Journal of Cleaner Production 411 (2023) 137340

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Review

How is the circular economy embracing social inclusion?

Roberta Souza Piao [a,*], Ticiana Braga de Vincenzi [b], Ana Lucia Fernandes da Silva [b], Maria Clara Chinen de Oliveira [b], Diego Vazquez-Brust [c], Marly Monteiro Carvalho [b]

[a] Department of Production Engineering, Polytechnic School, Universidade de São Paulo (USP) – Brazil, Av. Prof. Luciano Gualberto, 380 - Butantã, São Paulo, SP, 05508-010, Brazil

[b] Polytechnic School Universidade de São Paulo (USP) – Brazil, Av. Prof. Luciano Gualberto, 380 - Butantã, São Paulo, SP, 05508-010, Brazil

[c] Sustainability Strategy at the Portsmouth Business School, Portsmouth University, United Kingdom. University House, Winston Churchill Ave, Portsmouth, PO1 2UP, United Kingdom

ARTICLE INFO

Handling Editor: Tomas B. Ramos

Keywords:
Recycling
Waste pickers
Informal
Literature review
Waste management
Social inclusion

ABSTRACT

To fully contribute to sustainable development, circular economy has to devote more attention to social inclusion. This paper thoroughly analyzed the literature, answering the research question: how is circular economy embracing social inclusion? The research design applied quantitative and qualitative strategies. Bibliometric quantitative analysis with the aid of VosViewer, the RStudio software, and Bibliometrix Package were employed. An inductive content analysis was undertaken to analyze the themes of circular economy and social inclusion, applying NVivo software. The results brought out six clusters: (i) reverse logistics and recycling, (ii) circular economy and innovation, (iii) social innovation, (iv) sustainable supply chains, (v) bioeconomy, and (vi) closed-loop supply chain. Our findings showed that the circular strategies of reuse and reduce were the focus of the surveyed literature, while consumers and communities were the key stakeholders addressed. Recycling was directly linked to waste management and the inclusion of waste pickers in developing countries. As future research themes, it highlighted more theoretical and empirical research about community and consumer engagement in circular practices, besides the importance of entrepreneurship and social innovation to intensify circular practices embracing social inclusion.

1. Introduction

The promotion of circular economy strategies is a very important tool to promote sustainable development (Schröder et al., 2020). Most of the literature has focused on the production process and strategies to close loops in supply chains, such as remanufacturing, reuse, and recycling (Velenturf and Purnell, 2021; Mahmoum Gonbadi et al., 2021). The literature also highlights the transition from linear to circular systems in the creation of new job positions. According to the International Labour Organization (ILO), there will be a growth of 6 million jobs globally by 2030, mainly in waste management, recycling, services, repair, and business models based on renting. However, the literature is scarce in addressing circular economy practices from the perspective of social inclusion (Kirchherr et al., 2017; Geissdoerfer et al., 2017; Ngan et al., 2019; Hopkinson et al., 2018; Jabbour et al., 2019). Social inclusion is known as a process to improve the participation of people in disadvantage because of their income, age, gender, ethnicity, race, or disability (UN DESA – United Nations Department of Social Affairs, 2016).

The implementation of circular economy practices requires a huge change in societal values and behaviors (Chizaryfard et al., 2021; Kirchherr and Urban, 2018). Moreover, because of its radical reshaping of production and consumption systems, the transition to a circular system is likely have a tectonic impact on the social dimension of sustainable development (Vazquez-Brust et al., 2020). However, several authors (Sauve et al., 2015; Murray et al., 2017; Sehnem et al., 2020; Kirchherr, 2021; Belmonte-Ureña et al., 2021) have cautioned that aspects regarding the social dimension of sustainable development in CE are still notably under-developed, under-conceptualized and under-researched. More specifically, CE aims are very narrow and generic in terms of the social dimension of sustainable development, especially in terms of social inclusion (Vazquez-Brust et al., 2020; Belmonte-Ureña et al., 2021).

This is worrying and needs to be urgently addressed because as long

* Corresponding author.
E-mail addresses: robertacsouza@usp.br (R. Souza Piao), ticivin@usp.br (T.B. de Vincenzi), ana.gama@usp.br (A.L.F. da Silva), mariaclarachinen@usp.br (M.C.C. de Oliveira), diego.vazquez-brust@port.ac.uk (D. Vazquez-Brust), marlymc@usp.br (M. Monteiro Carvalho).

https://doi.org/10.1016/j.jclepro.2023.137340
Received 21 December 2022; Received in revised form 24 March 2023; Accepted 27 April 2023
Available online 28 April 2023

as CE does not embrace the missing social dimension of social inclusion, it cannot fully contribute to sustainable development. Moreover, it is argued that failure to have a deep understanding of social inclusion in CE could threaten the scalability of CE practice. To support our argument, it refers to literature analyzing the progression of CE from idea to practice Blomsma et al. (2022), Blomsma and Brennan (2017). This literature uses a process theory about the stages of constructing innovation to warn that the current phase of excitement about CE will inevitably be followed by a phase of validity challenge and intense scrutiny of the real life impacts of CE practices. At such a point, negative social impacts and even the lack of clear social benefits could lead to social resistance, followed by withdrawal of political and business support to the implementation of CE policies and practices, and even the collapse of the construct as a viable alternative for development. Yet, there are still many unknows relating to social inclusion in CE that need to be investigated to prevent undesired social impacts potentially leading to construct collapse.

Therefore, circular economy needs to engage with a social inclusion agenda as a matter of priority. When designing and implementing green innovation and policies on economic development, past experiences taught us that forgetting social aspects is detrimental to achieving sustainable development (Sarkis et al., 2010).

To address this need, recent studies have proposed frameworks to implement circular economy strategies considering the human side (Jabbour et al., 2019; Schröder et al., 2020; Kirchherr, 2021). Jabbour et al. (2019) proposed a framework combining circular economy and human resource management. The framework focused more on the firm level. The authors pointed out that circular economy business models need to be supported by human resource practices to achieve sustainable development. Kirchherr (2021) proposed circular justice as a framework to analyze the integration of groups, such as communities in circular processes based on transparency and participation in decisions.

Fairness was also discussed in the study about buyer-supplier relations by Hornibrook et al. (2009). These authors adopted the concept of organizational justice to analyze inter-organizational relationships. Themes such as trust, reputation, and collaboration were essential to analyze the relationships from the perspective of fairness (Fearne et al., 2012). The main research also concerned the workplace, focusing on employees, and the concept of fairness in the relations between organizations and suppliers in the supply chain. It also included concepts such as trust, and commitment; to analyze relations and how they evolve among organizations. The author's main concern was the impact of fairness on firm performance (Matopoulos et al., 2019).

Previous literature also proposed distinct strategies to promote social inclusion, such as the design of products and services for people at the bottom of the pyramid, to incorporate people in disadvantage as suppliers or distributors (Tang, 2018; Diener and Tillman, 2016). A literature review on the social aspects of a circular economy was also conducted; the results were analyzed according to thematic areas proposed by the Global Reporting Initiative (they are human rights, product responsibility, society, and labor practices and decent work) (Padilla-Rivera et al., 2020). The results mainly focused on methodologies and frameworks related to the issue. Luthin et al. (2023) conducted a literature review about circular economy and its social impacts, taking the concept as a whole, and not its specific strategies. The authors considered the Guidelines proposed by UNEP Methodological Sheets for Subcategories in Social Life Cycle Assessment (S-LCA). The Guidelines were elaborated based on stakeholders and their social impact on them. The six stakeholders defined were worker, local community (local communities), value chain actors (suppliers), consumers, society, and children. The subcategories detailed in Table 1were proposed for each stakeholder.

Nevertheless, from the perspective of a circular economy, Preston et al. (2019) proposed to analyze the value chain detailing the elements to promote the transition from linear to circular systems and the groups involved. For the authors, the transition required creating, slowing, and narrowing loops in the value chain. Creating loops refers to circular economy actions to extend the product life cycle, whereas slowing loops involve changes in the process in terms of design and manufacturing. Finally, narrowing flows is related to the adoption of new business models, such as sharing and products as a service, to find efficient ways to use the product. In terms of groups involved, Schröder (2020) and Schroeder et al. (2020) pointed out that the transition to a circular system needs the engagement of priority stakeholders such as employees (workers), communities, suppliers, and consumers. The author highlighted the importance of engaging communities in the extraction of inputs, training workers for the development of new skills, improving working conditions, and the importance of understanding and prioritizing consumer needs.

Table 1
Categories and subcategories of analysis in S-LCA Guide.

Main categories	Subcategories
Workers	promotion of employee wellness and equity, increased quality of life (employee), improved working conditions, job declines, training and education, forced re-education, health and safety issues
Communities (or Local Community)	job creation, job declines, setting the disappearance of low-level jobs, training and education, lower quality of life, higher health costs, health and safety issues, material supply guarantee, strengthening of the community, increased social wellbeing, social isolation, value-added creation and distribution, infrastructure and resource availability, political participation, lack of social acceptance
Suppliers +Value Chain Actor	elimination of socio-political supply risk, supply chain risk, material supply guarantee, market monopoly, increased competitiveness
Consumers	reduced costs of ownership, lower prices of goods, increased consumption, misuse of personal data, improved customer relationships, lack of transparency, lack of social acceptance
Society	social benefits, higher health costs, material supply guarantee, resource competition, resource imbalance, shifting problems, gender inequality, unequal distribution of opportunities, social equality, social inequality, social conflicts, increase in innovation, lack of transparency, lack of social acceptance
Children	training and education, health and safety issues

Source: elaborated by authors based on Luthin et al. (2023).

To sum up, the literature exploring CE and social impacts is still in its early stages, but it is unfolding and there is a need for desk research to review and map the state of the art in terms of how social inclusion is being addressed by research in the social dimension of CE. To address the gap, a systematic literature review was conducted on the circular economy and social inclusion based on the Web of Science and Scopus databases. The research question was: How is circular economy embracing social inclusion?

This paper is different from the existing literature in the following ways. Firstly, the literature review was based on the Web of Science (WoS) and Scopus databases. The WoS database was the first to index academic journals calculating their impact factor (Carvalho et al., 2013). The Scopus database has become relevant considering the increasing number of publications. It is the largest database of peer-reviewed journals (Morioka and de Carvalho, 2016). Secondly, an inductive content analysis was conducted to analyze the themes of circular economy and social inclusion (Elo and Kyngäs, 2008; Hsieh and Shannon, 2005) considering that there is little literature dealing with the combination of both topics.

First-order codes were elaborated based on evidence from a sample of articles. As far as is known to date, there is a lack of studies on circular economy strategies considering social inclusion and priority stakeholders. Consequently, the research gap was critically identified in the current literature to deliver research directions for future studies.

The paper was structured into five sections. Section 2 presents the

materials and methods. This section was detailed in terms of sample procedure, data processing, and data analysis. Section 3 brings the quantitative analysis, followed by content analysis conducted through codes elaborated from NVivo software. The results and discussion are detailed in Section 4, and the conclusions follow in Section 5.

2. Material and methods

The review model adopted here combined quantitative and qualitative strategies in two phases: bibliometric analysis and content analysis (Carvalho et al., 2013; Homrich et al., 2018). Bibliometric methods have a quantitative approach to describing, evaluating, and identifying published research. They are also useful in a systematic review as they facilitate the mapping of a research field without subjective bias (Zupic and Čater, 2015).

The Web of Science (WoS) and Elsevier Scopus scientific databases were employed for data collection. These databases were chosen because they have a large volume of peer-reviewed articles within the field of Circular Economy (CE) and also provided detailed information on the publications used in the bibliometric analysis (Homrich et al., 2018). The bibliometric analysis followed the three steps defined by Tranfield et al. (2003), namely (1) planning the review; (2) conducting a review; (3) reporting and dissemination.

2.1. Stage 1 – planning the review

In this stage, the need for a review and a research question was identified and elaborated upon, and the review protocol was developed.

2.2. Stage 2 – conducting a review

The data for this research were collected from the Web of Science (https://www.webofknowledge.com/) and Scopus databases (http://scopus.com/). The collection of data took place on January 27, 2022. The search string used was: ("circular economy" OR "closed loop" OR "reverse logistic*") AND (social*) AND (inclus* OR exclus*).

In the Web of Science (WoS) database, the search was applied to Topic and this action resulted in 104 documents, to which the filter document type was applied to select only articles, review articles, and early access. The filter applied returned 97 documents published between 2008 and 2021 and the information from this collection containing the complete record and cited references was exported in BibTeX format (savedrecs.bib).

In the Scopus database, the search was applied to Title, Abstract and Keywords and initially resulted in 141 documents. Next, two filters were applied: (1) document type, to select only documents classified as articles and review articles; and (2) year of publication, to select documents published until 2021. This reduced the results to 103 documents and the document data were exported in BibTeX format (scopus.bib).

After exporting the data from the WoS (savedrecs.bib) and Scopus (scopus.bib) databases with the necessary information to perform the bibliometrics, the Rstudio software and the Bibliometrix Package were used to "merge" the information into a single file (WoS 97 documents + Scopus 103 documents = 200 documents).

After consolidating the information, 72 duplicated documents were excluded, and also one document written in German, resulting in a sample of 127 documents (200 documents - 73 documents). Then, the authors read the titles, abstracts, and keywords of the 127 documents and, after this analysis, 9 documents that had no direct relationship with the topic of Circular Economy and Social Inclusion were excluded. Thus, the final sample contains a total of 118 documents (127 documents minus 9 documents).

2.3. Stage 3 – reporting and dissemination

Two computational tools were used to perform the bibliometrics: (1) Bibliometrix Package and Biblioshiny (Aria and Cuccurullo, 2017) which allows extracting different information from the data collection of the final sample. The growth in scientific production, the most relevant sources, the most cited articles, the most frequent words, a three-field graph, and a thematic map were analyzed; (2) VOSviewer software (Van Eck and Waltman, 2010) was used to generate the keywords co-occurrence network and thus examine the conceptual domains of the final sample research in clusters.

After the scientific mapping phase through bibliometrics, a content analysis of the 118 documents of the final sample was conducted. The Nvivo software was adopted in the process of encoding the information in the sample documents (Bazeley and Jackson, 2013). Table 2 presents the article search flow.

After the bibliometric analysis, a content analysis was performed that allows researchers to systematically evaluate qualitative content (for example, interviews and reports) usually employing coding schemes for categorizing the content (Tangpong, 2011). In both phases, computational tools were used, such as the VOSviewer software (version 1.6.15), and the Nvivo software (content analysis). The VOSviewer software was usually adopted to elaborate and visualize bibliometric networks, such as maps of keywords based on co-occurrence data, and the map of authors (Van Eck and Waltman, 2010).

The VosViewer allowed conducting a co-word analysis providing the elaboration of co-ocurrence networks and the analysis of each cluster keyword. An inductive content analysis followed to analyze the themes of circular economy and social inclusion (Elo and Kyngäs, 2008; Hsieh and Shannon, 2005) considering that the topics were fragmented in distinct knowledge areas, and there was scarce literature considering the combination of both topics. In order to conduct the inductive content analysis, three phases were followed: (1) preparation, (2) organization, and (3) reporting. In the preparation phase, all pdf articles of the sample were uploaded in NVivo software. This followed the reading of all titles, abstracts, and the main parts of the papers to understand how circular economy strategies were related to social inclusion. In this phase, the NVivo tool called "broad context search" supported the organization phase of the process. Two authors were also directly involved in the process to guarantee methodological rigor. The results provided the representative quotes, and the first cycle coding is reported in Table 3.

Table 2
Presentation of the article search flow.

Search flow information	
Database	Web of Science (https://www.webofknowledge.com/) Scopus (http://scopus.com/)
Search string	("circular economy" OR "closed loop" OR "reverse logistic[a]") AND (social[a]) AND (inclus[a] OR exclus[a])
Collection of data	January 27, 2022
Search was applied to	WoS (Topic[a]) Scopus (Title, Abstract and Keywords)
Filter in database (Document type)	WoS: articles, review articles and early access (97 documents) Scopus: articles and review articles (103 documents) **Total: 200 documents**
Exclusion criteria 1: duplicated documents and language	72 duplicated documents were excluded and 1 document written in German **Total: 127 documents**
Exclusion criteria 2: read the titles, abstracts, and keywords	9 documents that had no direct relationship with the topic of Circular Economy and Social Inclusion wereexcluded
Final sample	**Total: 118 documents**
Computational tools	Bibliometric analysis: VOSviewer software, Bibliometrix Package and Biblioshiny Content analysis: Nvivo software

[a] Topic will search in the title, abstract and keyword fields of Web of Science records.

Table 3
Representative codes of the combination of circular economy practices and social inclusion retrieved from the sample papers.

Representative quotes	Codes
The **repair** and reconditioning of used goods are other additional activities, complementary to waste management services, undertaken by some cooperatives and that prove to produce job and income opportunities. However, the interviews described them as being strongly subject to competition from new goods in terms of lower costs and consumerist rhetoric (18) (Campagnaro and D'Urzo, 2021, p.10)	Repair
The increasing rate of buildings **reuse** and maintenance, the creation of new pedestrian areas, the introduction of electric public transport improved the urban quality and consequently, the tourist attractiveness of the district (32) (De Medici et al., 2018, p.11, p.11)	Reuse
Central targets: jobs and training opportunities, startups and transitioning businesses, demonstration projects, product recycling rate, sharing, re-use and remanufacture in the specific focus areas, public procurement, reduction greenhouse gas emissions (36) (Fratini et al., 2019, p.985, p.985)	Remanufacture
As indicated in the literature, historically, the focus of local authorities has been rolling out **recycling** services to individual households, as there is a perception that flat residents are 'hard to reach'. (119) (Woodard and Rossouw, 2021, p.13, p.13)	Recycle
Recent years have seen an increase in social innovation that involves transactions that **reduce energy and resource waste** (e.g., circular economies) and peer-to-peer transaction models that involve collaborative sharing of goods and services (e.g., sharing economies) and less reliance on fiat money as a medium of exchange (e.g., solidarity economies) (103) (Spinelli et al., 2019, p.3).	Reduce
The combined recycling from all waste flows could **replace** more than 75% of the present use of fossil P for mineral fertilizer (123) (Zoboli et al., 2016, p.321, p.321)	Replace
The project involved prospective **workers** of the cooperative (waste pickers and non-waste pickers), students and researchers. Its main objective was to make the IRS role in WM visible through the implementation of a waste source-segregation experience in a neighbourhood of Tandil (114) (Villalba, 2020, p.5).	Workers
This analysis indicates that the handloom business offers important social benefits to the **community** such as providing jobs for rural **communities**, improving their income levels and living standards, empowering women to take leadership roles and providing self-development opportunities (116) (Wanniarachchi et al., 2020, p.121, p.121)	Communities
In contrast to larger companies, which are exposed to more public scrutiny, smaller companies, mostly founded with a sustainable purpose and CE-based strategy, opted for a more qualitative assessment. This type of assessment consisted of engaging in discussions with **suppliers** and other stakeholders affected by their operations, either ad-hoc or in organized workshops (115) (Walker et al., 2021, p. 839, p. 839)	Suppliers
The results show a high importance of third-party associated online attributes for **consumers.** Throughout all participation modes in CE activities, at least one of the online attributes, user reviews, third-party certification and guarantee/warranty scored amongst the top three (104) (Stein et al., 2020, p.9).	Consumers

3. Results

The results were divided into two sections. The first was a bibliometric analysis, detailing the trend of publications by year, the most influential journals, core research publications, the main authors and their origin, theories and methods of the 20 most cited articles, and core words. In the second part, a content analysis of the articles was presented using the VosViewer and NVivo software.

3.1. Bibliometric analysis

3.1.1. Final sample description

The sample contains 118 (109 written in English, 6 written in Portuguese, and 3 written in Spanish) divided into 100 articles, 17 reviews and 1 early access.

The documents were published in the period 2008–2021 in 66 sources, with articles authored by 384 researchers. Only 18 documents were of single authorship, which indicates a greater degree of collaboration between authors in the research. The collaboration index (CI) of the sample is 3.66 and calculated using the total number of authors of multi-authored articles (366 authors) divided by the total number of multi-authored articles (100 documents) (Secinaro et al., 2020). On average, each document was written by three authors (Authors per Document = 3.25).

Fig. 1 shows the graph of scientific production. The annual growth rate of publications in the sample was 49.81%. In the period 2015–2018, there was an increase in scientific production compared to the period 2008–2014. However, a significant growth in published articles occurred in the last three years (2019–2021).

3.1.2. Most influential journals

The documents were published in 66 different sources. In order to identify the main sources of publication, Bradford's Law was applied, which divides the documents in the final sample into three distinct zones. Zone 1 (also called the nuclear zone), where the most productive sources are located and provide the greatest contribution to research (Bashir, 2022). Zone 2 includes sources classified as moderately productive and zone 3 includes sources with low production in relation to the research topic. Considering the 66 publication sources in the final sample, in zone 1 there were 3 sources, in zone 2 there were 25 sources and in zone 3 there were 38 sources.

The 20 most relevant sources are shown in Table 4. According to Bradford's Law, in Zone 1 are the journals Sustainability, Journal of Cleaner Production and CIRIEC-España, Revista de Economia Publica, Social y Cooperativa.

The journal Sustainability has the largest number of publications in the sample (22 documents). The study with the highest citation within the final sample was "Supply Chain Configurations in the Circular Economy: A Systematic Literature Review" (Masi et al., 2017) which performed a systematic review of 77 documents to discuss and analyze the meso level of supply chains in relation to circular economy.

The second source with the highest number of publications (13 documents) was the Journal of Cleaner Production, highlighting the publication of the article "Green, circular, bio-economy: A comparative analysis of sustainability avenues" (D'Amato et al., 2017), one of the most cited articles in the final sample. The authors D'Amato et al. (2017) carried out a review using both bibliometric and conceptual analysis to evaluate about 2000 scientific articles published in the last three decades involving the themes of circular economy, bioeconomy, and green

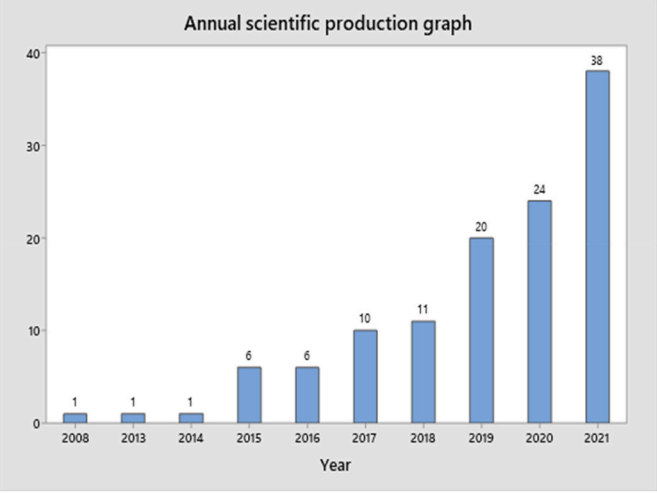

Fig. 1. Annual scientific production graph.

Table 4
Ranking of the 20 most relevant journals in the final sample according to the Bradford's Law.

Rank	Sources	Freq[a]	cumFreq	Zone
1	Sustainability	22	22	Zone 1
2	Journal of Cleaner Production	13	35	Zone 1
3	CIRIEC-España, Revista de Economia Publica, Social y Cooperativa	4	39	Zone 1
4	Resources Conservation and Recycling	3	42	Zone 2
5	Science of the Total Environment	3	45	Zone 2
6	Waste Management	3	48	Zone 2
7	International Journal of Supply Chain Management	2	50	Zone 2
8	International Journal of Sustainability in Higher Education	2	52	Zone 2
9	International Journal of Sustainable Development and World Ecology	2	54	Zone 2
10	Journal of Environmental Management	2	56	Zone 2
11	Local Environment	2	58	Zone 2
12	Supply Chain Management: An International Journal	2	60	Zone 2
13	Sustainable Development	2	62	Zone 2
14	Sustainable Production and Consumption	2	64	Zone 2
15	Waste Management and Research	2	66	Zone 2
16	WIT Transactions on Ecology and the Environment	2	68	Zone 2
17	Acta Horticulturae	1	69	Zone 2
18	Administrative Sciences	1	70	Zone 2
19	Agriculture (Switzerland)	1	71	Zone 2
20	Asia Life Sciences	1	72	Zone 2

[a] Number of published sample documents.
Source: Authors' elaboration using Bibliometrix R-package

economy.

The third source with the most documents (4 documents) published was the CIRIEC-España Revista de Economia Publica Social y Cooperativa. The article by Chaves Ávila and Monzón Campos (2018) (the eighth most cited article in the sample) sttod out; it addresses social economy from the perspective of emerging economic concepts (for example, social innovation and social enterprises).

According to the Journal Citation Report (JCR) of 2021, the most cited articles were observed to be published in different sources and in journals with a high impact factor (IF). Journals such as Omega-International Journal of Management Science (JCR 8.673), and Supply Chain Management: an International Journal (JCR 11.263) are presented in the sample (as detailed in Table 5). In addition, the affiliation of the first author shows the prevalence of European countries, such as France, Finland, United Kingdon, Germany, and Denmark (see Table 5).

3.1.3. Main authors

This subsection it presented the top 10 authors according to the final sample. This classification (Table 6) was based on the total number of publications and on the h-index, which consists of a metric that measures the productivity and impact of citations of the researcher's publications. In other words, the index was based on the set of scientific articles most cited by researcher and also on the number of citations they received in other publications (Aria and Cuccurullo, 2017).

Miemczyk J. was the most influential author, and his articles address

Table 5
The 20 most cited documents in the final sample.

Title/Authors	Source	JCR/IF (2021)	Total citations	Affiliation of the first author
Sustainable supply chain network design: An optimization-oriented review (Eskandarpour et al., 2015)	Omega-International Journal of Management Science	8.673	323	Ecole des Mines de Nantes, Nantes, France
Green, circular, bio economy: A comparative analysis of sustainability avenues (D'Amato et al., 2017)	Journal of Cleaner Production	11.072	287	University of Helsinki, Helsinki, Finland
20 years of performance measurement in sustainable supply chain management – what has been achieved? (Beske-Janssen et al., 2015)	Supply Chain Management: An International Journal	11.263	132	Centre for Sustainability Management (CSM), Leuphana Universität Lüneburg, Lüneburg, Germany
Supply Chain Configurations in the Circular Economy: A Systematic Literature Review (Masi et al., 2017)	Sustainability	3.889	118	Warwick Manufacturing Group, University of Warwick, Coventry, UK
Sustainable urban infrastructure in China: Towards a Factor 10 improvement in resource productivity through integrated infrastructure systems (Ness, 2008)	International Journal of Sustainable Development and World Ecology	4.870	91	University of South Australia, Mawson Lakes, Australia
Introduction of the circular economy within developing regions: A comparative analysis of advantages and opportunities for waste valorization (Ferronato et al., 2019)	Journal of Environmental Management	8.910	90	Department of Theoretical and Applied Sciences, University of Insubria. Varese, Italy
Reverse logistics network for municipal solid waste management: The inclusion of waste pickers as a Brazilian legal requirement (Ferri et al., 2015)	Waste Management	8.816	83	Department of Engineering and Technology, Federal University of Espírito Santo – UFES, Brazil
La economía social ante los paradigmas económicos emergentes:	CIRIEC-Espana Revista de Economia Publica, Social y Cooperativa	0.47	63	Universitat de València, Spain

(*continued on next page*)

Table 5 (*continued*)

Title/Authors	Source	JCR/IF (2021)	Total citations	Affiliation of the first author
innovación social, Economía colaborativa, economía circular, responsabilidad social empresarial, economía del bien común, empresa social y economía solidaria (Chaves Ávila and Monzón Campos, 2018)				
System dynamics applied to closed loop supply chains of desktops and laptops in Brazil: A perspective for social inclusion of waste pickers (Ghisolfi et al., 2017)	Waste Management	8.816	62	Transportation Engineering Program, Federal University of Rio de Janeiro – UFRJ, Brazil
Drivers for adopting reverse logistics in the construction industry: a qualitative study (Chileshe et al., 2016)	Engineering, Construction and Architectural Management	3.850	57	School of Natural and Built Environments, University of South Australia, Adelaide, Australia
Supply chain channel coordination with triple bottom line approach (Biswas et al., 2018)	Transportation Research Part E: Logistics and Transportation Review	10.047	54	Operations Management Area, Indian Institute of Management Lucknow, India
How does social sustainability feature in studies of supply chain management? A review and research agenda (Nakamba et al., 2017)	Supply Chain Management: An International Journal	11.263	52	School of Mechanical, Aerospace and Civil Engineering, University of Manchester, Manchester, UK
A typology of circular economy discourses: Navigating the diverse visions of a contested paradigm (Calisto Friant et al., 2020)	Resources, Conservation and Recycling	13.716	50	Copernicus Institute of Sustainable Development, Faculty of Geosciences, Utrecht University, The Netherlands
Multi-criteria decision-making approaches for green supply chains: a review (Banasik et al., 2018)	Flexible Services and Manufacturing Journal	2.209	49	Operations Research and Logistics, Wageningen University, The Netherlands
Effect of product recovery and sustainability enhancing indicators on the location selection of manufacturing facility (Govindan et al., 2016)	Ecological Indicators	6.263	44	Centre for Sustainable Operations Management, Department of Technology and Innovation University of Southern Denmark, Odense, Denmark
Exploring circular economy imaginaries in European cities: A research agenda for the governance of urban sustainability transitions (Fratini et al., 2019)	Journal of Cleaner Production	11.072	43	Center for Design, Innovation and Sustainable Transitions (DIST), Department of Planning, Aalborg University, Copenhagen, Denmark
Supporting phosphorus management in Austria: Potential, priorities and limitations (Zoboli et al., 2016)	Science of the Total Environment	10.754	40	Centre for Water Resource Systems, TU Wien, Karlsplatz, Vienna, Austria.
Dynamic development and execution of closed-loop supply chains: a natural resource-based view (Miemczyk et al., 2016)	Supply Chain Management: An International Journal	11.263	40	Audencia Business School, Nantes, France and Aix Marseille Université, Marseille, France
The discourse of eco-innovation in the European Union: An analysis of the Eco-Innovation Action Plan and Horizon 2020 (Colombo et al., 2019)	Journal of Cleaner Production	11.072	32	Hope Hall, University of Exeter, Prince of Wales Road, Exeter, UK
Environmental management partner selection for reverse supply chain collaboration: A sustainable approach (Govindan et al., 2019)	Journal of Environmental Management	8.910	32	Center for Sustainable Supply Chain Engineering, Department of Technology and Innovation, University of Southern Denmark, Odense M, Denmark

the topic of Closed Loop Supply Chain and Sustainable Supply Chain. Diniz C.G., affiliated to the Federal University of Espírito Santo in Brazil is the second most influential, and her research addresses the topic of social inclusion of collectors in Closed Loop supply chains and the Reverse Logistics Network. The co-authored article "System dynamics applied to closed loop supply chains of desktops and laptops in Brazil: A perspective for social inclusion of waste pickers" (Ghisolfi et al., 2017) highlights the importance of formalizing waste pickers through co-operatives or other types of organization, because once the formalization takes place, the collectors can demand rights and increase their bargaining power.

Authors such as Govindan K. (University of Southern Denmark, Denmark) and Jha P. (Department of Operational Research, University of Delhi, India) addressed research in the field of supply chain with a focus on sustainability.

Table 6
General information about the top 10 authors of the final sample.

Authors	h_index	Total citations	PY_start	Institution/Country
Miemczyk J	2	363	2015	Audencia Business School, Nantes, France AND Aix Marseille Université, Marseille, France
Diniz C G	2	145	2015	Department of Engineering and Technology, Federal University of Espírito Santo, Brazil
Govindan K	2	76	2016	Center for Sustainable Supply Chain Engineering, Department of Technology and Innovation, University of Southern Denmark, Odense M, Denmark
Jha P	2	76	2016	Department of Operational Research, University of Delhi, Delhi, India
Vermeulen W	2	57	2020	Copernicus Institute of Sustainable Development, Faculty of Geosciences, Utrecht University, Netherlands
Pansera M	1	33	2019	Universidade de Vigo - Post-Growth Innovation Lab, Pontevedra, Spain;
Abdallah S	1	7	2019	College of Business Administration, Abu Dhabi University, Abu Dhabi, UAE
Slomski V	2	4	2020	Fundação Escola de Comércio Álvares Penteado University Center (UNIFECAP), São Paulo, Brazil
Abrantes J	1	4	2021	Department of Environment and Planning, University of Aveiro, Aveiro, Portugal
Acheampong A	1	4	2020	Department of Construction Technology and Management, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

Vermeulen W. (Utrecht University, Princetonlaan, The Netherlands) was the fifth most relevant author. One of the author's articles was a literature review that developed a discursive typology to understand and analyze the plurality of the circular economy concept.

3.1.4. Theories and methods

This subsection identified the objective of the paper, the theories/themes addressed, and the method adopted in the 20 most cited articles. The analysis is detailed in Table 7.

From the 20 papers, seven are literature reviews. One of them is a literature review combined with the case study method. Six articles presented a qualitative approach as a research method, and five of them applied a quantitative approach as mathematical modeling. The quantitative methods are adopted in studies about manufacturing locations considering the dimensions of sustainability (Govindan et al., 2016), and reverse supply chain for electronic waste (Ghisolfi et al., 2017; Govindan et al., 2019). Ferri et al. (2015) and Ghisolfi et al. (2017) explore reverse logistics of solid waste in Brazil. Both of them adopted quantitative methods and refer to the inclusion of waste pickers in reverse logistics chains. The qualitative studies refer to developed countries such as France, United Kingdon, the Netherlands (Fratini et al., 2019), and South Australia (Chileshe et al., 2016). Bolivia is the only non-European country besides Australia, mentioned in the qualitative studies (Ferronato et al., 2019).

Regarding the theories and concepts, most of the 20 papers are dedicated to supply chain literature (Biswas et al., 2018; Nakamba et al., 2017) and variations such as closed-loop supply chain (also reverse logistics) (Miemczyk et al., 2016; Ghisolfi et al., 2017), reverse supply chain (Govindan et al., 2019), circular supply chains (Masi et al., 2017), sustainable supply chain management (Beske-Janssen et al., 2015), and green supply chain (Banasik et al., 2018). Two qualitative papers adopted circular economy as a theoretical background. One of them also adopted urban sustainability transitions (Fratini et al., 2019), and the other one brought resource-based view and dynamic capabilities combined with circular economy (Miemczyk et al., 2016). Only one adopted the lens of eco-innovation for analyzing the discourse of the theme in the EU (Colombo et al., 2019).

Details of each paper are presented in Table 7.

3.1.5. Core words

This subsection addresses the most frequent words from the final sample data collection that contains 490 Author's Keywords (DE) and 727 Keywords Plus (ID). Table 8 presents the keywords plus, which are those that frequently appear in the title of an article references, the 10 keywords most attributed by the authors of the documents in the final sample, and the most frequent words in the titles of the articles in the sample (Secinaro et al., 2020).

Words that appear in at least two categories were dubbed common terms and are "Circular Economy", "Reverse logistics", "Sustainable development", "Recycling", "Solid waste", "Waste management" and "Sustainability".

3.2. Content analysis

3.2.1. First part of the content analysis

A co-word analysis was conducted; it refers to a content analysis technique that uses the words present in the documents to establish links and build a conceptual structure. Co-word analysis is applied to document titles, keywords, abstracts, or full texts. The result of co-word analysis is a network of themes and their relationships representing the conceptual space of a field (Zupic and Čater, 2015). The method is useful to describe the links between distinct research topics, and it is based on the idea of obtaining the contents of the documents based on the co-occurrence of keywords (Yu et al., 2021; Callon et al., 1991).

A co-word analysis was conducted using the authors' keywords and created a co-occurrence network using the VOSviewer software. Fig. 2 displays the co-occurrence network for a threshold equal to 3 (i.e., minimum occurrence of 3). With this parameter, the network has 26 items, 6 clusters, and 55 links. Table 9 presents information about search clusters.

The co-word analysis allows classifying current research into 6 distinct clusters. This section provides a detailed understanding of the research in each cluster. The steps proposed by Bashir (2022) were followed.

3.2.1.1. Cluster 1 (red): Brazil; business model; developing countries; municipal solid waste; recycling; reverse logistics; waste pickers. In Cluster 1, most articles analyze waste and related topics, such as municipal solid waste, reverse logistics, and waste pickers. Brazil is also highlighted as Latin America's largest economy (Busch et al., 2018), and the increase in its generation of solid urban waste derives from the rapid urbanization of the country highlighted by Slomski et al. (2021). Also pointed out was the elaboration of the Brazilian Solid Waste Policy (BSWP) from 2010 (Souza and Sami, 2018) and the barriers faced by municipalities to address all requirements (Ferri et al., 2015). The main objectives of BSWP were to implement selective collection, composting of organic waste, and reverse logistics (Ferri et al., 2015). The law also proposes principles such as integrated waste management, and shared responsibility for the life cycle products among manufacturers, importers, distributors, and consumers (Sakamoto et al., 2021). With the implementation of the law, organizations are responsible for

Table 7
Summary of information on the 20 most cited articles in the final sample (e.g., objectives, theories, and methods).

Order	Authors	Number of citations via Google Scholar[a]	Objective	Methodology	Theories/or themes
1	(Eskandarpour et al., 2015, p.12, p.12)	686	"Objective is to review SCND problems that include a clear assessment of at least two of the three dimensions of sustainable development: economic aspects, environmental performance and social responsibility. We review papers containing mathematical models (linear and nonlinear programs with integer or mixed integer variables) with binary decision variables modeling the selection of candidate facilities."	Review Period of time: 1990 to 2014; Database: (Scopus, Web of Science)	Supply chain management (SCM)/Supply Chain Network Design (SCND)
2	(D'Amato et al., 2017, p.717, p.717)	836	"The aim of this article is thus to compare these three sustainability concepts: CE, GE, BE."	Review (Bibliometric analysis and conceptual analysis) Period of time: 1990 to 2017; Database: Web of Science.	Three sustainability concepts: Circular Economy, Green Economy and Bioeconomy
3	(Beske-Janssen et al., 2015, p.665, p.665)	319	"This paper aims to fill this gap by systematically reviewing 20 years of literature on sustainability performance measurement and management in SSCM with a particular focus on indicators, tools and systems proposed and empirically investigated"	Review (bibliometrical metrics and research content): Period of time: past 20 years Databases: Academic journal (EBSCO Business Source, Emerald, Science Direct and Wiley)	Sustainable Supply Chain Management (SSCM)
4	(Masi et al., 2017, p.1, p.1)	286	"This paper conducts a systematic literature review (SLR) on CE with two objectives: the first is to synthesize what goals and assumptions about CE underpin the different strands of research on the meso-level, and second to assess the state of knowledge on SC configurations and their competitive environments within CE."	Review Period of time: 2005 to 2017 Databases: Web of Science, Scopus and ProQuest	Circular Supply Chains (CSCs)
5	(Ness, 2008, p.288, p.288)	233	"This paper emphasizes that more holistic infrastructure systems are of great importance to achieving sustainable development of China and hence of the planet."	Critical analysis	Sustainable urban infrastructure
6	(Ferronato et al., 2019, p.367, p.367)	255	"The aim of this study is to present the main opportunities for introducing CE in low-middle and middle income developing regions, where recycling systems are not still developed."	Case studies Country: Romania, a European Country, and Bolivia, no-European. Data collect: The international collaboration among the universities involved and a literature survey.	Solid waste management (SWM)
7	(Ferri et al., 2015, p.174, p.174)	166	"This article proposes a reverse logistics network involving MSWM to solve the challenge of managing these wastes in an economic way considering the new legal requirements and the inclusion of waste pickers."	Mathematical modelling (applied mathematical modeling for the city of São Mateus in Brazil)	Reverse logistics network (Management of municipal solid waste (MSW))
8	(Chaves Ávila and Monzón Campos, 2018, p.6)	277	"The article seeks to clarify the concepts of social enterprises, solidarity economy, collaborative economy, circular economy, economy for the common good, fourth sector, social innovation and corporate social responsibility. The goal is to understand how these concepts compare and relate to the established concept of the social economy."	Review	Social economy
9	(Ghisolfi et al., 2017, p.15, p.15)	129	"This work designs a closed cycle model to manage the reverse logistics of desktop and laptop waste and assesses the impact of Brazilian public policies related to solid waste management on the social inclusion of waste pickers."	Mathematical model	Closed loop supply chains/ Structure of reverse logistics for waste electrical and electronic equipment (WEEE)
10	(Chileshe et al., 2016, p.135, p.135)	112	"This study explores the drivers that are relevant for implementing Reverse logistics (RL) practices in construction."	Qualitative approach Country: South Australia Data collect: (Semi-structured interviews)	Reverse logistics
11	(Biswas et al., 2018, p.214, p.214)	95	"Answer the aforementioned questions by investigating a dyadic supply chain that puts efforts toward greening as well as CSR activities, along with profit motive while facing deterministic demand."	Mathematical model	Supply chain/Triple bottom line
12	(Nakamba et al., 2017, p.522, p.522)	116	"The purpose of this paper is to examine how social sustainability is considered in the study of supply chain management"	Review Period of time: 2007 to 2017 Database: EBSCOhost, Scopus and Emerald	Supply chain management

(*continued on next page*)

Table 7 (*continued*)

Order	Authors	Number of citations via Google Scholar[a]	Objective	Methodology	Theories/or themes
13	(Calisto Friant et al., 2020, p.2, p.2)	262	"This research aims to address such conceptual risks and help actors better navigate and analyze the history, complexity and plurality of circularity visions by establishing a typology of circularity discourses."	Critical review and discussion of the results obtained (typology of discourses on CE) in an academic conference and three academic workshops Database: Google Scholar, Scopus and WorldCat	Circular economy
14	(Banasik et al., 2018, p.366, p.366)	120	"The aim of this paper is to review the use of Multi-Criteria Decision Making (MCDM) approaches for designing efficient and effective Designing Green Supply Chains (GSCs)."	Review Period of time: 2000 to 2015 Database: ISI Web of Science	Green supply chains
15	(Govindan et al., 2016, p.517, p.517)	76	"This study aims at prioritizing alternative potential locations for manufacturing firms with respect to the three dimensions of sustainability."	Mathematical modeling	Sustainable development
16	(Fratini et al., 2019, p.976, p.976)	142	"Our research interest draws towards understanding those situated processes that are co-producing governance concepts, such as 'circular economy', which have potential for driving changes in urban contexts."	Qualitative approach (literature review and three case studies) Literature review Period of time: 2001 to 2017 Database: Scopus Three case studies (In Amsterdam, Paris and London.)	Circular economy/urban sustainability transitions
17	(Zoboli et al., 2016, p.314, p.314)	59	"This case study shows the added value of using Material Flow Analysis as a basis to design sound management strategies."	Qualitative approach (Case study)	Circular economy/Phosphorus management
18	(Miemczyk et al., 2016, p.453, p.453)	89	"This paper aims to reflect on recent closed-loop supply chain (CLSC) practices using a natural resource-based view (NRBV) and dynamic capabilities (DC) perspective."	Qualitative approach (case studies) Data collect: semi-structured interview	Closed-loop supply chains/ natural resource-based view (NRBV) and dynamic capabilities (DC)
19	(Colombo et al., 2019, p.654)	86	"The aim of this paper is to explore how the discourse of eco-innovation has been framed by the EU, to unravel its meanings and to shed light on its recent evolution."	Qualitative approach (discourse analysis)	Eco-innovation
20	(Govindan et al., 2019, p.785, p.785)	76	"The novelty of the study which distinguishes it from the other studies in this field lies in identifying the performance attributes for the evaluation of the OEMs by 3PRLPs for a collaborative RL venture."	Mathematical modeling	Reverse supply chain

[a] In February 2023, the citations of the 20 most cited articles were verified via Google Scholar.

post-consumption and for incorporating the costs of treating products and packaging into the cost of production (Slomski et al., 2021).

Waste management could be discussed from a technical perspective or socio-ecological view. The first one is more centralized whereas the social-ecological perspective takes into consideration disruptive types of innovation based on a small scale, and small communities (Swagemakers et al., 2018). The authors introduced the concept of communing as a social practice, from Elinor Ostrom's work, to analyze circular economies. They conducted an analysis of the management of green waste in the city of Vigo, Spain. The main idea is to analyze how to manage resources from local communities. For the authors, the communing perspective brings local and historical resources to the analysis, which could open up alternatives to provide incentives to community prosperity.

Table 8
The 10 most frequent words: keywords plus, author keywords, and Titles.

Keywords Plus (ID)	Freq.	Author keywords (DE)	Freq.	Titles	Freq.
Recycling	31	Circular economy	52	Circular economy	31
Waste management	28	Sustainability	20	Supply chain	14
Sustainable development	26	Reverse logistics	8	Sustainable development	6
Sustainability	21	Sustainable development	8	Closed loop supply	5
Circular economy	20	Recycling	6	Literature review	5
Reverse logistics	14	Innovation	5	Reverse logistics	5
Economics	12	Waste pickers	5	Waste management	5
Municipal solid waste	12	Brazil	4	Solid waste	4
Solid waste	12	Closed-loop supply chain	4	Systematic literature	4
Waste disposal	12	Social innovation	4	Urban sustainability	4

Sakamoto et al. (2021) highlight the waste management model called "Inclusive and Solidarity Recycling" which addresses environmental and social objectives, such as job creation and pollution reduction. The social side is also highlighted by Bubicz et al. (2019) for developing countries in a literature review about the sustainable supply chain. Similarly, the informal recycling sector is discussed by Villalba (2020), who analyzed the integration of the informal recycling sector into the formal waste management system in the city of Buenos Aires. The main challenges highlighted are the maintenance of communication channels with local authorities to elaborate joint actions to promote integrated waste management policies.

Sustainable business models are discussed by Thorisdottir and Johannsdottir (2019) in a literature review of the fashion industry. For the authors, the integration of sustainability in the business includes the values of organizations, entrepreneurship, innovation, and internationalization processes. Wanniarachchi et al. (2020) also analyze sustainable business models and their features in the textile handloom industry

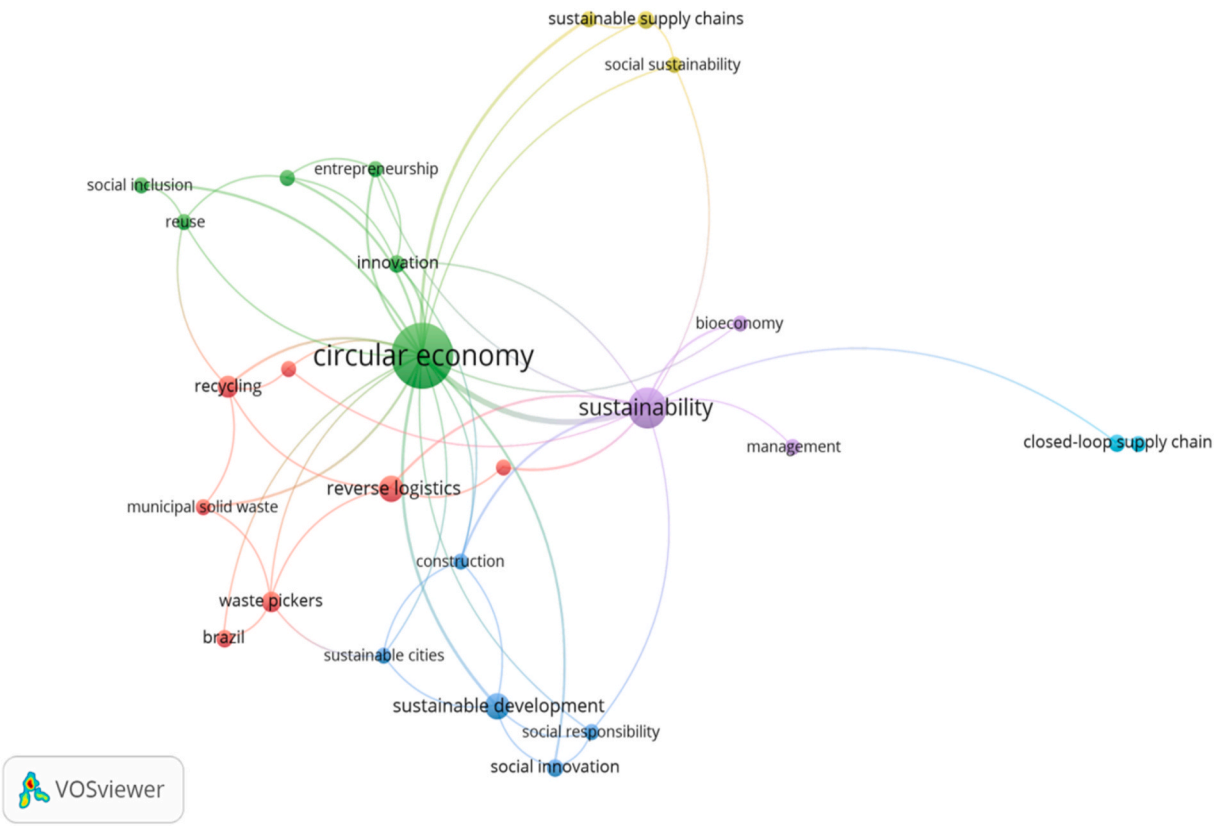

Fig. 2. Co-occurrence network for circular economy and social inclusion. **Note:** The thresholds for the minimum number of co-occurrences of a keyword was equal to 3.

Table 9
Co-occurrence network clusters: keywords and frequency in each cluster.

Cluster	Keywords and frequency	Research flow
Cluster 1 (red)	Brazil (4); recycling (6); reverse logistics (8); waste pickers (5); business model (3); developing countries (3); waste pickers (5)	Reverse logistics, recycling
Cluster 2 (green)	circular economy (52); entrepreneurship (3); governance (3); innovation (5); social inclusion (3)	Circular economy, innovation
Cluster 3 (blue)	social innovation (4); social responsibility (3); sustainable cities (3); sustainable development (8)	Social innovation
Cluster 4 (yellow)	industrial ecology (3); social sustainability (3); sustainable supply chains (4)	Sustainable supply chains
Cluster 5 (magenta)	Bioeconomy (3); management (3); sustainability (20)	Bioeconomy
Cluster 6 (light blue)	closed-loop supply chain (4); supply chain management (3)	Closed-Loop Supply Chain

located in Sri Lanka. These authors recommended that the expansion of a sustainable business model in this industry depends on the implementation of design and the developing of entrepreneurial skills in weaving communities. Weigeng Weigend Rodríguez et al. (2020) conducted a literature review combining the literature of the circular economy to provide an insight into "how to go from present to future".

This cluster largely mentioned the recycling strategy of circular economy, highlighting the importance of the informal sector, mainly waste pickers in waste management systems in developing countries, such as Brazil and Argentina. The papers also bring out the involvement of communities in developing countries to the implementation of sustainable business models.

3.2.1.2. Cluster 2 (green): circular economy, entrepreneurship, governance, innovation, reuse, and social inclusion. In cluster 2, the concept of governance is mainly related to institutions and how to drive changes regarding circular economy strategies. Governance is addressed at distinct levels such as municipal, and regional (Swagemakers et al., 2018), besides private and public sectors, as pointed out by Swagemakers et al. (2018) as governance models. For these authors, there is a third governance model to close loops and to manage shared resources. This governance model is specifically important considering communities and distinct stakeholders.

Alba-Patino et al. (2021) discussed governance from the perspective of social and environmental indicators and postulated that these indicators could provide a better connection in terms of global governance showing the changes in the economies. Governance is also discussed with the concept of socially innovative models as stated by Spinelli et al. (2019), who discussed the increase of social innovation through alternative transaction models. These involve collective actions, such as co-design and co-delivery methodology, the role of communities, the participation of local businesses and organizations, and continuous interface with local and central policymakers.

In this cluster, reuse is most related to recycling and waste management as in Caldas et al. (2020) and Slomski et al. (2021). Slomski et al. (2021) pointed out the reuse of domestic solid waste, which is ignored by municipal governments, and also highlighted the importance of reverse logistics to mitigate environmental impacts, generate jobs, and promote social inclusion. Fidélis et al. (2021) analyzed the reuse of water in the context of national action plans in the European Union, and discovered the content analysis of action plans revealed a scarce concern about water management.

Regarding social inclusion, Slomski et al. (2021) analyzed the potential of correctly managing urban solid waste to promote income generation and social inclusion. Souza and Sami (2018) propose a

methodology to implement a reverse logistics organization with waste management cooperatives in São Paulo, Brazil. The project described in that paper consisted of distinct stakeholders, such as the Environmental Sanitation Technology Company of the State of São Paulo (Cetesb), and the Faculty of Medicine of the University of São Paulo (USP). The results indicated the importance of cooperation and simultaneous actions for the success of the project.

Busch et al. (2018) discuss frugal innovation and social inclusion in two cases of solar water heating companies from Brazil. They analyze the relationship between sustainability and frugal innovation. From the cases analyzed, the authors concluded that companies achieve circular products increasing environmental sustainability and social inclusion. Campagnaro and D'Urzo (2021) analyze the type of organization called B social cooperation in the Italian waste management sector. The paper highlights the importance of supporting cooperatives to promote the transition to a circular system, besides environmental benefits and social inclusion.

Regarding entrepreneurship, Thorisdottir and Johannsdottir (2019) discuss the analysis of fashion business models taking into account elements such as organization values, innovation, and entrepreneurship. Velenturf et al. (2019) stated the importance of social entrepreneurship but argue that the concept is under-theorized in academic literature. Wanniarachchi et al. (2020) argue that community-based entrepreneurship must be stimulated to support sustainable business innovation in the handloom industry. Bucea-Manea-Ţoniş et al. (2021) also analyzed countries in the European Union considering innovation and entrepreneurship as elements to classify countries. The relations among concepts such as social enterprise, social entrepreneurship, and solidarity economy were also discussed in Chaves Ávila and Monzón Campos (2018). De Medici et al. (2018) discusses the distinct types of capital and how they could kindle entrepreneurship. The authors classify capital as institutional; knowledge institutional capital depends on the local authority and refers to coordinated actions. Knowledge capital is usually provided by higher education institutions or innovation hubs that can transfer knowledge to society. According De Medici et al. (2018) the interaction of these capitals is essential to promote entrepreneurship, and highlighted the contribution of empowering civil society.

3.2.1.3. Cluster 3 (blue): social innovation, social responsibility, sustainable cities and sustainable development. According to Spinelli et al. (2019) social innovation refers to alternative transaction models, such as circular economies; it involves changes in social relations, and the shared values of the people involved. The authors also related social innovation to communities' development, and examined four case studies from the perspective of asset-based community development (ABCD) principles. Swagemakers et al. (2018) bring the idea of bottom-up social innovation based on the learning process developed by citizens, who learn how to use resources more sustainably. For Swagemakers et al. (2018) this process brings less tension between social, environmental, and economic objectives. Moreover, it could stimulate greater participation of small organizations, and local communities.

Nicolosi et al. (2021) discuss social farming and its contribution to sustainable development. They also discuss the capacity of social farming to introduce innovations supported by the service ecosystems on farms whereas Provasnek et al. (2017) discuss eco-innovations related to stakeholder engagement and the steps to transform eco-innovations into sustainability-oriented innovations.

Another framework is proposed by Rebehy et al. (2017), which is to implement a waste management system adopting a social business based on decentralized micro-cooperatives and the inclusion of people from the Bottom of the Pyramid to promote sustainable development.

Chen (2021) proposes a framework to articulate a circular economy within the context of sustainable cities. Circular economy is also analyzed from the perspective of rebound effects. Chen (2021) argues that literature discussing rebound effects has to consider the social dimension and circular economy stakeholders. Fabbricatti and Biancamano (2019) and Kang et al. (2019) also highlight sustainable cities in the context of sustainable development goals, SDG 11, and their importance in the sustainable development research literature. Kang et al. (2019) highlighted the efforts of China in the development of sustainable cities and detail the overall process of China's development of sustainable cities, pointing out the importance of policy and administrative support for promoting sustainable development (Kang et al., 2019).

3.2.1.4. Cluster 4 (yellow): industrial ecology, social sustainability, sustainable supply chains. Vahidzadeh et al. (2021) conducted a literature review on regional industrial symbiosis. The main themes in the literature review are separated into clusters, one of which addresses the social aspects of industrial symbiosis. In this cluster, the literature is related to collaborations/links among stakeholders of symbiosis networks. Walker et al. (2021) also argued that industrial ecology and supply chain topics have limited inclusion of the social dimension. Other authors, such as Weigend Rebehy et al. (2017), Velenturf et al. (2019), and Walker et al. (2021), pointed out that industrial ecology is a holistic approach and propose to combine environmental and economic dimensions. They also referred to industrial ecology as a base concept for the circular economy literature.

Clube and Tennant (2022) highlighted that China adopted the principle of industrial ecology as a national development strategy at the beginning of the 2000s. Molina-Prieto et al. (2019) argued that industrial ecology is based on two literature backgrounds, system theory and ecology. They state that industrial ecology is a concept that strengthens urban sustainability. Campos et al. (2014) conducted a systemic analysis based on industrial ecology, on the reverse logistics of electric and electronic waste.

Regarding sustainable supply chains, Bubicz et al. (2019) conducted a literature review about how the social dimension was incorporated by the supply chain management literature, identifying human rights, product responsibility, labur conditions and society as four social dimensions. The most studied dimension is labor conditions, followed by human rights. The social dimension is largely addressed in the studies about suppliers' selection and procurement activities. As further research, Bubicz et al. (2019) highlighted the scarcity of studies integrating the four social aspects in the implementation of sustainable supply chains, and the need for more research about small and medium companies and their links to large companies.

3.2.1.5. Cluster 5 (magenta): bioeconomy, management, and sustainability. Bioeconomy is analyzed considering the balance of the increasing demand for natural resources and biodiversity conservation (Fidélis et al., 2021; Calisto Friant et al., 2020). D'Amato et al. (2017) conducted a literature review about the concepts of circular economy, green economy, and bioeconomy; green economy is the "umbrella" concept including elements from circular economy and biodiversity. Bioeconomy focuses on resources concerning the biosecurity of local processes and rural policies. The latter are also related to the knowledge-based bioeconomy, mainly in Europe.

Liobikiene et al. (2019) developed a framework proposing a bioeconomy based on a strong sustainability approach. They identify a trade-off between feedstock limitations and the increased demand for bio-resources. They also introduced some indicators to measure the progress of the bioeconomy process, which are biocapacity from the supply side, and land footprint from the demand side.

According to D'Amato et al. (2017) and Liobikiene et al. (2019), bioeconomy is strongly addressed in the European Union agenda. In 2012, the European Commission launched the strategy "Innovating for sustainable growth: a bioeconomy for Europe", which was renewed in 2018. Liobikiene et al. (2019) stated the importance of bioeconomy to reach sustainable development goals. The authors also conducted a

review, pointing out the distinction between a bioeconomy more focused on biotechnology and others on a sustainable bioeconomy. The authors also add that most of the literature about bioeconomy focuses on the economic aspect. Bicchielli et al. (2021) also discuss the connections among bioeconomy, circular economy, and sustainable development goals. They argue that a bioeconomy could accelerate the transition to a circular system since its main focus is using renewable biological resources. It also emphasizes the collaboration of distinct stakeholders to explain the BIOVOICES H2020 Project funded by the European Commission.

3.2.1.6. Cluster 6 (light blue): closed-loop supply chain; supply chain management. The terms found in the Cluster 6 (light blue) closed-loop supply chain and supply chain management are used in the papers in a general manner. The only exception is Chileshe et al. (2016) that conducted an empirical study focused on reserve logistics in the construction industry. The closed-loop supply chain is discussed under this perspective and targets minimal waste.

4. Discussion

The studies reviewed in our sample provide a large body of knowledge referring to circular economy strategies and social inclusion. The discussion section combined the codes proposed in the methods section regarding circular economy strategies and priority stakeholders and the stakeholders' categories proposed in the S-LCA (Luthin et al., 2023). The main idea was to identify and analyze the intersections between each CE strategy and each stakeholder. The result of this intersection was supported by NVivo based on the frequency of words relating each circular strategy to distinct stakeholders, which is detailed in Table 10.

The number of intersections was higher in the reduce and reuse circular strategies for communities and consumers, followed by society, as shown in Fig. 3 (based on Table 10).

All CE strategies are mentioned for communities. The importance of addressing community needs through organizing networks for reducing the use of resources such as energy and water was pointed out. Also mentioned is the organization of communities to create circular businesses (Spinelli et al., 2019), and the local communities as decision markers in waste management processes (Suarez-Fernandez de Miranda et al., 2021).

Only remanufacturing is not mentioned as regards consumers. The literature highlighted the importance of circular products to educate and change the mentality of consumers (Walker et al., 2021; Berry et al., 2022), and the promotion of social relations between farmers and consumers for promoting a reduction in the use of resources (Colucci et al., 2019).

Reuse and society were discussed very often in the scope of urban sustainability, stressing the positive impacts of reusing domestic solid waste to generate income, jobs, and social inclusion. In this matter, the literature highlighted the importance of integrative management practices in the reuse of waste for society (Slomski et al., 2021; Kjellén, 2018).

Reuse and consumers are generally linked in the papers concerning educating consumers about the importance to reuse, and recognizing the importance of circular business models that promote sharing and extended product life cycle (Thorisdottir and Johannsdottir, 2019; Wanniarachchi et al., 2020; Campagnaro and D'Urzo, 2021; Ferreira et al., 2017; Gavrilescu et al., 2021).

Communities were mentioned from the perspective of reuse in different types of industry, and promoting the engagement of communities for reuse, such as micro-cooperatives (Rebehy et al., 2017), and the construction industry (Chileshe et al., 2016). The circular business models mentioned in the consumers scope are also discussed in the context of communities considering social entrepreneurship and social innovation (Chaves Ávila and Monzón Campos, 2018; De Medici et al., 2018). Most papers discussed the topic conceptually, not empirically. One exception is the paper proposed by Spinelli et al. (2019) which relates social innovation and communities analyzing four case studies. In addition, Swagemakers et al. (2018) discuss the importance of social innovation originating from communities and local groups as an alternative to reduce tensions among economic, environmental, and social objectives in a study conducted in Spain. Communities' priority stakeholder is added to the discussion as a third governance mode, besides the governance exerted by private and public sectors. According to Swagemakers et al. (2018) the third governance mode called commoning is exerted by the local stakeholders' collective action and implies collaborative decision-making. The discussion on reuse and community also included local economy, and how to promote local development (Calisto Friant et al., 2020; Campagnaro and D'Urzo, 2021; De Medici et al., 2018).

Suppliers and reuse were mentioned from the perspective of collaboration in value chains for promoting a sustainable system (Chileshe et al., 2016), supplier selection considering circular practices (Banasik et al., 2018), and the inclusion of suppliers in circular business models as sharing and product-service-system (Kristensen et al., 2021). Workers and reuse were addressed in terms of improving working conditions (Gavrilescu et al., 2021; Berry et al., 2022; Gwara et al., 2021) as detailed in the cross-tabulation in Fig. 4.

The analysis of core words and content analysis from VosViewer evidences the importance of reverse logistics and waste management in the literature. Both themes are directly related to recycling, which is a less frequent word in the analysis of intersections based on NVivo. The themes were greatly analyzed in developing countries such as Brazil (Busch et al., 2018; Souza and Sami, 2018; Ferri et al., 2015; Ghisolfi et al., 2017), and Argentina (Villalba, 2020), but also in developed countries, such as Spain (Swagemakers et al., 2018). In developed countries, the discussion about waste management is more systemic and it mostly approaches the concept of urban sustainability (Fratini et al., 2019; Fidélis et al., 2021; Torre et al., 2021). From the sample it raises other subcategories related to society as urban regeneration (Callon et al., 1991), urban symbiosis (De Medici et al., 2018), and urban recycling (Yáñez, 2021).

Some papers refer to the awareness of consumers about working conditions in recycling post-consumer packages (de Jesus and Barbieri, 2013; Berry et al., 2022). A more systemic approach discusses how consumers could benefit from the implementation of circular economy in urban areas (Farné Fratini et al., 2019); the discussion on consumerism is less important than welfare and social inclusion (Glavič, 2015). To our knowledge, no papers address the consumer perspective detailing empirical results or proposing systemic frameworks to analyze how

Table 10
Intersections between circular strategies and stakeholders.

	Children	Community	Workers	Consumers	Society	Suppliers	Total
Recycle	0	5	2	9	3	6	25
Reduce	2	19	8	22	12	7	70
Remanufacture	0	1	1	0	3	0	5
Repair	0	7	3	11	7	5	33
Replace	0	3	0	1	1	1	6
Reuse	0	18	8	22	20	9	77
Total	**2**	**53**	**22**	**65**	**46**	**28**	**216**

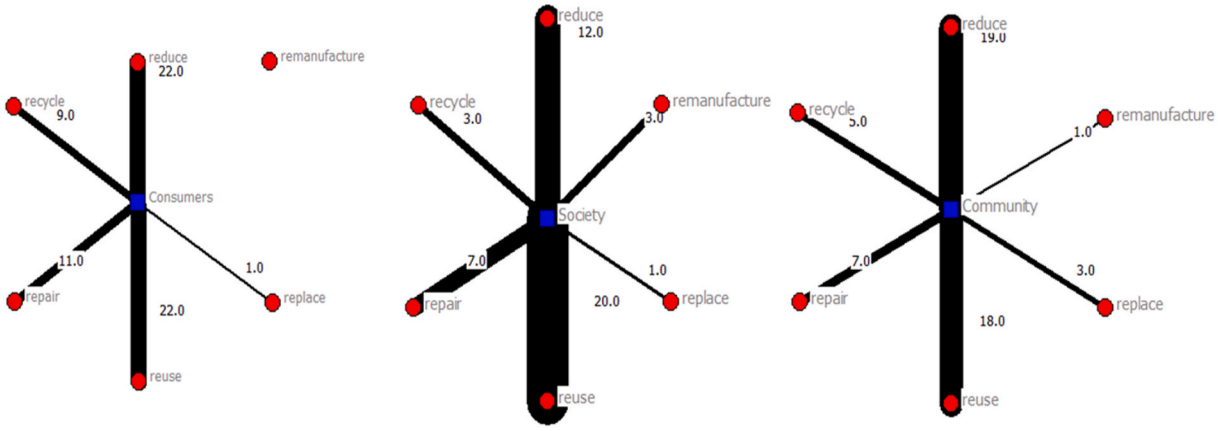

Fig. 3. Cross-tabulation based on codes intersection.

Fig. 4. Cross-tabulation based on codes intersection.

consumers could play a better role in improving recycling rates. The concern about the alliances between suppliers and designers for reducing the level of waste (Chileshe et al., 2016), and between suppliers and manufacturers for the development of recycling raw materials (Miemczyk et al., 2016) is worth mentioning. In these matters, alliances and collaboration emerged as a subcategory of inductive analysis.

The literature refers to community in the creation of a new service system in European Countries to support activities based on communities. The authors suggested activities such as eco-design, recycling, professional education, co-working, office sharing, among others (Farné Fratini et al., 2019). Also proposed is the engagement of communities in the waste-to-energy incineration in Taiwan through education (Lu et al., 2017).

The society category was associated to the increase in innovation according to S-LCA guidelines. In the sample, the link between recycling and innovation detailed the importance of technologies such as blockchain for creating new opportunities to ecoinnovation, and human innovation in converting waste into new raw materials, product, and energy (Bucea-Manea-Ţoniş et al., 2021). The literature on recycling and workers mainly discusses how to formalize cooperatives of waste pickers and provide better working conditions (Nolasco et al., 2021; Ferri et al., 2015).

However, it would be important to investigate alternative recycling processes that allow waste pickers to migrate to work in positions promoted by new circular business models. This would require training and education to waste pickers and would allow them to have other occupations in a circular system.

There are differences between developed and developing countries, which makes it essential consider the challenges of developing countries as regards social inclusion. The challenges are mainly related to promoting efficiency and scaling up activities, while simultaneously promoting social inclusion. This opens the way for adopting new approaches for analyzing waste pickers inclusion in developing countries as a form of social justice, taking into account transparent relations and the participation of all stakeholders in taking decisions (Berry et al., 2022; Souza-Piao et al., 2023).

Bioeconomy is one of the clusters yielded by the VosViewer analysis. However, the papers about bioeconomy are mostly conceptual and present the topic as an alternative to promote new business models related to renewable biological resources (Bicchielli et al., 2021), to sustainable development goals (Bicchielli et al., 2021), and refer to European countries (D' Amato et al., 2017; Liobikiene et al., 2019).

Reducing is the only circular practice in which children were mentioned, in the context of preventing child labor in the review of frameworks for reverse logistics (Melo et al., 2021).

5. Conclusions

For this paper, published articles referring to how circular economy is embracing social inclusion were reviewed. A quantitative and a qualitative analysis were conducted using a sample of 118 documents collected from the Web of Science and Scopus databases.

The quantitative analysis indicated that most papers were published between 2019 and 2021. The sample of the 20 most cited papers demonstrated the prevalence of European countries as the affiliation of first authors. The analysis about authors detailed that the second most influential author is affiliated to a Brazilian University and the paper discusses the inclusion of waste pickers.

The themes of reverse logistics/waste management and supply chains were the ones mainly addressed in the 20 most cited papers of the sample. Most qualitative articles were dedicated to analyzing subjects in developed countries. The only exception was Bolivia (Ferronato et al., 2019).

The analysis based on core words and VosViewer shows the importance of reverse logistics and waste management; most focus on waste pickers and their inclusion in formal urban waste management systems

in developing countries. However, there are indications that the analysis for developed countries is more systematic and refers to urban regeneration and urban recycling, taking into consideration distinct stakeholders, such as community, society, and workers.

Codes were also elaborated from inductive content analysis and stakeholders categories proposed by S-LCA. Reuse and reduce linked to communities, consumers, and society. The inductive analysis raised new subcategories for society and communities stakeholders. In the scope of society, it raises the concept of urban sustainability for addressing circular strategies from a systemic perspective. Also pointed out was innovation, not only in the context of society, as proposed by the S-LCA guide, but in communities perspectives. From communities perspective, the concept of social innovation and communing is discussed, linked to social entrepreneurship for demonstrating the strength of these stakeholders for promoting circular strategies.

For supplier's stakeholders, the results indicated a new subcategory of analysis, alliances and collaboration. The supply chain theme was most addressed in the 20 most cited papers of the sample, while collaboration among suppliers raised as an important element for analyzing the supplier's participation in the transition to a circular system.

Among the known unknows about CE and social inclusion, it is still not clear the extent to which a CE that does not integrate social inclusion may inadvertently have severe social consequences, such as hollowing out of jobs and displacement of labor previously occupied in a linear economy (Vanhuyse, 2021). [What?] also lacks understanding of the extent to which CE can also potentially increase inequality by further marginalizing socially vulnerable groups depending on waste collection for their livelihood Greer et al. (2021). There is little analysis of potential social exclusion caused by substituting imports of raw materials with circular inputs (e.g. the potential decrease in livelihood of raw material producers in developing countries. Theoretically, inequalities in the distribution of value and risks in CE were not adequately conceptualized, although empirical research suggests trade-offs between eco-efficiency (value captured by enterprises) and eco-development (value captured by communities) in a circular economy (Paquin et al., 2015). Other theoretical gaps with potential negative impacts include the void in terms of conceptualizing the processes needed for ensuring that all the workers in the international CE value chain are well paid and have good working conditions. Empirically, very little has been done to investigate the impacts of CE in social inclusion. Even the assumption that CE is inclusive because value in CE is circulated among enterprises of all sizes in the industry, this has neither been sufficiently conceptualized nor tested.

Future research should theoretically and empirically explore communities, urban regeneration and innovation and their links to circular strategies, as well as the importance of entrepreneurship and social innovation for intensifying circular practices embracing social inclusion, mainly in developing countries.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgements

The authors would like to acknowledge the São Paulo Research Foundation (FAPESP),grant #2019/21292-6 for supporting this research.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jclepro.2023.137340.

References

Alba-Patino, D., Carabassa, V., Castro, H., Gutiérrez-Briceño, I., García-Llorente, M., Giagnocavo, C., et al., 2021. Social indicators of ecosystem restoration for enhancing human wellbeing. Resour. Conserv. Recycl. 174, 105782 https://doi.org/10.1016/j.resconrec.2021.105782.

Aria, M., Cuccurullo, C., 2017. bibliometrix: an R-tool for comprehensive science mapping analysis. Journal of Informetrics 11 (4), 959–975. https://doi.org/10.1016/j.joi.2017.08.007.

Banasik, A., Bloemhof-Ruwaard, J.M., Kanellopoulos, A., Claassen, G.D.H., van der Vorst, J.G., 2018. Multi-criteria decision making approaches for green supply chains: a review. Flex. Serv. Manuf. J. 30, 366–396. https://doi.org/10.1007/s10696-016-9263-5.

Bashir, M.F., 2022. Oil price shocks, stock market returns, and volatility spillovers: a bibliometric analysis and its implications. Environ. Sci. Pollut. Control Ser. 1, 1–20. https://doi.org/10.1007/S11356-021-18314-4/FIGURES/13.

Bazeley, P., Jackson, K., 2013. Qualitative Data Analysis with NVivo. Sage Publica- tions Limited.

Belmonte-Ureña, L.J., Plaza-Úbeda, J.A., Vazquez-Brust, D., Yakovleva, N., 2021. Circular economy, degrowth and green growth as pathways for research on sustainable development goals: a global analysis and future agenda. Ecol. Econ. 185, 107050.

Berry, B., Farber, B., Rios, F.C., Haedicke, M.A., Chakraborty, S., Lowden, S.S., Bilec, M. M., Isenhour, C., 2022. Just by design: exploring justice as a multidimensional concept in US circular economy discourse. Local Environ. 27 (10–11), 1225–1241. https://doi.org/10.1080/13549839.2021.1994535.

Beske-Janssen, P., Johnson, M.P., Schaltegger, S., 2015. 20 years of performance measurement in sustainable supply chain management–what has been achieved? Supply Chain Manag. 20 (6), 664–680. https://doi.org/10.1108/SCM-06-2015-0216.

Bicchielli, C., Biancone, N., Ferri, F., Grifoni, P., 2021. BiOnto: an ontology for sustainable bioeconomy and bioproducts. Sustainability 13 (8), 4265. https://doi.org/10.3390/su13084265.

Biswas, I., Raj, A., Srivastava, S.K., 2018. Supply chain channel coordination with triple bottom line approach. Transport. Res.: Logist. Transport Rev. 115, 213–226. https://doi.org/10.1016/j.tre.2018.05.007.

Blomsma, F., Bauwens, T., Weissbrod, I., Kirchherr, J., 2022. The 'need for speed': towards circular disruption—what it is, how to make it happen and how to know it's happening. Bus. Strat. Environ. 32 (3), 1010–1031. https://doi.org/10.1002/bse.3106.

Blomsma, F., Brennan, G., 2017. The emergence of circular economy: a new framing around prolonging resource productivity. J. Ind. Ecol. 21 (3), 603–614. https://doi.org/10.1111/jiec.12603.

Bubicz, M.E., Barbosa-Póvoa, A.P.F.D., Carvalho, A., 2019. Incorporating social aspects in sustainable supply chains: trends and future directions. J. Clean. Prod. 237, 117500 https://doi.org/10.1016/j.jclepro.2019.06.331.

Bucea-Manea-Ţoniş, R., Šević, A., Ilić, M.P., Bucea-Manea-Ţoniş, R., Popović Šević, N., Mihoreanu, L., 2021. Untapped aspects of innovation and competition within a European resilient circular economy. A dual comparative study. Sustainability 13 (15), 8290. https://doi.org/10.3390/su13158290.

Busch, H.C., Dauth, T., Fischer, L., Souza, M., 2018. Frugal innovation approaches to sustainable domestic energy: two cases of solar water heating from Brazil. Int. J. Technol Learn. Innovat. Dev. 10 (3–4), 231–257. https://doi.org/10.1504/IJTLID.2018.093725.

Caldas, R.C., Pinto Silva, C.B., Barroso, S.F., 2020. The systemic-integrative horizontal transverasality of the environmental dimension of sustainable development: an evolving concept. Veredas Direito 17, 41. https://doi.org/10.18623/rvd.v17i38.1749.

Calisto Friant, M., Vermeulen, W.J.V., Salomone, R., 2020. A typology of circular economy discourses: navigating the diverse visions of a contested paradigm. Resour. Conserv. Recycl. 161, 104917 https://doi.org/10.1016/J.RESCONREC.2020.104917.

Callon, M., Courtial, J.P., Laville, F., 1991. Co-word analysis as a tool for describing the network of interactions between basic and technological research: the case of polymer chemistry. Scientometrics 22 (1), 155–205. https://doi.org/10.1007/bf02019280.

Campagnaro, C., D'Urzo, M., 2021. Social cooperation as a driver for a social and solidarity focused approach to the circular economy. Sustainability 13 (18), 10145. https://doi.org/10.3390/su131810145.

Campos, T.R.T., Fonseca, M.V.A., Morais, R.M.N., 2014. Reverse logistics: a route that only makes sense when adopting a systemic vision. WIT Trans. Ecol. Environ. 180, 41–52. https://doi.org/10.2495/WM140041.

Carvalho, M.M., Fleury, A., Lopes, A.P., 2013. An overview of the literature on technology roadmapping (TRM): contributions and trends. Technol. Forecast. Soc. Change 80 (7), 1418–1437. https://doi.org/10.1016/j.techfore.2012.11.008.

Chaves Ávila, R., Monzón Campos, J.L., 2018. La economía social ante los paradigmas económicos emergentes: innovación social, economía colaborativa, economía circular, responsabilidad social empresarial, economía del bien común, empresa

social y economía solidaria. CIRIEC-Esp. Rev. Econ. Publica Soc. Coop. 93, 5–50. https://doi.org/10.7203/CIRIEC-E.93.1290.
Chen, C.W., 2021. Clarifying rebound effects of the circular economy in the context of sustainable cities. Sustain. Cities Soc. 66, 102622 https://doi.org/10.1016/j.scs.2020.102622.
Chizaryfard, A., Trucco, P., Nuur, C., 2021. The transformation to a circular economy: framing an evolutionary view. J. Evol. Econ. 31, 475–504. https://doi.org/10.1007/s00191-020-00709-0.
Chileshe, N., Rameezdeen, R., Hosseini, M.R., 2016. Drivers for adopting reverse logistics in the construction industry: a qualitative study. Eng. Construct. Architect. Manag. 23 (2), 134–157. https://doi.org/10.1108/ECAM-06-2014-0087/FULL/PDF.
Clube, R.K., Tennant, M., 2022. Social inclusion and the circular economy: the case of a fashion textiles manufacturer in Vietnam. Bus. Strategy Dev. 5 (1), 4–16. https://doi.org/10.1002/bsd2.179.
Colombo, L.A., Pansera, M., Owen, R., 2019. The discourse of eco-innovation in the European Union: An analysis of the Eco-Innovation Action Plan and Horizon 2020. J. Clean. Prod. 214, 653–665. https://doi.org/10.1016/J.JCLEPRO.2018.12.150.
Colucci, N., Dall'Agnol, N., De Biasi, P., Orsini, F., Tagliaferri, N., Tonet, E., 2019, December). PINECUBE: technologies for sustainable plant production and urban renewal in Belluno (Italy). In: International Symposium on Botanical Gardens and Landscapes, 1298, pp. 135–144.
D'Amato, D., Droste, N., Allen, B., Kettunen, M., Lähtinen, K., Korhonen, J., Leskinen, P., Matthies, B.D., Toppinen, A., 2017. Green, circular, bio economy: a comparative analysis of sustainability avenues. J. Clean. Prod. 168, 716–734. https://doi.org/10.1016/J.JCLEPRO.2017.09.053.
de Jesus, F.S.M., Barbieri, J.C., 2013. Acting of scavengers cooperatives in reverse logistics business programs through direct commercialization. Rev. Gestão Soc. e Ambiental 7 (3), 20–37.
De Medici, S., Riganti, P., Viola, S., 2018. Circular economy and the role of universities in urban regeneration: the case of ortigia, syracuse. Sustainability 10 (11), 4305. https://doi.org/10.3390/SU10114305.
Diener, D.L., Tillman, A.M., 2016. Scrapping steel components for recycling—isn't that good enough? Seeking improvements in automotive component end-of-life. Resour. Conserv. Recycl. 110, 48–60. https://doi.org/10.1016/j.resconrec.2016.03.001.
Elo, S., Kyngäs, H., 2008. The qualitative content analysis process. J. Adv. Nurs. 62, 107–115. https://doi.org/10.1111/j.1365-2648.2007.04569.x.
Eskandarpour, M., Dejax, P., Miemczyk, J., Péton, O., 2015. Sustainable supply chain network design: an optimization-oriented review. Omega 54, 11–32. https://doi.org/10.1016/j.omega.2015.01.006.
Fabbricatti, K., Biancamano, P.F., 2019. Circular economy and resilience thinking for historic urban landscape regeneration: the case of torre annunziata, naples. Sustainability 11 (12), 3391. https://doi.org/10.3390/SU11123391.
Fearne, A., Yawson, D., Buxton, A., Tait, J., 2012. Measuring Fairness in Supply Chain Trading Relationships: A Methodology Guide.
Ferreira, P.G., Da Silva, F.C., Ferreira, V.F., 2017. The importance of chemistry for the circular economy. Rev. Virtual de Química 9 (1), 452–473. https://doi.org/10.21577/1984-6835.20170025.
Ferri, G.L., Diniz Chaves, G. de L., Ribeiro, G.M., 2015. Reverse logistics network for municipal solid waste management: the inclusion of waste pickers as a Brazilian legal requirement. Waste Manage. (Tucson, Ariz.) 40, 173–191. https://doi.org/10.1016/J.WASMAN.2015.02.036.
Ferronato, N., Rada, E.C., Portillo, M.A.G., Cioca, L.I., Ragazzi, M., Torretta, V., 2019. Introduction of the circular economy within developing regions: a comparative analysis of advantages and opportunities for waste valorization. J. Environ. Manag. 230, 366–378. https://doi.org/10.1016/j.jenvman.2018.09.095.
Fidélis, T., Cardoso, A.S., Riazi, F., Miranda, A.C., Abrantes, J., Teles, F., Roebeling, P.C., 2021. Policy narratives of circular economy in the EU – assessing the embeddedness of water and land in national action plans. J. Clean. Prod. 288, 125685 https://doi.org/10.1016/j.jclepro.2020.125685.
Fratini, C.F., Georg, S., Jørgensen, M.S., 2019. Exploring circular economy imaginaries in European cities: a research agenda for the governance of urban sustainability transitions. J. Clean. Prod. 228, 974–989. https://doi.org/10.1016/J.JCLEPRO.2019.04.193.
Gavrilescu, D., Enache, A., Ibănescu, D., Teodosiu, C., Fiore, S., 2021. Sustainability assessment of waste electric and electronic equipment management systems: development and validation of the SUSTWEEE methodology. J. Clean. Prod. 306, 127214 https://doi.org/10.1016/j.jclepro.2021.127214.
Geissdoerfer, M., Savaget, P., Bocken, N.M.P., Hultink, E.J., 2017. The Circular Economy – a new sustainability paradigm? J. Clean. Prod. 143, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048.
Ghisolfi, V., Diniz Chaves, G. de L., Ribeiro Siman, R., Xavier, L.H., 2017. System dynamics applied to closed loop supply chains of desktops and laptops in Brazil: a perspective for social inclusion of waste pickers. Waste Manage. (Tucson, Ariz.) 60, 14–31. https://doi.org/10.1016/J.WASMAN.2016.12.018.
Glavič, P., 2015. Chemical and process industries beyond gross domestic product. Chem. Eng. Trans. 45, 1801–1806. https://doi.org/10.3303/CET1545302.
Govindan, K., Garg, K., Gupta, S., Jha, P.C., 2016. Effect of product recovery and sustainability enhancing indicators on the location selection of manufacturing facility. Ecol. Indicat. 67, 517–532. https://doi.org/10.1016/j.ecolind.2016.01.035.
Govindan, K., Jha, P.C., Agarwal, V., Darbari, J.D., 2019. Environmental management partner selection for reverse supply chain collaboration: a sustainable approach. J. Environ. Manag. 236, 784–797. https://doi.org/10.1016/j.jenvman.2018.11.088.
Greer, R., von Wirth, T., Loorbach, D., 2021. The Waste-Resource Paradox: practical dilemmas and societal implications in the transition to a circular economy. J. Clean. Prod. 303, 126831 https://doi.org/10.1016/j.jclepro.2021.126831.
Gwara, S., Wale, E., Odindo, A., Buckley, C., 2021. Attitudes and perceptions on the agricultural use of human excreta and human excreta derived materials: a scoping review. Agriculture 11 (2), 153. https://doi.org/10.3390/agriculture11020153.
Homrich, A.S., Galvão, G., Abadia, L.G., Carvalho, M.M., 2018. The circular economy umbrella: trends and gaps on integrating pathways. J. Clean. Prod. 175, 525–543. https://doi.org/10.1016/j.jclepro.2017.11.06.
Hopkinson, P., Zils, M., Hawkins, P., Roper, S., 2018. Managing a complex global circular economy business model: opportunities and challenges. Calif. Manag. Rev. 60 (3), 71–94. https://doi.org/10.1177/0008125618764692.
Hornibrook, S., Fearne, A., Lazzarin, M., 2009. Exploring the association between fairness and organisational outcomes in supply chain relationships. Int. J. Retail Distrib. Manag. 37 (9), 790–803. https://doi.org/10.1108/09590550910975826.
Hsieh, H.F., Shannon, S., 2005. Three approaches to qualitative content analysis. Qual. Health Res. 15, 1277–1288. https://doi.org/10.1177/1049732305276687.
Jabbour, C.J.C., Sarkis, J., de Sousa Jabbour, A.B.L., Renwick, D.W.S., Singh, S.K., Grebinevych, O., Kruglianskas, I., Godinho Filho, M., 2019. Who is in charge? A review and a research agenda on the 'human side' of the circular economy. J. Clean. Prod. 222, 793–801. https://doi.org/10.1016/j.jclepro.2019.03.038.
Kang, W., Wang, M., Liu, J., Lv, X., Zhang, Y., Luo, D., Wang, D., 2019. Building sustainable cities in China: experience, challenges, and prospects. Chinese J. Urban Environ. Studies 7 (1), 1940002. https://doi.org/10.1142/S2345748119400025.
Kjellén, M., 2018. Wastewater governance and the local, regional and global environments. Water Altern. (WaA) 11 (2).
Kirchherr, J., 2021. Towards circular justice: a proposition. Resour. Conserv. Recycl. 173, 105712 https://doi.org/10.1016/j.resconrec.2021.105712.
Kirchherr, J., Urban, F., 2018. Technology transfer and cooperation for low carbon energy technology: analysing 30 years of scholarship and proposing a research agenda. Energy Pol. 119, 600–609. https://doi.org/10.1016/j.enpol.2018.05.001.
Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy: an analysis of 114 definitions. Resour. Conserv. Recycl. 127, 221–232. https://doi.org/10.1016/J.RESCONREC.2017.09.005.
Kristensen, H.S., Mosgaard, M.A., Remmen, A., 2021. Circular public procurement practices in Danish municipalities. J. Clean. Prod. 281, 124962 https://doi.org/10.1016/j.jclepro.2020.124962.
Liobikiene, G., Balezentis, T., Streimkiene, D., 2019. Evaluation of bioeconomy in the context of strong sustainability. Sustain. Dev. 1–10. https://doi.org/10.1002/sd.1984.
Lu, Y.T., Lee, Y.M., Hong, C.Y., 2017. Inventory analysis and social life cycle assessment of greenhouse gas emissions from waste-to-energy incineration in Taiwan. Sustainability 9 (11), 1959. https://doi.org/10.3390/su9111959.
Luthin, A., Traverso, M., Crawford, R.H., 2023. Assessing the social life cycle impacts of the circular economy. J. Clean. Prod. 386, 135725 https://doi.org/10.1016/j.jclepro.2022.135725.
Mahmoum Gonbadi, A., Genovese, A., Sgalambro, A., 2021. Closed-loop supply chain design for the transition towards a circular economy: a systematic literature review of methods, applications and current gaps. J. Clean. Prod. 323, 129101 https://doi.org/10.1016/j.jclepro.2021.129101.
Masi, D., Day, S., Godsell, J., 2017. Supply chain Configurations in the circular economy: a systematic literature review. Sustainability (9), 1602. https://doi.org/10.3390/SU9091602, 2017, Vol. 9, Page 1602, 9.
Matopoulos, A., Didonet, S., Tsanasidis, V., Fearne, A., 2019. The role of perceived justice in buyer-supplier relationships in times of economic crisis. J. Purch. Supply Manag. 25 (4), 100554 https://doi.org/10.1016/j.pursup.2019.100554.
Melo, A.C.S., Braga, A.E., Leite, C.D.P., Bastos, L.D.S.L., Nunes, D.R.D.L., 2021. Frameworks for reverse logistics and sustainable design integration under a sustainability perspective: a systematic literature review. Res. Eng. Des. 32, 225–243. https://doi.org/10.1007/s00163-020-00351-8.
Miemczyk, J., Howard, M., Johnsen, T.E., 2016. Dynamic development and execution of closed-loop supply chains: a natural resource-based view. Supply Chain Manag. 21 (4), 453–469. https://doi.org/10.1108/SCM-12-2014-0405.
Molina-Prieto, L., Suárez-Serrano, M., Villa-Camacho, M., 2019. Multidisciplinary loop for urban sustainability. Rev. Arquit. 21 (2), 76–88. https://doi.org/10.14718/RevArq.2019.21.2.204.
Morioka, S.N., de Carvalho, M.M., 2016. A systematic literature review towards a conceptual framework for integrating sustainability performance into business. J. Clean. Prod. 136, 134–146. https://doi.org/10.1016/j.jclepro.2016.01.104.
Murray, A., Skene, K., Haynes, K., 2017. The circular economy: an interdisciplinary exploration of the concept and application in a global context. J. Bus. Ethics 140, 369–380. https://doi.org/10.1007/s10551-015-2693-2.
Nakamba, C.C., Chan, P.W., Sharmina, M., 2017. How does social sustainability feature in studies of supply chain management? A review and research agenda. Supply Chain Manag. 22 (6), 522–541. https://doi.org/10.1108/SCM-12-2016-0436.
Ness, D., 2008. Sustainable urban infrastructure in China: towards a Factor 10 improvement in resource productivity through integrated infrastructure systems. Int. J. Sustain. Dev. World Ecol. 15 (4), 288–301. https://doi.org/10.3843/SusDev.15.4:2a.
Nicolosi, A., Laganà, V.R., Di Gregorio, D., Privitera, D., 2021. Social farming in the virtuous system of the circular economy. An exploratory research. Sustainability 13 (2), 989. https://doi.org/10.3390/su13020989.
Ngan, S.L., How, B.S., Teng, S.Y., Promentilla, M.A.B., Yatim, P., Er, A.C., Lam, H.L., 2019. Prioritization of sustainability indicators for promoting the circular economy: the case of developing countries. Renewable Sustainable Energy Rev. 111, 314–331. https://doi.org/10.1016/j.rser.2019.05.001.
Nolasco, E., Vieira Duraes, P.H., Pereira Gonçalves, J., Oliveira, M.C.D., Monteiro de Abreu, L., Nascimento de Almeida, A., 2021. Characterization of solid wastes as a

tool to implement waste management strategies in a university campus. Int. J. Sustain. High Educ. 22 (2), 217–236. https://doi.org/10.1108/IJSHE-12-2019-0358.
Padilla-Rivera, A., Russo-Garrido, S., Merveille, N., 2020. Addressing the social aspects of a circular economy: a systematic literature review. Sustainability 12 (19), 7912. https://doi.org/10.3390/su12197912.
Paquin, R.L., Busch, T., Tilleman, S.G., 2015. Creating economic and environmental value through industrial symbiosis. Long. Range Plan. 48 (2), 95–107. https://doi.org/10.1016/j.lrp.2013.11.002.
Provasnek, A.K., Sentic, A., Schmid, E., 2017. Integrating eco-innovations and stakeholder engagement for sustainable development and a social license to operate. Corp. Soc. Responsib. Environ. Manag. 24 (3), 173–185. https://doi.org/10.1002/csr.1406.
Preston, F., Lehne, J., Wellesley, L., 2019. An Inclusive Circular Economy: Priorities for Developing Countries, vol. 8. Royal Institute of International Affairs, London. Research Paper. https://www.chathamhouse.org/sites/default/fles/publications/research/2019-05-22-Circular%20Economy.pdf. (Accessed 20 November 2020).
Rebehy, P.C.P.W., Costa, A.L., Campello, C.A., de Freitas Espinoza, D., Neto, M.J., 2017. Innovative social business of selective waste collection in Brazil: Cleaner production and poverty reduction. J. Clean. Prod. 154, 462–473. https://doi.org/10.1016/j.jclepro.2017.03.173.
Sarkis, J., Helms, M.M., Hervani, A.A., 2010. Reverse logistics and social sustainability. Corp. Soc. Responsib. Environ. Manag. 17 (6), 337–354. https://doi.org/10.1002/csr.220.
Sakamoto, J.L., Silva de Souza Lima Cano, N., Faria Dionisio de Oliveira, J., Rutkowski, E.W., 2021. How much for an inclusive and solidary selective waste collection? A Brazilian study case. Local Environ. 26 (8), 985–1007. https://doi.org/10.1080/13549839.2021.1952965.
Sauve, S., Bernard, S., Sloan, P., 2015. Environmental sciences, sustainable development and circular economy: alternative concepts for trans-disciplinary research. Environ. Dev. 17, 48e56.
Schröder, P., 2020. Promoting a Just Transition to an Inclusive Circular Economy. Royal Institute of International Affairs.
Schröder, P., Lemille, A., Desmond, P., 2020. Making the circular economy work for human development. Resour. Conserv. Recycl. 156, 104686 https://doi.org/10.1016/j.resconrec.2020.104686.
Secinaro, S., Brescia, V., Calandra, D., Biancone, P., 2020. Employing bibliometric analysis to identify suitable business models for electric cars. J. Clean. Prod. 264, 121503 https://doi.org/10.1016/j.jclepro.2020.121503.
Sehnem, S., Ndubisi, N.O., Preschlak, D., Bernardy, R.J., Santos Junior, S., 2020. Circular economy in the wine chain production: maturity, challenges, and lessons from an emerging economy perspective. Prod. Plann. Control 31 (11–12), 1014–1034. https://doi.org/10.1080/09537287.2019.1695914.
Slomski, V.G., Silva Lima, I.C., Slomski, V., Slavov, T., 2021. Pathways to urban sustainability: an investigation of the economic potential of untreated household solid waste (HSW) in the city of São Paulo. Sustainability 12 (13), 5249. https://doi.org/10.3390/su12135249.
Souza, G.F., Sami, B.S., 2018. Environmental assessment in the cooperatives of recyclable materials in Brazil. Asia Life Sci. 16 (1), 1–13.
Souza-Piao, R., de Vincenzi, T.B., de Carvalho, M.M., 2023. Strategies for social inclusion in circular economy. In: de Souza Campos, L.M., Vázquez-Brust, D.A. (Eds.), The Social Dimensions of the Circular Economy. Greening of Industry Networks Studies. Springer, Cham. https://doi.org/10.1007/978-3-031-25436-9_12, 10.
Spinelli, G., Weaver, P., Marks, M., Victor, C., 2019. Making a case for creating living labs for aging-in-place: enabling socially innovative models for experimentation and complementary economies. Front. Sociol. 4, 19. https://doi.org/10.3389/FSOC.2019.00019/BIBTEX.
Stein, N., Spinler, S., Vanthournout, H., Blass, V., 2020. Consumer perception of online attributes in circular economy activities. Sustainability 12 (5), 1914. https://doi.org/10.3390/su12051914.
Suarez-Fernandez de Miranda, S., Aguayo-González, F., Ávila-Gutiérrez, M.J., Córdoba-Roldán, A., 2021. Neuro-competence approach for sustainable engineering. Sustainability 13 (8), 4389. https://doi.org/10.3390/su13084389.
Swagemakers, P., Garcia, M.D.D., Wiskerke, J.S.C., 2018. Socially-inclusive development and value creation: how a composting project in galicia (Spain) 'hit the rocks. Sustainability 10 (6), 2040. https://doi.org/10.3390/SU10062040, 2018, Vol. 10, Page 2040.
Tang, C., 2018. Socially responsible supply chains in emerging markets: some research opportunities. J. Oper. Manag. 57, 1–10. https://doi.org/10.1016/j.jom.2018.01.002, 2018.
Tangpong, C., 2011. Content analytic approach to measuring constructs in operations and supply chain management. J. Oper. Manag. 29 (6), 627–638. https://doi.org/10.1016/j.jom.2010.08.001.
Thorisdottir, T.S., Johannsdottir, L., 2019. Sustainability within fashion business models: a systematic literature review. Sustainability 11 (8), 2233. https://doi.org/10.3390/su11082233.
Torre, A., Vázquez-Rowe, I., Parodi, E., Kahhat, R., 2021. Wastewater treatment decentralization: is this the right direction for megacities in the Global South? Sci. Total Environ. 778, 146227 https://doi.org/10.1016/j.scitotenv.2021.146227.
Tranfield, D., Denyer, D., Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. Br. J. Manag. 14, 207–222. https://doi.org/10.1111/1467-8551.00375.
UN DESA – United Nations Department of Social Affairs, 2016. Leaving No One behind: the Imperative of Inclusive Development, Report on the World Social Situation 2016. United Nations, New York, USA.
Vahidzadeh, R., Bertanza, G., Sbaffoni, S., Vaccari, M., 2021. Regional industrial symbiosis: a review based on social network analysis. J. Clean. Prod. 280, 124054 https://doi.org/10.1016/j.jclepro.2020.124054.
Van Eck, N.J., Waltman, L., 2010. Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics 84 (2), 523–538. https://doi.org/10.1007/s11192-009-0146-3.
Vanhuyse, et al., 2021. Achei 3 Artigos Dele Nesse Ano No Scholar.
Vazquez-Brust, D., Piao, R.S., de Melo, M.F.D.S., Yaryd, R.T., Carvalho, M.M., 2020. The governance of collaboration for sustainable development: exploring the "black box". J. Clean. Prod. 256, 120260 https://doi.org/10.1016/j.jclepro.2020.120260.
Velenturf, A.P., Jensen, P.D., Purnell, P., Jopson, J., Ebner, N., 2019. A call to integrate economic, social and environmental motives into guidance for business support for the transition to a circular economy. Adm. Sci. 9 (4), 92. https://doi.org/10.3390/admsci9040092.
Velenturf, A.P., Purnell, P., 2021. Principles for a sustainable circular economy. Sustain. Prod. Consum. 27, 1437–1457. https://doi.org/10.1016/j.spc.2021.02.018.
Villalba, L., 2020. Recent evolution of the informal recycling sector in Argentina within the 'popular economy': measuring its impact through a case study in Tandil (Buenos Aires). Waste Manag. Res. 38 (9), 1037–1046. https://doi.org/10.1177/0734242X20938437.
Walker, A.M., Opferkuch, K., Lindgreen, E.R., Simboli, A., Vermeulen, W.J., Raggi, A., 2021. Assessing the social sustainability of circular economy practices: industry perspectives from Italy and The Netherlands. Sustain. Prod. Consum. 27, 831–844. https://doi.org/10.1016/j.spc.2021.01.030.
Wanniarachchi, T., Dissanayake, K., Downs, C., 2020. Improving sustainability and encouraging innovation in traditional craft sectors: the case of the Sri Lankan handloom industry. Res. J. Text. Appar. 24 (2), 111–130. https://doi.org/10.1108/RJTA-09-2019-0041.
Weigend Rodríguez, R.W., Pomponi, F., Webster, K., D'Amico, B., 2020. The future of the circular economy and the circular economy of the future. Built. Environ. Proj. Asset. Manag. 10 (4), 529–546. https://doi.org/10.1108/BEPAM-07-2019-0063.
Woodard, R., Rossouw, A., 2021. An evaluation of interventions for improving pro-environmental waste behaviour in social housing. Sustainability 13 (13), 7272. https://doi.org/10.3390/su13137272.
Yáñez, P.P., 2021. Viabilidad de la economía circular en países no industrializados y su ajuste a una propuesta de economías transformadoras. Un acercamiento al escenario latinoamericano. CIRIEC-Esp. Rev. Econ. Publica Soc. Coop. (101), 289–323. https://doi.org/10.7203/CIRIEC-E.101.15979.
Yu, Y., Jin, Z., Qiu, J., 2021. Global isotopic hydrograph separation research history and trends: a text mining and bibliometric analysis study. Water 13 (18), 2529. https://doi.org/10.3390/w13182529.
Zoboli, O., Zessner, M., Rechberger, H., 2016. Supporting phosphorus management in Austria: potential, priorities and limitations. Sci. Total Environ. 565, 313–323. https://doi.org/10.1016/J.SCITOTENV.2016.04.171.
Zupic, I., Čater, T., 2015. Bibliometric methods in management and organization. Organ. Res. Methods 18 (3), 429–472. https://doi.org/10.1177/1094428114562629.