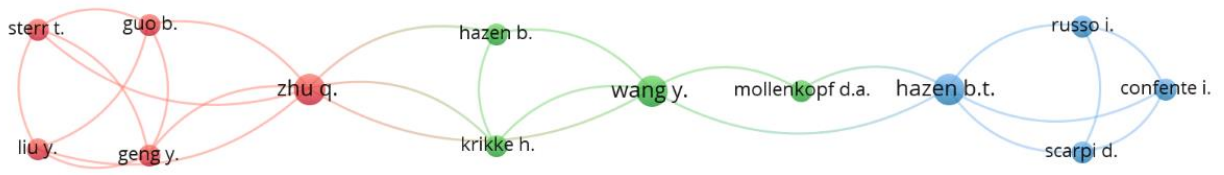
**Figure 8. Percentage of publications by country.**



Source: Self elaborated with data obtained from WoS and Scopus. (March, 2021)

As per the intellectual structure of research, first of all, we will analyze co-authorship. According to Kumar (2015), co-authorship, a proxy of research collaboration, is a key mechanism that links different sets of talent to produce a research output. Using VOSviewer we obtained the following map:

**Figure 9. Co-authorship network by author.**

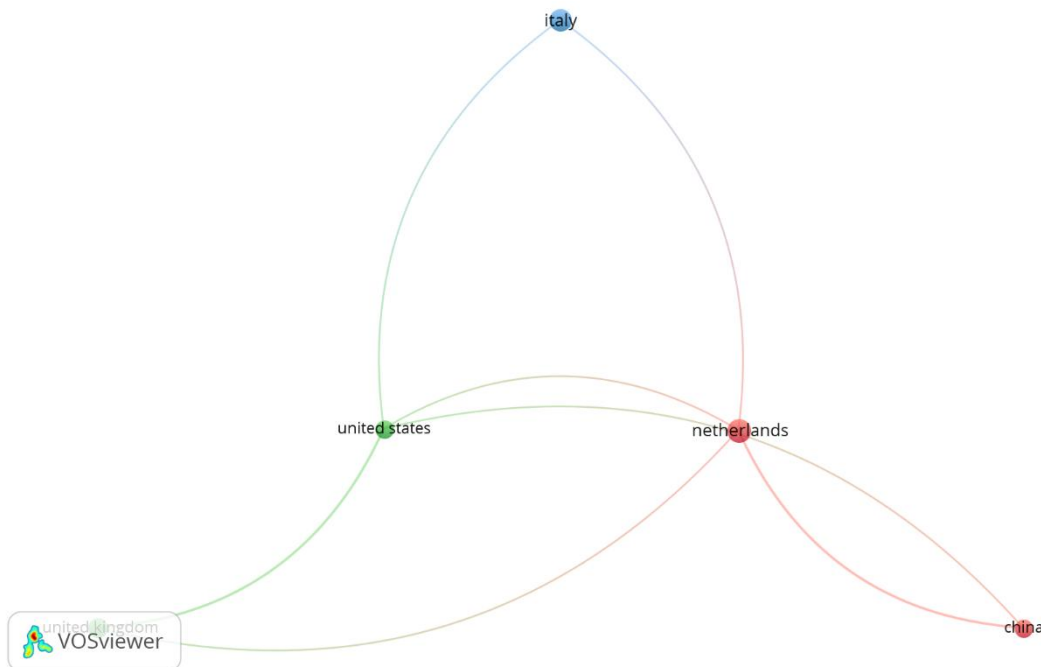


Source: Self elaborated using VOSviewer with data obtained from WoS and Scopus. (March, 2021)

Out of 259 authors involved in the research, we found a weak connection among all of them, creating just a network that involves 13 authors that have collaborated at some extent. The image creates three clusters from which only one (green) is connected to the other two.

If we analyze the same co-authorship but considering the country origin of the research, we obtain the following image:

**Figure 10. Co-authorship network by country.**

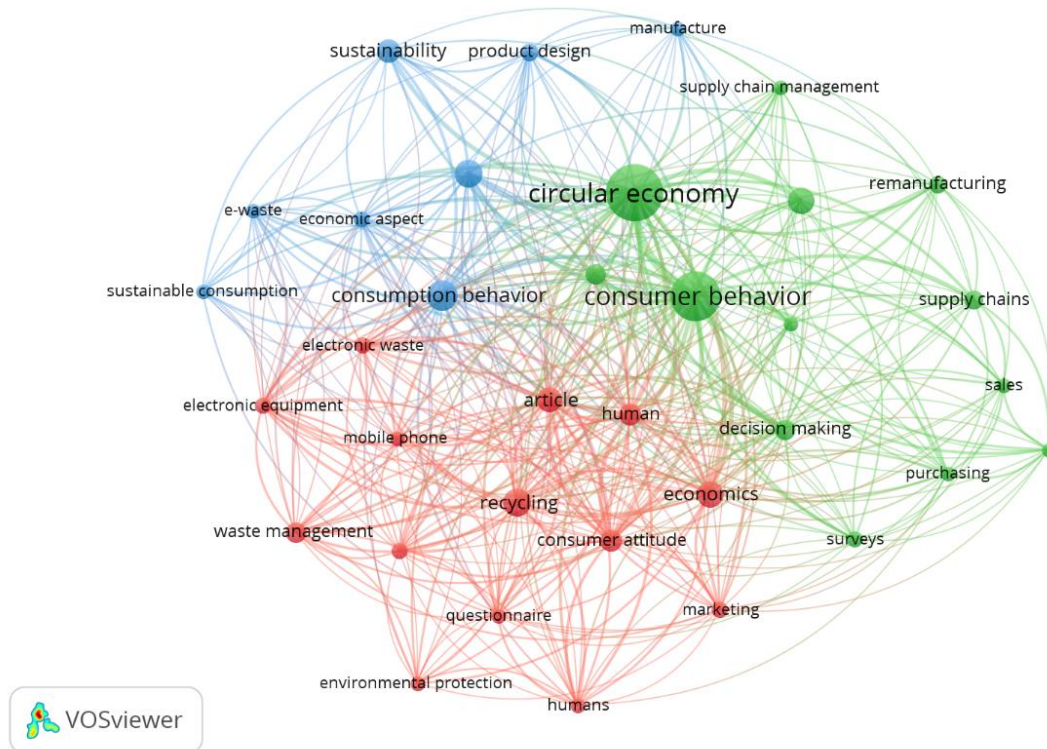


Source: Self elaborated using VOSviewer with data obtained from WoS and Scopus. (March 2021)

The result is a network shaped by three clearly differentiated clusters of authors all interconnected. The researchers from China have only collaborated with those coming from Netherlands, being also remarkable that this last country is the one which has most of the research on this topic.

In order to reveal a clearer network representing the co-occurrence of keywords among the documents, we selected a threshold of a minimum of five mentions per keyword, which is a common practice for this kind of analyses in order to have clearly differentiated and consistent clusters (Zhang et al., 2019; Uriona and Vaz, 2017; Pesta, Fuerst and Kirkegaard, 2018). This left us with the following image, where out of 833 total keywords, 35 met the threshold:

**Figure 11. Co-occurrence of keywords with threshold of five minimum mentions.**

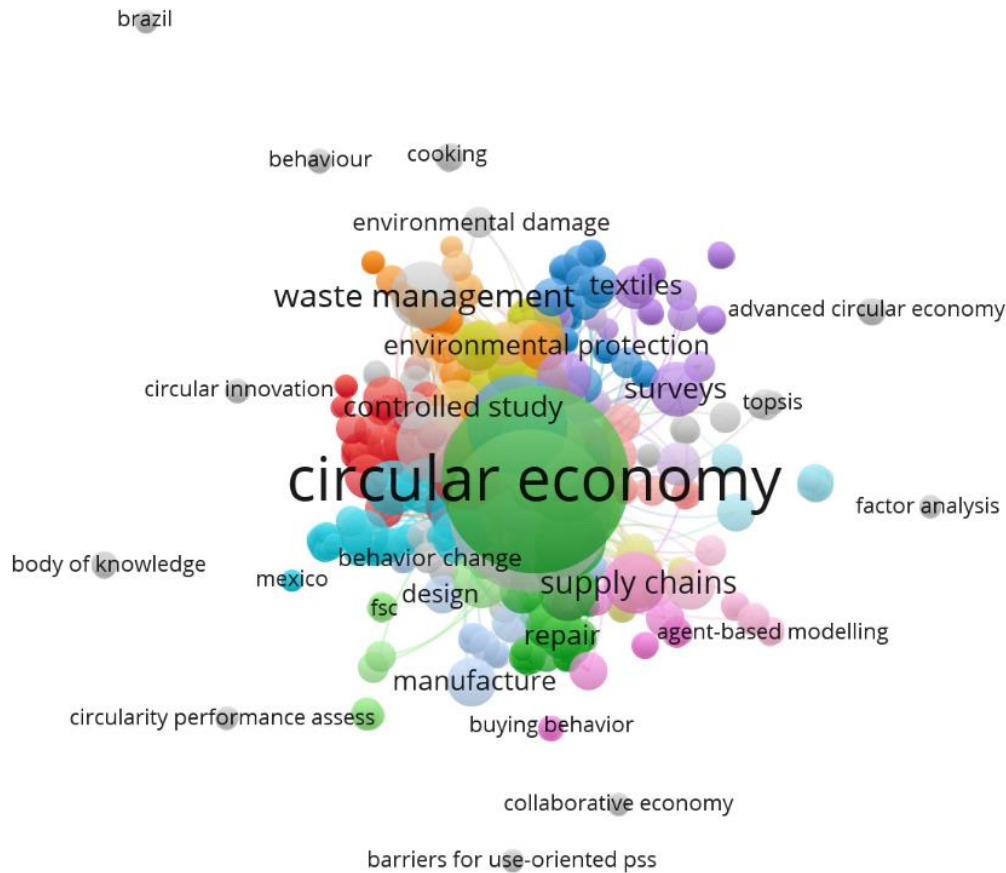


Source: Self elaborated using VOSviewer with data obtained from WoS and Scopus. (March, 2021)

The result of the content analysis is a network shaped by three clearly identified clusters which we will review later in this study.

This is the full picture of the co-occurrence keyword network without selecting any threshold:

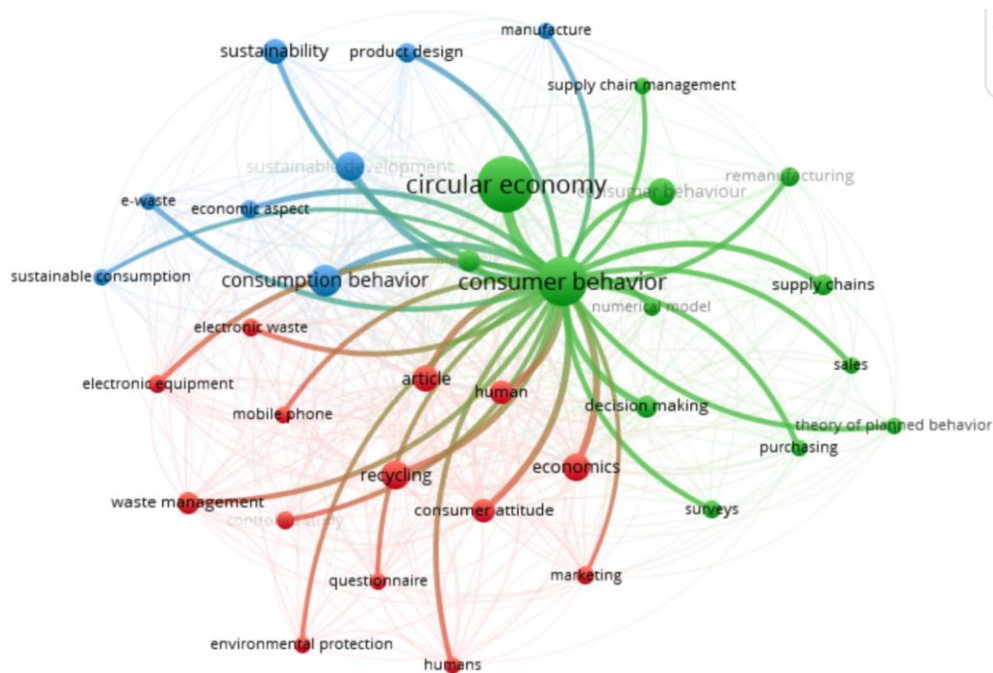
**Figure 12. Co-occurrence of keywords without threshold.**



Source: Self elaborated using VOSviewer with data obtained from WoS and Scopus. (March 2021)

There are thirty different clusters. What we can identify here, is that there is room for research related to CE and CB on the topics of circular innovation, collaborative economy, buying behavior, circularity performance assessments, circular supply chains, and remanufacturing, among others. In general terms, we can see that there is not much research concerning both terms CE and CB as a topic or keyword, out of 111 documents analyzed just 52 contain both. In the following image we can see the map of co-occurrence obtained by selecting their knot:

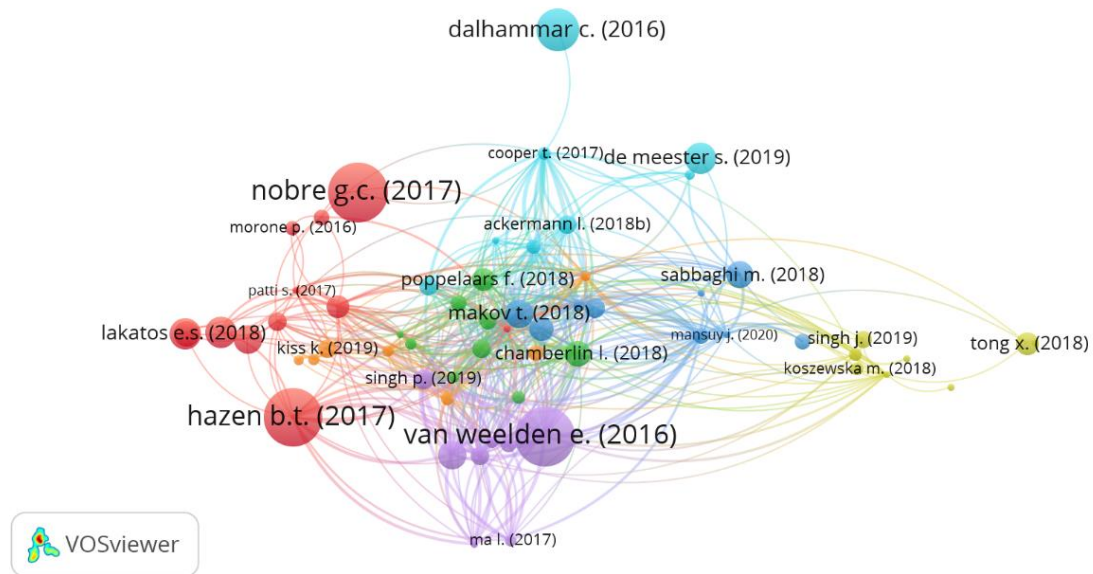
Figure 13. Co-occurrence of keywords. CE and CB knot.



Source: Self elaborated using VOSviewer with data obtained from WoS and Scopus. (March 2021)

The analysis of the bibliographic coupling showed the image involving when two documents have at least one reference in common. The higher the number of references to the same texts means that the similarity between the citing texts is higher. The network obtained was the following:

**Figure 14. Bibliographic coupling. One reference in common.**

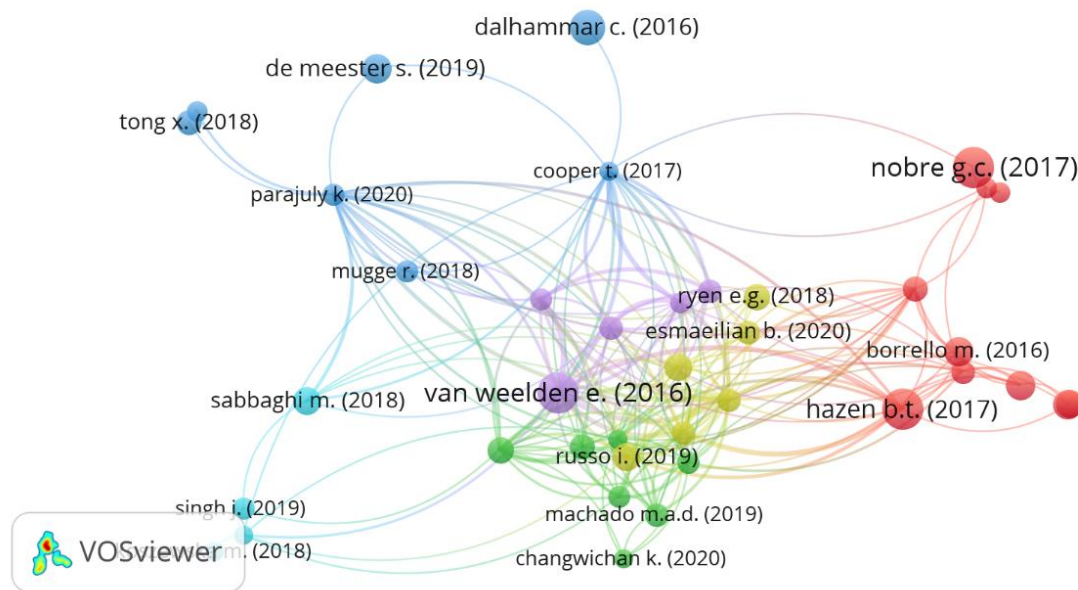


Source: Self elaborated using VOSviewer with data obtained from WoS and Scopus. (March, 2021)

As per the network we see that out of 111 documents, 61 have at least one reference in common to other text among the literature.

To get a better image, we will analyze the coupling adding a threshold of minimum of five documents in common, which is a usual practice for these kind of analyses in order to have clearly differentiated and consistent clusters (Zhang et al., 2019; Uriona and Vaz, 2017; Pesta, Fuerst and Kirkegaard, 2018):

Figure 15. Bibliographic coupling. Five references in common.



Source: Self elaborated using VOSviewer with data obtained from WoS and Scopus. (March 2021)

This picture illustrates better the similarity between the links of the texts written by each author with five same references in common with each.

Finally, we analyzed the co-citation, which indicates the frequency with which two documents are cited together. We selected the minimum threshold and we found out that the maximum number of times that two of these 111 documents were cited together was 4 times. The network is the following:

Figure 15. Bibliographic co-citation.



Source: Self elaborated using VOSviewer with data obtained from WoS and Scopus. (March 2021)

As we can see the network is quite plain, being the authors involved in the co-citation on many occasions involved in more than one publication.



## 4.2. Results of the content analysis

In the following paragraphs we will proceed to analyze the literature targeting the keyword cluster division. We based our results on the clusters shown in Figure 9. Co-occurrence of keywords with threshold of five minimum mentions. VOSviewer does not allow to set the number of clusters in an exogenous way, and we have selected a threshold of minimum five mentions per word, which delivered three clearly differentiated clusters whose papers comprise a higher rate of similarity amongst them.

In the table below we can see the detailed list of keywords that fall under each cluster:

**Table 1. Keywords comprised in each cluster.**

Cluster 1	Links	Total link strenght	Occurrences
Recycling	24	77	17
Economics	28	85	15
Consumer attitude	30	85	11
Human	30	88	11
Waste management	21	48	9
Controlled study	20	36	6
Economic aspect	22	47	6
Electronic equipment	21	50	6
Electronic waste	24	51	6
Environmental protection	14	25	6
Marketing	22	34	6

Cluster 2	Links	Total link strenght	Occurrences
Consumer behavior	30	216	52
Decision making	25	59	10
Supply chains	18	41	8
Remanufacturing	16	29	7
Surveys	15	25	6
Numerical model	19	33	5

Cluster 3	Links	Total link strenght	Occurrences
Circular economy	30	216	70
Sustainable development	22	68	17
Sustainability	17	39	12
Life Cycle	21	41	9
Product design	20	37	7

Source. Self-elaborated using VOSviewer (April 2021). Note. All keywords with more than 5 occurrences are shown in the table.

The keyword occurrence attribute indicates the number of documents in which a keyword occurs. The analysis of the clusters is made through co-occurrence where the links attribute shown on Table 1 indicates the number of co-occurrence links of a given keyword with other keywords. The total link strength refers to the fact that keywords that appear in many documents are more likely to coexist than keywords that appear in a limited number of documents (Nees Van Eck and Waltman, 2018).

Cluster 1 comprises a total of 41 articles, mainly published between 2018 and 2020. The articles that fall under this group concern the topic of consumer attitudes and how they are formed in an economic context. The aspect of environmental protection, especially the rising concern on the recent environmental problems derived from our consumption -and production- habits, has a significant and positive influence on consumer attitude (CA) towards products and services which are labelled as ecological, green or bio. Other aspects, which are more tangible or directly observable (on which to base an evaluation of said contribution) can be waste management, electronic waste, and equipment, all related to the rising concern over environment and sustainability. Lastly, Marketing can obviously influence CA towards certain products, services, or brands, among others, especially taking into account that by knowing the market, marketers can target consumer attitudes through specific strategies.

Cluster 2 is comprised of 57 documents from which 33 have been written between 2019 and 2020. It comprises keywords related to CB and Decision Making which influence the remanufacturing and supply chain processes towards achieving more sustainable development. Consumers generally have a negative idea of these refurbished or remanufactured products due to the fact that they associate them with the concept of

lower quality (Hazen et al., 2017). A mindset change on the manufacturers' side is a prerequisite, they should begin to introduce sustainable techniques and circular economy processes to the supply chains, although the challenge is to convince them to modify the supply chain timings and provide additional services such as extended guarantees or repair services to consumers (Dahlhammar, 2016).

Finally, Cluster 3 comprises 83 documents, mostly published between 2018 and 2020. Most of the articles directly address the topic of CE relating it to the need for sustainability due to the limited resources and the unprecedented growth of the population (Smol et al. 2015; Dalhammar, 2016; Lakatos et al., 2018). The keywords comprised in this cluster indicate the "output side" of the actions taken towards sustainability, which is a more circular economy that contributes to an increase in sustainability and sustainable development. In this sense product or service "life-cycle" and "design" are key instruments for SD and CE.

There can be identified a relationship between the clusters: Cluster 1 constrains the attitudes and human traits that condition CB and decision making which are contained in Cluster 2, being Cluster 3 the results of this process, a more sustainable economy based on CE. The research is primarily focused on aspects regarding technology such as electronic waste and refurbishment and remanufacturing of electronics, therefore the results obtained are on the consumer behaviors and attitudes regarding technology and how consumers react to refurbished technology. Some other sectors such as fashion and food and beverages are approached by researchers, but further investigation should be done to obtain a broader picture. Also, there are industries such as automobile, aerospace and construction which can as well include circular economy and make progress towards sustainable practices, but further research should be done to find out the CB and perceptions in these areas.

## 5. Discussion

After reviewing all the literature in terms of bibliometric and content analysis we have identified that the interest for this topic together has been growing recently, especially since 2017-2018 that authors have identified the CB as a real need to give an impulse towards the general transition to the CE.

Most of the literature comes from European and Chinese authors, possibly because in 2015 the European Union adopted the First Circular Economy Action Plan (European Commission, 2015) and since 2009 China has been working under the framework of the Law for the Promotion of the Circular Economy (The World Bank, 2009) which have drawn attention into the topics related to CE.

Most studies reached the conclusion that consumers associate refurbished, recycled, or remanufactured products with negative characteristics such as lower quality and lack of guarantees but do not provide possible solutions or research on how marketing strategies can draw attention to CE products and services and change these negative perceptions (Chamberlin and Boks, 2018; Pisitsankkhakarn and Vassanadumrongdee, 2020; Singh et al., 2019; Botelho et al., 2016).

Another important topic that authors reach is the lack of institutional support for manufacturers to motivate them to shift to circularity (Smol et al., 2015; Dalhammar, 2016). Most of the focus from institutions towards the CE is directed towards recycling which although is an important part of the CE strategy it is not all of it. Shifting towards renewable energies, refurbishing, remanufacturing and the sharing and products as a service concept are quite as important and institutions play a key role in supporting manufacturers (Ranta et al., 2018). We identify then a general agreement amongst all the literature on the fact that there is a lack of institutional support and that the policies of CE are mainly focusing on household recycling. Short-term CE strategies such as extending product lifetimes have the potential to reduce the environmental impact while being an attractive and straightforward measure for companies to implement, whereas shifting to cleaner sources of materials and energy would be more of a long-term process (Kaddoura et al., 2019). In this context, we must highlight the concept of Sustainable Business Model Innovation which is centred on identifying different archetypes of sustainable strategies for companies, such as promoting eco-efficiency, creating value from waste, and delivering functionality rather than ownership (Bocken, 2014).

The interest in studying the management of electronic waste (e-waste) is growing with time. Electronic devices are mainly made from valuable and in some cases limited metals and materials which it makes it very appealing for manufacturers to introduce themselves in the refurbishing or recycling niche since it can lead to benefits and profitability for their supply chains (De Meester et al. 2019). However, this faces significant challenges, the first one being the complexity of recycling the different components; the second is that consumers have to be willing to purchase refurbished products instead of new; and the third is that consumers must also be involved in closing the loop by returning the electronics once they are not functional anymore (Poppelaars et al., 2018; De Meester et al., 2019; Botelho et al., 2016; Baier et al., 2020). However, on the opposite side of the scale, Mako and Vivanco (2018) argue that the benefits of the CE are often taken for granted and suggest that there can be a rebound effect due to the imperfect substitution between "re-circulated" (recycled, reused, etc.) and new products, and re-spending due to economic savings derived from these circular practices, especially on the technological sector.

The introduction of CE in the fashion industry and the consumer attitude towards it is another important topic that drives the authors' attention in the recent years. Studies agree that the youngest generations pay higher attention to sustainable features in fashion brands and that the fashion industry is currently exploiting that niche combining sustainable production with strong marketing campaigns that draw the attention of consumers (Urmínová and Kusá, 2020; Morais et al., 2020).

As can be seen, most of the attention is drawn towards the electronics and fashion industries, but it is a fact that the construction industry consumes many natural resources, and it would play a key role to incorporate CE strategies, especially in the design and use of sustainable materials that either come from ecological resources or from upcycling processes, with the purpose of guaranteeing the sustainable growth of cities and the society. The literature is scant on sectors such as tourism, transportation, or even renewable energies, this last one is key to ensure long term sustainability and consumers must as well get involved.

Studies on agricultural products mainly address the sustainability of the packaging of products related to consumer acceptance (Borrello et al., 2016, Testa et al.; 2020, Clark et al., 2020) but do not pay much attention to the production of sustainable foods and

beverages and the products and services integrated through the agricultural supply chain.

Some articles find evidence that consumers do not actively participate in "closing the loops", i.e., they do not return products when is not working anymore to be either recycled, refurbished, or repaired but generally, the reason why there is this lack of participation on the consumers' side is not given further importance. Most studies are silent on the reasons for the observed consumer behavior; a research gap that certainly should be addressed in the future.

## 6. Conclusions and limitations

The main objective of this paper was to perform a bibliometric analysis on the research done on the topics of Consumer Behavior and Circular Economy to unravel emerging topics of interest based on the literature obtained from Web of Science and Scopus databases.

From a total of 111 documents analyzed, the findings indicate that the interest in this topic has been growing at a fast pace since 2016 and that more than half of these articles have been written between 2019 and 2020, being the authors from Netherlands, Italy, and China the most active.

The analytical results of the keyword co-occurrence show a network of three clearly differentiated clusters conformed by articles that focus each on the following topics: Cluster 1 addresses the attitudes and human traits that condition CB and decision making; Cluster 2, treats the topics of CB and decision making themselves in more in depth; and Cluster 3., includes issues related to Sustainable Development and CE. First of all, the findings suggest that CE policies to stimulate both companies and consumers should be promoted by governments and institutions, which in some countries like China and the EU it is already taking place. The problem is that governments and institutions address mainly to the topic of household waste recycling (Hazen et al., 2017) and not to all the other sustainable opportunities that the CE proposes such as refurbishing, product-as-a-service or green energies.

The literature has identified a lack of consumer acceptance towards the CE products due to some key factors such as price, culture, and trust (Lakatos et al., 2018) but there is a

lack of research on how to solve these barriers to promote circular CB which could be an interesting topic to direct future research. Also, research does not go deep into the matter of how these aforementioned key factors influence behaviors.

Researchers have a heightened interest on the topic of sustainability in the technological sector, focusing on what it is called *e-waste* (electronic waste) and they reflect the benefits and advantages that both consumers and companies can obtain from applying circular practices such as refurbishing or repairing technological products (Dahlhammar, 2016), but once again these researchers do not suggest how to promote consumer acceptance towards these practices and mainly focus on the side of the manufacturers. Also, we must mention that mostly literature focuses on the technological sector and at some extent on the sustainability of the fashion industries (Koszewska, 2018; Urmínovía and Kusá, 2020) but little literature has been found on other sectors such as agriculture, tourism, and transportation.

Cutting edge technologies such as Big Data and Internet of the Things (IoT) can be potential contributors to promote CE practices (Nobre and Tavares, 2017), but these should not be only tools for producers but also for consumers. Also, with these tools it becomes possible for marketers and manufacturers to identify better consumers' needs and adapt the circular products and services to them promoting sustainable consumption and involvement in CE.

As several authors mention, CB is not only influenced by individual factors social structures and culture also play a key role in the decision-making process of consumers (Lakatos et al. 2018; Piatrov, 2020; Mansuy et al., 2020). Research on these topics is slowly emerging, but most of the studies focus on surveys made to population groups in specific countries, maybe it would be interesting to have a broader image of the influence of these factors in bigger groups such as the European countries as a whole or Asian countries.

Also, there is almost no research on CE and CB in Latin American or African countries, it makes sense since most of the authors are either European, Northern American, or Asian. It would be interesting to have some references on the awareness of consumers regarding circular practices in those countries.

The limitations of this research concern the fact that we have focused our bibliometric analysis on the terms of CB and CE, while the dataset used here is indeed

comprehensive on the topic of CB and CE, there may be other research in the realm of CE addressing the issue implicitly and without connecting it specifically to CB. On the other hand, another limitation is that VOSviewer does not allow to perform an individual analysis of the clusters and the strength of links between the keywords constrained in each of them.

When looking at the full network of keywords, some topics point at future research concerning CE and CB, such as how to promote collaborative economies, the consumer barriers for “use-oriented” product service systems, CB, and environmental damage, buying behavior and circular products and product design.

Since this is a topic that is gaining attention in the recent years there is still a broad gap for researchers to further investigate and propose valuable solutions and ideas to promote CBMs and circular consumption.



### Annex I. Documents that appear both in WoS and Scopus

Authors	Article Title	Year	DOI
Lakatos, ES; Dan, V; Cioca, LI; Bacali, L; Ciobanu, AM	How Supportive Are Romanian Consumers of the Circular Economy Concept: A Survey	2016	10.3390/su8080789
Dalhammar, C	Industry attitudes towards ecodesign standards for improved resource efficiency	2016	10.1016/j.jclepro.2015.12.035
Van Weelden, E; Mugge, R; Bakker, C	Paving the way towards circular consumption: exploring consumer acceptance of refurbished mobile phones in the Dutch market	2016	10.1016/j.jclepro.2015.11.065
Hazen, BT; Mollenkopf, DA; Wang, YC	Remanufacturing for the Circular Economy: An Examination of Consumer Switching Behavior	2017	10.1002/bse.1929
Nobre, GC; Tavares, E	Scientific literature analysis on big data and internet of things applications on circular economy: a bibliometric study	2017	10.1007/s11192-017-2281-6
Poppelaars, F; Bakker, C; van Engelen, J	Does Access Trump Ownership? Exploring Consumer Acceptance of Access-Based Consumption in the Case of Smartphones	2018	10.3390/su10072133

Tong, X; Nikolic, I; Dijkhuizen, B; van den Hoven, M; Minderhoud, M; Wackerlin, N; Wang, T; Tao, DY	Behaviour change in post- consumer recycling: Applying agent-based modelling in social experiment	2018	10.1016/j.jclepro.2018.03.261
Chamberlin, L; Boks, C	Marketing Approaches for a Circular Economy: Using Design Frameworks to Interpret Online Communications	2018	10.3390/su10062070
Sabbaghi, M; Behdad, S	Consumer decisions to repair mobile phones and manufacturer pricing policies: The concept of value leakage	2018	10.1016/j.resconrec.2018.01.015
Barbu, CM; Florea, DL; Ogarca, RF; Barbu, MCR	FROM OWNERSHIP TO ACCESS: HOW THE SHARING ECONOMY IS CHANGING THE CONSUMER BEHAVIOR	2018	10.24818/EA/2018/48/373
Lakatos, ES; Cioca, LI; Dan, V; Ciomos, AO; Crisan, OA; Barsan, G	Studies and Investigation about the Attitude towards Sustainable Production, Consumption and Waste Generation in Line with Circular Economy in Romania	2018	10.3390/su10030865
Canetta, L; Fontana, A; Foletti, M; Tschanen, M	Sustainability assessment of various circular economy scenarios in the consumer electronics sector	2018	

Kiss, K; Ruzskai, C; Takacs-Gyorgy, K	Examination of Short Supply Chains Based on Circular Economy and Sustainability Aspects	2019	10.3390/resources8040161
Mashhadi, AR; Vedantam, A; Behdad, S	Investigation of consumer's acceptance of product-service-systems: A case study of cell phone leasing	2019	10.1016/j.resconrec.2018.12.006
Poponi, S; Colantoni, A; Cividino, SRS; Mosconi, EM	The Stakeholders' Perspective within the B Corp Certification for a Circular Approach	2019	10.3390/su11061584
Wagner, MM; Heinzl, T	Human Perceptions of Recycled Textiles and Circular Fashion: A Systematic Literature Review	2020	10.3390/su122410599
Corsini, F; Gusmerotti, NM; Frey, M	Consumer's Circular Behaviors in Relation to the Purchase, Extension of Life, and End of Life Management of Electrical and Electronic Products: A Review	2020	10.3390/su122410443
Wang, YC; Zhu, Q; Krikke, H; Hazen, B	How product and process knowledge enable consumer switching to remanufactured laptop computers in circular economy	2020	10.1016/j.techfore.2020.120275
Cordova-Pizarro, D; Aguilar-Barajas, I;	Circular Economy in Mexico's Electronic and Cell Phone Industry: Recent	2020	10.3390/app10217744

Rodriguez, CA; Romero, D	Evidence of Consumer Behavior		
Mansuy, J; Verlinde, S; Macharis, C	Understanding preferences for EEE collection services: A choice-based conjoint analysis	2020	10.1016/j.resconrec.2020.104899
Mathews, JA	Schumpeterian economic dynamics of greening: propagation of green eco-platforms	2020	10.1007/s00191-020-00669-5
Baier, D; Rausch, TM; Wagner, TF	The Drivers of Sustainable Apparel and Sportswear Consumption: A Segmented Kano Perspective	2020	10.3390/su12072788
Gazzola, P; Pavione, E; Pezzetti, R; Grechi, D	Trends in the Fashion Industry. The Perception of Sustainability and Circular Economy: A Gender/Generation Quantitative Approach	2020	10.3390/su12072809
Changwichan, K; Gheewala, SH	Choice of materials for takeaway beverage cups towards a circular economy	2020	10.1016/j.spc.2020.02.004
Hoffmann, BS; Morais, JD; Teodoro, PF	Life cycle assessment of innovative circular business models for modern cloth diapers	2020	10.1016/j.jclepro.2019.119364

## Annex II. Number of publications by author.

Author	Number of publications	Author	Number of publications	Author	Number of publications	Author	Number of publications
Mugge, R.	5	Brusselaers, J.	1	Florea, D.L.	1	Knieke, C.	1
Bakker, C.	3	Camocho, D.	1	Fogarassy, C.	1	Koszewska, M.	1
Behdad, S.	3	Canetta, L.	1	Foletti, M.	1	Krikke, H.	1
Ackermann, L.	2	Carvalho, C.	1	Fontana, A.	1	Krishnamurthy, S.	1
Cioca, L.I.	2	Cembalo, L.	1	Frayret, J.M.	1	Kuehr, R.	1
Clark, N.	2	Chamberlin, L.	1	Frey, M.	1	Kulczycka, J.	1
Cooper, T.	2	Changwichan, K.	1	Fröhling, M.	1	Kusá, A.	1
Dan, V.	2	Chapman, J.	1	Gan, Q.	1	Labelle, A.	1
Hazen, B.T.	2	Chen, S.	1	Gaspar, M.	1	Lakemond, C.M.M.	1
Lakatos, E.S.	2	Cheng, C.C.	1	Gaustad, G.	1	Lawrenz, S.	1
Poppelaars, F.	2	Chiriac, M.	1	Gazzola, P.	1	Lewis, K.	1
Trimingham, R.	2	Chou, H.M.	1	Geng, Y.	1	Leyva-Díaz, J.C.	1
van Engelen, J.	2	Ciobanu, A.M.	1	Gheewala, S.H.	1	Li, B.	1
Wang, Y.	2	Ciomos, A.O.	1	Giacosa, E.	1	Lin, K.	1
Aguilar-Barajas, I.	1	Cividino, S.R.S.	1	Goldmann, D.	1	Lin, M.	1
Ahlstedt, S.	1	Colantoni, A.	1	Gorazda, K.	1	Liu, Y.	1
Ajibade, S.	1	Confente, I.	1	Goworek, H.	1	Lloyd, P.	1

Alemão, C.	1	Cordova-Pizarro, D.	1	Grechi, D.	1	Lombardi, A.	1
Alevizou, P.J.	1	Corsini, F.	1	Guo, B.	1	Ma, L.	1
Aliakseyeu, D.	1	Cottafava, D.	1	Gusmerotti, N.M.	1	Machado, M.A.D.	1
Almeida, S.O.d.	1	Crisan, O.A.	1	Gyuricza, C.	1	Macharis, C.	1
Auriscchio, M.	1	Critchell, K.	1	Haines-Gadd, M.	1	Makov, T.	1
Babbitt, C.W.	1	D'Affuso, C.	1	Hamann, M.	1	Mansuy, J.	1
Babbitt, G.	1	D'Agostin, A.	1	Hartini, S.	1	Masiukiewicz, P.	1
Bacali, L.	1	Dalhammar, C.	1	Hazen, B.	1	Mason, J.	1
Baier, D.	1	Dams, Y.	1	Heinzel, T.	1	Mathews, J.A.	1
Barbu, C.M.	1	De Meester, S.	1	Henclik, A.	1	Michal, J.	1
Barsan, G.	1	Deak, G.	1	Henninger, C.E.	1	Minderhoud, M.	1
Bauer-Civiello, A.	1	Debaveye, S.	1	Hoffmann, B.S.	1	Mollenkopf, D.A.	1
Benham, C.	1	Dec, P.	1	Hole, A.S.	1	Mont, O.	1
Berry, K.	1	Dewulf, J.	1	Hole, G.	1	Montagna, G.	1
Biswas, W.	1	Dijkhuizen, B.	1	Hultink, E.J.	1	Morais, C.	1
Bocken, N.M.P.	1	Eagle, L.	1	Hussey, K.	1	Moretto, C.F.	1
Boks, C.	1	Elg, M.	1	Iovino, R.	1	Morone, P.	1
Bollick, L.C.	1	Esmaeilian, B.	1	Iraldo, F.	1	Mosconi, E.M.	1
Borrello, M.	1	Fatimah, Y.A.	1	Izhar, T.N.T.	1	Muldoon, O.	1

Botelho, A.	1	Ferreira Dias, M.	1	Julião, J.	1	Myana, R.	1
Bracquene, E.	1	Ferreira, A.M.	1	Kabel, D.	1	Nachtergaele, P.	1
Bragagnolo, G.	1	Ferreira, C.	1	Kiliç, E.	1	Nagy-Pércsi, K.	1
Březina, D.	1	Fitzpatrick, C.	1	Kiss, K.	1	Navia, R.	1

### Annex III. Documents comprised in cluster 1.

Cluster 1 - Documents
Borrello, M., Lombardi, A., Pascucci, S. & Cembalo, L. 2016, "The seven challenges for transitioning into a bio-based circular economy in the agri-food sector", <i>Recent Patents on Food, Nutrition and Agriculture</i> , vol. 8, no. 1, pp. 39-47.
Botelho, A., Ferreira Dias, M., Ferreira, C. & Pinto, L.M.C. 2016, "The market of electrical and electronic equipment waste in Portugal: Analysis of take-back consumers' decisions", <i>Waste Management and Research</i> , vol. 34, no. 10, pp. 1074-1080.
Canetta, L., Fontana, A., Foletti, M. & Tschanen, M. 2018, "Sustainability Assessment of Various Circular Economy Scenarios in the Consumer Electronics Sector", <i>2018 IEEE International Conference on Engineering, Technology and Innovation, ICE/ITMC 2018 - Proceedings</i> .
Changwichan, K. & Gheewala, S.H. 2020, "Choice of materials for takeaway beverage cups towards a circular economy", <i>Sustainable Production and Consumption</i> , vol. 22, pp. 34-44.
Cheng, C.-. & Chou, H.-. 2018, "Applying the concept of circular economy - Using the cultural difference of European consumers as an example", <i>Proceedings of 4th IEEE International Conference on Applied System Innovation 2018, ICASI 2018</i> , pp. 449.
Corsini, F., Gusmerotti, N.M. & Frey, M. 2020, "Consumer's circular behaviors in relation to the purchase, extension of life, and end of life management of electrical and electronic products: A review", <i>Sustainability (Switzerland)</i> , vol. 12, no. 24, pp. 1-16.
Dalhammar, C. 2016, "Industry attitudes towards ecodesign standards for improved resource efficiency", <i>Journal of Cleaner Production</i> , vol. 123, pp. 155-166.
De Meester, S., Nachtergaele, P., Debaveye, S., Vos, P. & Dewulf, J. 2019, "Using material flow analysis and life cycle assessment in decision support: A case study on WEEE valorization in Belgium", <i>Resources, Conservation and Recycling</i> , vol. 142, pp. 1-9.



<p>Esmailian, B., Sarkis, J., Lewis, K. &amp; Behdad, S. 2020, "Blockchain for the future of sustainable supply chain management in Industry 4.0", <i>Resources, Conservation and Recycling</i>, vol. 163.</p>
<p>Gan, Q. &amp; Chen, S. 2019, "Assessing consumers' motivations for purchasing remanufactured products: Using single valued neutrosophic sets and prospect theory", <i>Kybernetes</i>, vol. 49, no. 9, pp. 2221-2240.</p>
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<p>Sabbaghi, M. &amp; Behdad, S. 2018, "Consumer decisions to repair mobile phones and manufacturer pricing policies: The concept of value leakage", <i>Resources, Conservation and Recycling</i>, vol. 133, pp. 101-111.</p>
<p>Tong, X., Nikolic, I., Dijkhuizen, B., van den Hoven, M., Minderhoud, M., Wäckerlin, N., Wang, T. &amp; Tao, D. 2018, "Behaviour change in post-consumer recycling: Applying agent-based modelling in social experiment", <i>Journal of Cleaner Production</i>, vol. 187, pp. 1006-1013.</p>
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Facultad de Ciencias Económicas, Empresariales y Turismo. Plaza de la Victoria, 2. 28802. Alcalá de Henares. Madrid - Telf. (34)918855187. E-Mail: [catedra.rsc@uah.es](mailto:catedra.rsc@uah.es)

## CÁTEDRA DE RESPONSABILIDAD SOCIAL CORPORATIVA

### DIRECTORA

***Dra. Dña. Elena Mañas Alcón***

Profesora Titular de Universidad, Universidad de Alcalá