Circular Economy: a Bibliometric Mapping

Othman Mohammad Ahmed Mustafa[1], Peter Lengyel[2]

A B S T R A C T

In recent years due to the impact of climate change, there was an increased awareness for the importance of changing our practices. That can be done by integrating the circular economy with environmental thinking and initiatives into the current systems, which in turn will have the role of decreasing the carbon footprint, measuring up the companies profit and also motivate the competitiveness. Despite the benefits of implementing the circular economy saving ideas to the systems, it's still not widely used. Therefore, in this study a bibliometric analysis is done on the circular economy's literature over the last two decades to understand the present level of research work in the field. This research is quantitatively evaluating the academic literature and defining research characteristics based on the number of published articles and their citation impact, also it's quantifying and assessing the scientific success of individuals and organizations in the field. It was found that European countries have contributed with a high number of publications in the area of the research. Based on the results, it is clear that the relevance of the circular economy has increased in recent years, and further study and research is still needed in this area.

1. Introduction

After the domination of linear economy (Take-Make-Dispose) the new economic system (Circular Economy (CE)) showed up as a systematic approach that aims to eliminate the waste and to use the resources continuously by reusing, repairing, refurbishing, remanufacturing, and recycling to come up with a closed-loop system minimizing the input resources and waste. Extending the life time of the products and making their new resources for other processes is this approach's aim. To guarantee our planet's well-being, there was the need to build circular frameworks that integrate the idea of the circular economy to reduce the pressure on the environment. Furthermore, businesses have become more aware of the circular economy concept. This awareness is arising from seeing the circular economy as a mechanism which can be utilized to form a competitive advantage by addressing sustainable development challenges to make sustainable operations with increasing the efficiency and generating added value to the end customers. Environmental issues cannot be ignored by the organizations anymore as in addition to growing government legislation and improving public understanding of environmental conservation, taking care of these issues has been so critical to succeeding in the global market. In the new century, the incorporation of environmental, economic, and social efficiency to achieve sustainability is a major business challenge for numerous businesses (Verghese & Lewis 2007).

2. Literature review

The concept of circular economy has both a textual and conceptual meaning. It is an opposite meaning of a linear economy in a textual context, linear economy is one that through development is characterized as turning natural resources into waste. Such processing of waste leads to the degradation of the ecosystem in two ways: through the removal of natural resources from the environment (through mining/unsustainable harvesting) and by decreasing the value of natural resources caused by waste emissions. At the resource acquisition point, contamination may also occur.

[1] Institute of Applied Informatics and Logistics, Faculty of Economics and Business, University of Debrecen
Othman.mustafa@econ.unideb.hu
[2] Institute of Applied Informatics and Logistics, Faculty of Economics and Business, University of Debrecen
Lengyel.peter@econ.unideb.hu

The term linear economy has been put into popular use by those writing about the circular economy and related concepts. An economy is expected to have no circular net environmental impact, which means it is anticipated to have no net environmental effect in the circular sense; instead, it is meant to repair any harm caused by resource acquisition while ensuring that little waste is generated in the development process and in the product's life cycle. The word circular has a second conceptual sense, implied, that relates to the cycle definition. Two processes of particular concern here are the biogeochemical cycles and the idea of the recycling of materials (Murray et al. 2017).

The root of the word 'circular economy' itself is being addressed. The idea behind a circular economy has definitely been around for a long time, Hoffman the first president of the Royal Society of Chemistry, declared as early as 1848 "in an ideal chemical factory there is, strictly speaking, no waste but only pro-ducts. The better a real factory makes use of its waste, the closer it gets to its ideal, the bigger is the profit" (Miller, 2018). Another claim that Kenneth Boulding (1966) was the originator of the term when he wrote the following: "Man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy" (Greyson, 2007). Liu et al., (2009) claim it was originally a Chinese concept. Yuan et al. (2006) also argue that the first use of a circular economy concept was in China and occurred in Zhu's unreferenced 1998 article, influenced by German and Swedish loop-closing, and originating from the theory of Industrial Ecology that models industrial processes by them using material and energy flow. The CE concept development is currently taking place in Europe, which is reflected in the fact that most of the relevant literature is published in the form of documents and initiatives related to government and non-governmental organizations. These publications consider the development of ideas, the production of visions, and the formulation of strategies (Kalmykova et al., 2018).

Therefore, the word 'Circular Economy' was correlated by various writers with a variety of meanings and associations. The following CE definitions were found in the literature:

1.   "A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro-level (products, companies, consumers), meso level (eco-industrial parks) and macro-level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations."(Kirchherr et al., 2017)

2.   "A circular economy is a mode of economic development that aims to protect the environment and prevent pollution, thereby facilitating sustainable economic development." (Ma et al., 2014)

3.   "The central idea is to close material loops, reduce inputs, and reuse or recycle products and waste to achieve a higher quality of life through increased resource efficiency." (Peters et al., 2007)

4.   "The focus of the circular economy gradually extends beyond issues related to material management and covers other aspects, such as energy efficiency and conservation, land management, soil protection and water"(Su et al., 2013).

5.   "Circular economy refers to the production and consumption of goods through closed loop material flows that internalize environmental externalities linked to virgin resource extraction and the generation of waste (including pollution)" (Sauvé et al., 2016)

The idea of a cyclical closed-loop system with the recirculation of resources and energy and the minimization of the demand for resources to ensure sustainable development is generally common in the definitions.

The circular economy would provide the current and new players in the sector with comprehensive business possibilities. In a circular economy, closed loops contain two supply chains: forward and reverse. A recovered product in a reverse chain joins the forward chain again (Bai & Gabnai 2021; Fuzesi et al 2020; Wells & Seitz 2005). Throughout the reverse cycle, possibilities open up for companies. One of the major changes in a circular economy can be said to concern consumption and the position of consumers. As the idea of ownership will be replaced by purchasing access and efficiency, the relationships between customers and goods and services will change dramatically. In

other terms, customers would pay per usage or pay a charge for monthly access instead of paying for ownership (Antikainen & Valkokari 2016).

In general, depending on the careful nature of the circularity and implementation process, there is a considerable opportunity for the introduction of circular structures by various organizations to provide economic, environmental, and social benefits with overall positive benefits (Rizos et al., 2017).

3. Methodology

The literature review is an excellent methodological tool that helps identify possible research gaps and build a block for all academic research activities. It can also help to give an overview of the areas which the research is dissimilar with synthesizing the research findings to find the areas in which more research work is still needed (Snyder 2019).

Conducting research literature reviews helps to provide a detailed overview of the subject and highlight the relevant research areas which will lead to identify the research gaps to refine and define the research question. However, this review focuses on studying the term circular economy through a data collection followed by evaluation and analyzing of the collected data in order to measure and evaluate the scientific progress of individuals and organizations by analyzing the academic literature quantitatively and identifying the research features based on the number of the published papers and their citation impact.

By quantitatively evaluating academic literature and defining research characteristics based on the number of published papers and their citation effects, the systematic bibliometric approach is used to quantify and assess the scientific success of individuals and organizations (De Bellis 2009). Bibliometric analysis can help open up the publication trends and hotspots of emerging research topics (Persson et al., 2004).

3.1. Data sources

Scopus is an indexing and abstract database that has been developed by Elsevier Co. With 14,000 STM and social science titles from 4,000 publishers, STM journal papers and the references used in those articles are available, and this database is the largest single abstract and indexing database ever created (Burnham, 2006). In addition, the Scopus database combines the characteristics of both Web of Science and PubMed allowing utility enhancing for both medical and academic research (Falagas et al. 2008). Therefore, it was selected to provide original data for this study.

Scopus search was conducted in order to retrieve the articles in the circular economy, title search includes "circular economy". The search period is from 1990 to 2020, only articles were left for further study, except irrelevant articles, and a total of 1,541 publications were retrieved for bibliometric analysis.

3.2. Bibliometric mapping

VOSviewer is a program used to build, visualize and explore bibliometric maps on a computer. It displays broad bibliometric maps in an easy-to-interpret way, paying particular attention to the graphical representation of the maps (Van Eck & Waltman 2010). VOSviewer can be used to study different relations for all kinds of bibliometric network data, for example, co-authorship and citation relations between researchers, organizations, or countries (Van Eck & Waltman 2016).

Bibliometric mapping is used to research the structure and dynamics of the field by using various forms of bibliometric maps to achieve a better understanding and useful insights into the circular economy.

Co-authorship networks can be defined as a type of social network and paper citation network as a type of information science network. These two different types of networks are thoroughly studied, especially in the complex networks field (Newman 2011; Popp et al. 2018; Pancsira 2019; Mizik 2021). Co-authorship networks, as one of the most understandable and well-known forms of

collaboration networks, are built on the social dimension of the relationship of different authors (Koopman et al. 2015).

Co-authorship analysis can be used to define the position of an author in the cooperation network. It provides important information on the scientists' own contribution to the research output included in their official scientific biography (Glänzel 2014). The weakness of the connections across the communities denotes that most of the journals that belong to the same community tend to cite the same publications within their community and rarely reference articles from other communities (Onel et al. 2011).

4. Results and discussion

4.1. Descriptive statistics

The number of research papers published between 1990 and 2020 was 1541. The number of annual publications was no more than two and even zero in many years. Most of them were published after the year 2004 with a significant increase in publication numbers of scientific articles in the circular economy during the period 2015 to 2020. The significant increase of publications starting from 2015 is due to the adoption of the European commission of the first circular economy action plan which includes policies to aid Europe's transition to a circular economy, increase global competitiveness, promote long-term economic development, and create new employment.

494 articles were published in 2020 based on Scopus database which gives an insight into how the relevance of the circular economy has increased in recent years and how further study and research is still needed in this area (Figure 1). The first circular economy-related article was published in 1991 by Leontief, W. titled "The economy as a circular flow." (Leontief 1991). Therefore, 1,541 articles were retrieved in that period using Scopus database in order to analyze the propagation of the scientific articles in the field of the circular economy.
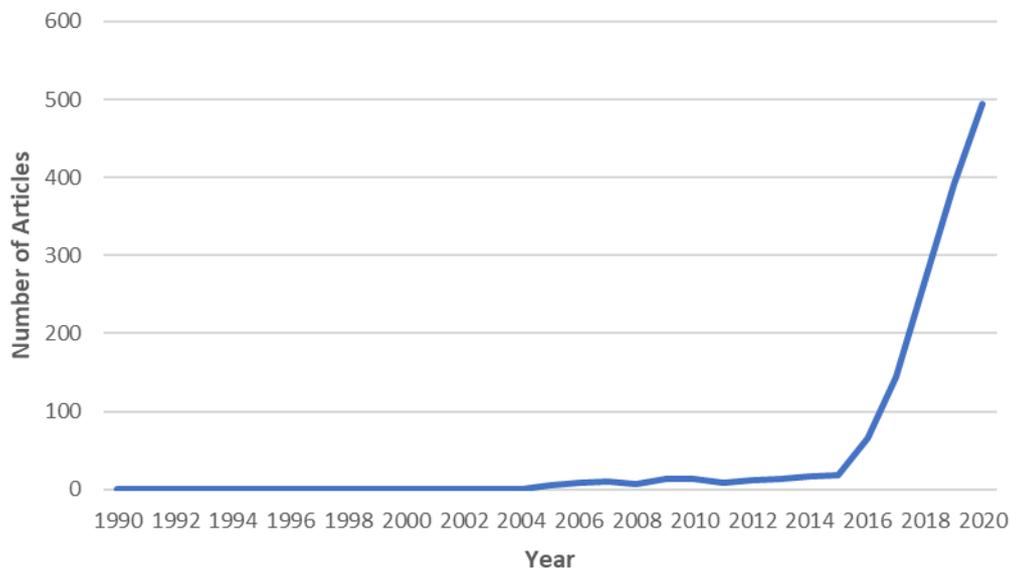

Figure 1. Number of articles published during the period by year under review

4.2. Co-authorship analysis

Based on the data obtained from Scopus, Figure 2 shows the bibliometric map of the co-authorship network by country, the scale of the nodes reflects the number of articles published by each country, the thickness of the lines shows the number of collaborations and the various colours display the clusters that can be segregated in the co-authoring network.
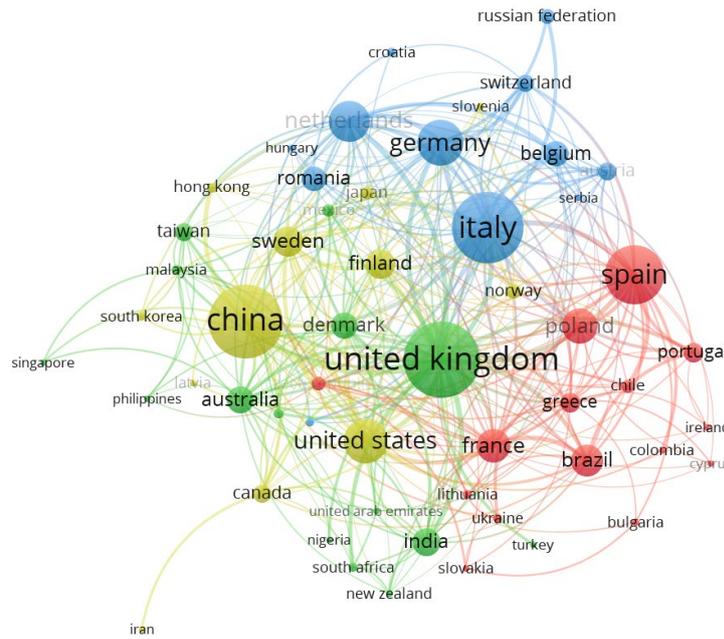
Figure 2. Co-authorship network by country

The bibliometric map shows that Europe is leading the research in the circular economy area over 88 countries contributed in the publications as 6 of the European country have contributed with the highest numbers of publications and the highest was the United Kingdom. The United Kingdom comes first with (15%, N= 231) of the overall published documents, then China comes in the second place with (13.4%, N=207), followed by Italy (12%, N=185), Spain (9%, N=144), Germany (6%, N=98), Netherlands (5.8%, N=90), France (4.4%, N=68), also the United states comes as one of highest contributed publications with (6.2%, N= 97). Table 1. shows top ten countries with highest numbers of publications in circular economy area.

Table 1. Top 10 countries in the circular economy publications

Country	No. Articles	Cited by
United Kingdom	231	5,594
China	208	4,708
Italy	184	3,137
Spain	144	1,410
Germany	98	1,434
United States	96	1,867
Netherlands	90	2,692
France	68	868
Brazil	63	773
India	63	447

Figure 3 shows the bibliometric map for the co-authorship network by authors, a total of 229 authors have published or contributed to the publication of scientific articles related to the circular economy. The size of the nodes indicates the number of articles that have been published and the colors of the nodes reflect the research groups.
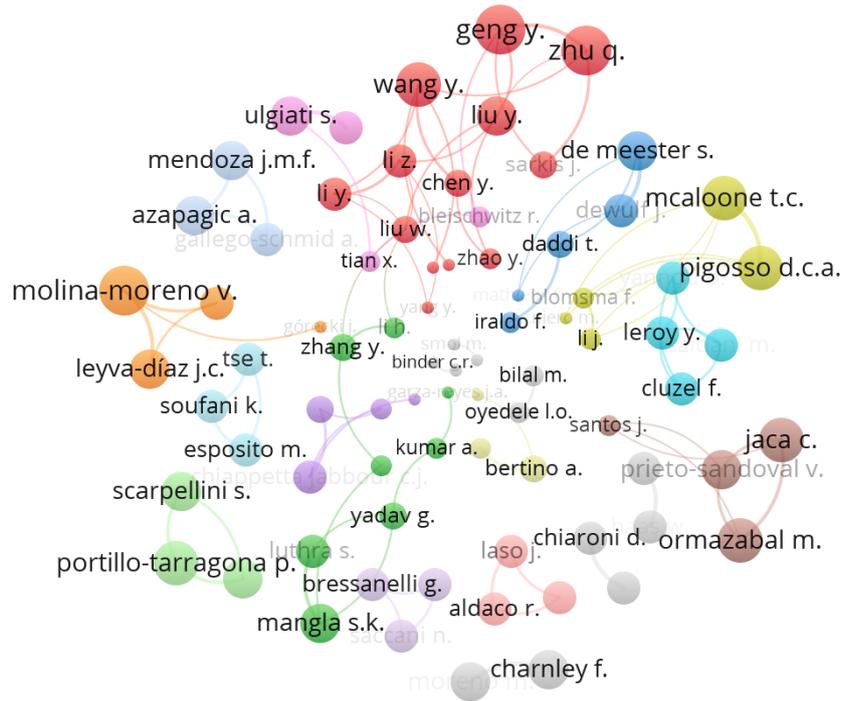
Figure 3. Co-authorship network

With ten documents released on Scopus, Geng Yong (Professor at Shanghai Jiao Tong University) has the largest number of publications in the field of circular economy, followed by Charnley Fiona (Associate professor of circular economy at the University of Exeter business school, United Kingdom), Molina Moreno Valentin (University of Granada, Spain), Mangla Sachin Kumar (Plymouth business school, United Kingdom), Sarkis Joseph (Worcester polytechnic institute, United States) with eight documents for each of them. The highest citations were for Geng Yong with 1,423 citations in total. Table 2 shows the top ten authors in the field of the circular economy.

Table 2. Top 10 authors in the circular economy area

Author	No. Articles	Cited by
Geng Y.	10	1,423
Charnley Fiona	8	204
Molina Moreno Valentin	8	191
Mangla Sachin Kumar	8	95
Sarkis Joseph	8	610
Azapagic A.	7	175
Jaca C.	7	175
Zhang Y.	7	114
Zhao Y.	7	2
Zhu Q.	7	462

Romanian organizations showed the highest interest in publishing circular economy-related articles with 13 documents for Bucharest University of economic studies, and the academy of Romanian scientists comes seventh with three articles. Chinese, Spanish, Italian and English organizations were among the top ten organizations. Table 3 shows the top ten organizations in publishing circular economy-related articles.

Table 3. Top 10 organizations in the circular economy area

Organization	No. of Articles	Cited by
Bucharest University of Economic Studies, Romania	13	31
Faculty of Business and Management, Universidad Autonoma de Chile, Chile	4	114
Polytechnic School of Linares, Jaén University, Spain	4	107
Chinese Academy of Sciences, Beijing, China	4	45

Department of Economics and Business, University of Catania, Italy	4	13
Academy of Romanian Scientists, Bucharest, Romania	3	89
Bristol Business School, West England University, Bristol, United Kingdom	3	55
Agroamb Prodalt s.l., Calzada das Gándaras, Spain	3	23
Supply Chain Improvement Centre, Derby University, Derby, United Kingdom	3	15
Department of architecture, university of Naples Federico II, Naples, Italy	3	10

From 1990 to 2020 an average of 1,000 keywords have been used in 1,541 articles retrieved from the Scopus database. The colors of the nodes give an insight into the keywords most frequently used in the period mentioned above, the keywords 'circular economy', 'environmental impact', 'economic development', 'life cycle', 'recovery', 'landfill', 'closed loops', 'recycling', 'efficiency', 'stakeholder', 'emerging economy', 'pollution control' were the most significant keywords used in the retrieved articles which gives an insight about the most important issues that the authors tried to study in the period from 1990 to 2020.

Four key groups were identified from the bibliometric map (Figure 4): (red) connected to the terms 'recycling', 'waste management', 'economic aspect', 'human' and 'economic analysis'. (green) connected to the terms 'sustainable development', 'sustainability', 'environmental economics', 'economic conditions' and 'economic development'. (blue) connected to the terms 'economics', 'industrial economics', 'economic and social effects', 'decision making' and 'supply chains'. (yellow) connected to the terms 'life cycle', 'environmental impact', 'life cycle analysis', 'life cycle assessment', 'climate change' and 'greenhouse gases'. The higher occurrence keywords have the larger size of nodes and the bigger nodes in each groups represents the most relevant keywords in the group.
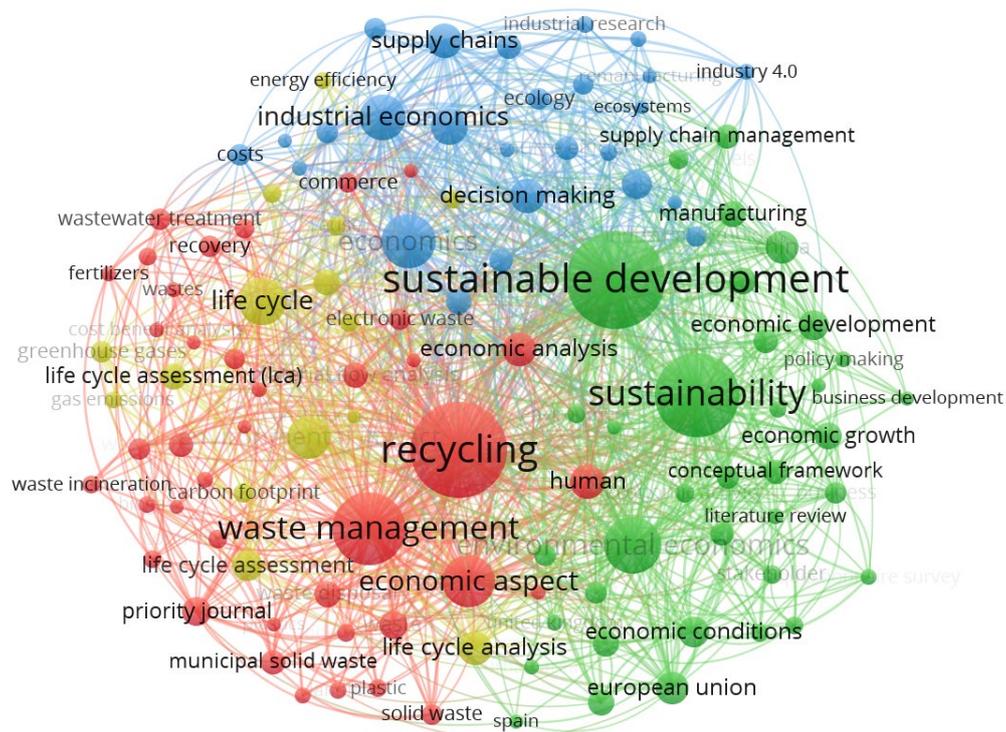

Figure 4. Co-occurrence network of the most examined keywords in the retrieved articles

Based on author and index keywords (8,833 with repetitions). Minimum number of occurrences of a keyword is 20. Of the 8,833 keywords 117 meet the treshold. The occurrences of 'circular economy" is 1,214. Fractional counting (the weight of a link is fractionalized)

4.3. Most cited articles published in the period 1990 to 2020

Citation analysis is one of the best ways to judge the validity of a scientific claim since it involves how many times the scientific documents or the scientists have been cited. Citations also play an important role in monitoring the effect of the research and defining the research benefits, as well as enabling the documented flow overtime to be monitored before the linkage of downstream products is identified.

The number of citations for the retrieved documents in circular economy area based on Scopus database varies from 0 to 1077. Table 4 shows the top ten articles cited, with the highest citations for the article published in 2016 by Ghisellini P., Cialani C., and Ulgiati S. entitled "a review on circular economy: the expected transition to a balanced interplay of environmental and economic systems".

Table 4. Most cited articles in circular economy between 1990 to 2020

	Author (s)	Title	Year	Cited by
1.	Ghisellini P., Cialani C., Ulgiati S.	A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems	2016	1,077
2.	Bocken N.M.B et al.,	Product design and business model strategies for a circular economy	2016	454
3.	Murray A., Skene K., Haynes K.	The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context	2017	447
4.	Korhone J., Nuur C., Feldmann A., Birkie S. E.	Circular economy as essentially contested content	2018	403
5.	Su B., Heshmati A., Geng Y., Yu X.	A review of the circular economy in china: moving from rhetoric to implementation	2013	392
6.	Geng Y., Fu J., Sarkis J., Xue B.	Towards a national circular economy indicator system in china: an evaluation and critical nalysis	2012	317
7.	Haas W., Krausmann F., Wiedenhofer D., Heinz M.	How circular is the global economy? An assessment of material flows, waste production and recycling in the European union and the world in 2005	2015	293
8.	Genovese A., Acquaye A. A., Figueroa A., Koh S. C. L.	Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications	2017	281
9.	Sauvé S., Bernard S., Sloan P.	Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research	2016	222
10.	Blomsma, Brennan G.	The emergence of circular economy: A new framing around prolonging resource productivity	2017	211

5. Conclusion

The findings were obtained based on the total number of articles in the circular economy retrieved by the Scopus database. VOSviewer application was used to analyze the data and build the bibliometric maps of the scientefic articles in circular economy. Different types of analysis can be done using VOSviewer like collaboration between organization and authors, the citation relations between journals and the co-occurence relations.

A total number 1,541 of scientefic articles were published in the period 1990 to 2020 with a significant increasing of publication after the year 2015 to reach the maximum number of publications in 2020 with 494 publications in circular economy area. The total number of authors is more than1000 which have published articles in this area with, high number of publications were in Europe, China and United States. With a high number of publications, six of the European countries have contributed and the highest was the one with (15%, N= 231) of the overall published documents, then China comes in the second place with (13.4%, N=207), also the United States comes as one of highest contributed publications with (6.2%, N= 97). The most productive author was Geng Yong (Professor

at Shanghai Jiao Tong University) with 10 documents related to the circular economy area published on Scopus. 'Circular Economy', 'environmental impact', 'life cycle', 'economic development' and recycling were the most frequently used keyword in the retrieved articles. This research helps to recognize the patterns of research in the circular economy over the last two decades and to expose the most successful and productive countries, auithors and organizations in the field.

References

Antikainen, M., & Valkokari, K. 2016. Technology innovation management review. Technology Innovation Management Review, 6(7), 5.

Bai, A., Gabnai, Z. 2021. Opportunities of Circular Economy in a Complex System of Woody Biomass and Municipal Sewage Plants. In: Malico, Isabel; Sousa, Adélia; Cristina Gonçalves, Ana (szerk.) Forest Biomass - From Trees to Energy. InTech Open Access Publisher pp. 1-23. Paper: Chapter 9, 23 p. https://doi.org/10.5772/intechopen.90324

Burnham, J. F. 2006. Scopus database: A review. Biomedical Digital Libraries, 3, 1–9. https://doi.org/10.1186/1742-5581-3-1

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. 2008. Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. The FASEB Journal, 22(2), 338–342. https://doi.org/10.1096/fj.07-9492lsf

Füzesi, I., Csordás, A., Reuf, S., Felföldi, J. 2020. Consumer acceptance of Blockchain-Based Traceability Systems in Food Supply Chains Journal of Agricultural Informatics 11 : 1 pp. 9-23. , 15 p. https://doi.org/10.17700/jai.2020.11.1.562

Glänzel, W. 2014. Analysis of co-authorship patterns at the individual level. Transinformacao, 26(3), 229–238. https://doi.org/10.1590/0103-3786201400030001

Greyson, J. 2007. An economic instrument for zero waste, economic growth and sustainability. Journal of Cleaner Production, 15(13–14), 1382–1390. https://doi.org/10.1016/j.jclepro.2006.07.019

Kalmykova, Y., Sadagopan, M., & Rosado, L. 2018. Circular economy - From review of theories and practices to development of implementation tools. Resources, Conservation and Recycling, 135(February), 190–201. https://doi.org/10.1016/j.resconrec.2017.10.034

Kirchherr, J., Reike, D., & Hekkert, M. 2017. Conceptualizing the circular economy: An analysis of 114 definitions. Resources, Conservation and Recycling, 127(September), 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Koopman, R., Wang, S., Scharnhorst, A., & Englebienne, G. 2015. Ariadne's thread - Interactive navigation in a world of networked information. Conference on Human Factors in Computing Systems - Proceedings, 18, 1833–1838. https://doi.org/10.1145/2702613.2732781

Leontief, W. 1991. The economy as a circular flow. Structural Change and Economic Dynamics, 2(1), 181–212. https://doi.org/10.1016/0954-349X(91)90012-H

Liu, Q., Li, H. ming, Zuo, X. li, Zhang, F. fei, & Wang, L. 2009. A survey and analysis on public awareness and performance for promoting circular economy in China: A case study from Tianjin. Journal of Cleaner Production, 17(2), 265–270. https://doi.org/10.1016/j.jclepro.2008.06.003

Ma, S. H., Wen, Z. G., Chen, J. N., & Wen, Z. C. 2014. Mode of circular economy in China's iron and steel industry: A case study in Wu'an city. Journal of Cleaner Production, 64, 505–512. https://doi.org/10.1016/j.jclepro.2013.10.008

Miller, C. R. 2018. Hanbook of Green Chemistry and Technology (Issue September 2017).

Mizik, T. 2021. Economic Aspects and Sustainability of Ethanol Production -A Systematic Literature Review Energies 14 : 19 Paper: 6137 , 25 p. https://doi.org/10.3390/en14196137

Murray, A., Skene, K., & Haynes, K. 2017. The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context. Journal of Business Ethics, 140(3), 369–380. https://doi.org/10.1007/s10551-015-2693-2

Newman, M. E. J. 2011. The structure of scientific collaboration networks. The Structure and Dynamics of Networks, 9781400841, 221–226. https://doi.org/10.1515/9781400841356.221

Onel, S., Zeid, A., & Kamarthi, S. 2011. The structure and analysis of nanotechnology co-author and citation networks. Scientometrics, 89(1), 119–138. https://doi.org/10.1007/s11192-011-0434-6

Pancsira, J. 2019. Examination of International Agricultural Trade Literature by Social Network Analysis. Journal of Ecoagritourism, 15(1), 29–33.

Persson, O., Glänzel, W., & Danell, R. 2004. Inflationary bibliometric values: The role of scientific collaboration and the need for relative indicators in evaluative studies. Scientometrics, 60(3), 421–432. https://doi.org/10.1023/B:SCIE.0000034384.35498.7d

Peters, G. P., Weber, C. L., Guan, D., & Hubacek, K. 2007. China's growing CO2 emissions - A race between increasing consumption and efficiency gains. Environmental Science and Technology, 41(17), 5939–5944. https://doi.org/10.1021/es070108f

Popp, J., Balogh, P., Oláh, J., Kot, S., Rákos, M. H., & Lengyel, P. 2018. Social network analysis of scientific articles published by food policy. Sustainability (Switzerland), 10(3), 1–20. https://doi.org/10.3390/su10030577

Rizos, V., Tuokko, K., Tuokko, K., & Behrens, A. 2017. <RR2017-08_CircularEconomy_0.pdf>.

Sauvé, S., Bernard, S., & Sloan, P. 2016. Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. Environmental Development, 17, 48–56. https://doi.org/10.1016/j.envdev.2015.09.002

Snyder, H. 2019. Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104(March), 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Su, B., Heshmati, A., Geng, Y., & Yu, X. 2013. A review of the circular economy in China: Moving from rhetoric to implementation. Journal of Cleaner Production, 42, 215–227. https://doi.org/10.1016/j.jclepro.2012.11.020

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

Van Eck, N. J., & Waltman, L. 2016. Text Mining and Visualization. Text Mining and Visualization, 1–5. https://doi.org/10.1201/b19007

Verghese, K., & Lewis, H. 2007. Environmental innovation in industrial packaging: A supply chain approach. International Journal of Production Research, 45(18–19), 4381–4401. https://doi.org/10.1080/00207540701450211

Wells, P., & Seitz, M. 2005. Business models and closed-loop supply chains: A typology. Supply Chain Management, 10(4), 249–251. https://doi.org/10.1108/13598540510612712

Yuan, Z., Bi, J., & Moriguichi, Y. 2006. The circular economy: A new development strategy in China. Journal of Industrial Ecology, 10(1–2), 4–8. https://doi.org/10.1162/108819806775545321