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The Circular Economy, Bioeconomy, and Green Investments: A Systematic Review of the Literature

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RESUMO

Proposta – O objetivo deste artigo é avaliar os conceitos teóricos de Bioeconomia e Economia Circular em associação aos estudos de investimentos sustentáveis.
Quadro teórico – Vários estudos apontam que investimentos sustentáveis devem substituir os processos de produção. Esta literatura oferece um ambiente favorável para novos estudos sobre Economia Circular e Bioeconomia. No entanto, a literatura carece de definições e diferenciação entre os dois conceitos teóricos.
Design/metodologia/abordagem – A Revisão Sistemática da Literatura (RSL) foi adequada para sistematizar as informações dos 345 artigos, 231 relacionados à Economia Circular e 114 artigos relacionados à Bioeconomia. Além disso, este artigo procedeu com análise de conteúdo dos 24 artigos com maior número de citações.
Resultados – Os resultados revelaram que os conceitos de Economia Circular e Bioeconomia podem ser semelhantes ou distintos. Os conceitos são semelhantes devido à preocupação com o desenvolvimento econômico sustentável. No entanto, a Economia Circular utiliza conceitos relacionados à diferenciação do paradigma de um sistema produtivo linear para um sistema produtivo na forma de *loop*. A Bioeconomia está mais preocupada com o uso de recursos biológicos e biotecnologia. A distribuição geográfica dos estudos também pode demonstrar as diferenças entre os conceitos teóricos analisados, bem como o número de publicações, citações e métodos utilizados. No entanto, ambas as abordagens estão alinhadas com a escassez de base de dados.
Originalidade/Valor – O estudo revelou baixa utilização do conceito de Bioeconomia em países com alta biodiversidade, por exemplo, os países que compõem a região amazônica. Por outro lado, houve uma maior sinergia entre a abordagem da Economia Circular e os processos produtivos nos diferentes setores econômicos dos países em desenvolvimento.
Palavras-Chave: Economia circular; Bioeconomia; Finanças verdes; Revisão Sistemática da Literatura (RSL).

ABSTRACT

Purpose *– This study aims to evaluate the theoretical concept of the Bioeconomy and the Circular Economy in association with studies about green finance.*
Theoretical framework *– Several studies pointed out that sustainable investments must replace production processes. This literature provides a favorable environment for new studies on the Circular Economy and Bioeconomy. However, the literature lacks definitions and differentiation between both concepts.*
Design/methodology/approach *– A Systematic Literature Review (SLR) was adequate to systematize the information from 345 articles, 231 relating to the Circular Economy, and 114 articles relating to the Bioeconomy. In addition, the contents of the 24 articles with the highest number of citations was reviewed.*
Findings *– Our analysis revealed that the concepts of the Circular Economy and Bioeconomy could be similar or different. The concepts are similar due to the concern with sustainable economic development. However, the Circular Economy uses concepts that are related to the differentiation of the paradigm from a linear productive system to that of a loop. The Bioeconomy is more concerned with the use of biological resources and biotechnology. A geographic distribution of the studies can also identify the differences as well as the number of publications, citations, and methods used. However, both approaches equally show a scarcity of databases.*
Originality/value *– Our study reveals that the Bioeconomy concept is hardly used in countries with high biodiversity, for example, countries that make up the Amazon region. On the other hand, there was a greater synergy between the Circular Economy approach and production processes in different economic sectors in developing countries.*
Keywords: *Circular Economy; Bioeconomy; Green Finance; Systematic Literature Review (SLR).*

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1. INTRODUCTION

The increase in consumption patterns and industrial demand, and the lack of ecological regeneration causes instability in the environment (BOCKEN, 2015). Based on this problem, there is a lack of studies analyzing the importance of sustainable development to generate economic development concomitantly with social and environmental preservation (VELLANI *et al*., 2009). According to the United Nations World Commission on the Environment and Development (UN, 1987), sustainable development argues that society cannot corrupt future generations' needs, which requires strategies to reduce environmental damage worldwide.

Based on this assumption, the literature addresses the concept of green finance or sustainable investments, which deals with the association between finance and business with environmentally friendly behavior. Green Finance provides the opportunity to achieve sustainable innovation pathways, promoting institutional and financial knowledge by funding green projects (HE *et al*., 2019; FALCONE; SICA, 2019). Nowadays, companies' success is no longer solely associated with productive capacity, innovation, and market share. The contemporary world consumer considers the product's impact on the environment and the social aspects during the production process. Thus, the demand, price, and quality of products might impact the business strategy concerning sustainable development (FIGUEIREDO *et al*., 2009). For this reason, we choose green finance to moderate the concepts of Bioeconomy and Circular Economy to boost new projects and investments in developed and developing countries. We argue that green finance is crucial to promote sustainability through new pathways of economic development.

Some sustainable development strategies have gained prominence in the international literature, such as the concepts of Bioeconomy and Circular Economic. The Bioeconomy has been considered an important strategy to solve health and agriculture's main challenges since biological advances (in science, technology, and innovation) influence social, economic, and cultural changes (WIELD *et al*., 2013). On the other hand, the Circular Economy is considered an economic strategy, as it considers an application of a closed cycle of materials and products to reduce the use and waste of natural resources. The Circular Economic allows companies to control their products and materials throughout the life cycle, which can solve

the problem of raw material availability and maintain physical product ownership while offering service to the final consumer (MASI *et al*., 2018; BOCKEN *et al*., 2016).

However, these new theoretical concepts have still been little explored and end up getting confused. In this regard, our research problem intends to answer whether Bioeconomy and Circular Economy have similar or distinct theoretical concepts. This article aims to evaluate the theoretical concept of the Bioeconomy and the Circular Economic in association with green finance studies by using the Systematic Literature method. In this sense, our study presents some contributions. First, we show the synergies and discrepancies by comparing Bioeconomy and Circular Economy concepts. Second, we systematize several aspects of the most cited articles, such as which journals published these studies, the most used keywords, which geographical regions were analyzed, and which kind of methods were used. Third, we show that, although Bioeconomy is an essential concept for countries with high biodiversity, this concept has been marginally explored in regions like Amazonia. The next topic presents the literature review.

2. THEORETICAL FOUNDATION

This section briefly presents the background literature on the concepts of Circular Economy and Bioeconomy used by green finance studies. The concept of Circular Economics was first presented by Boulding (1966) and Pearce and Kerry Turner (1990), but with roots in diverse theoretical knowledge such as Environmental Economics, Industrial Ecology, Ecological Economics, and Cradle-to-Cradle, being the main essence of this the creation of a closed cycle of matter, energy and process losses (MASI *et al*., 2018). In addition, this main essence is associated with other principles such as the manufacture of durable products and a focus on maintenance services that allow an extension of products' service life (SILVA *et al*., 2018; STAHEL, 2010).

Thus, according to Aboulamer (2018), the Circular Economy became a form of reinvention of the traditional linear productive mode, since both global leaders and consumers began to consider the misuse of resources and their limits so that they have demanded greater sustainability on the part of companies. The author also points out that with the Circular Economy, it is possible to produce and design products with a longer lifespan.

Therefore, the Circular Economy tends to optimize the use of resources compared with the current linear production model through the efficient transition from open cycles to closed cycles of energy, material and lower losses of the productive process (STRAT *et al*., 2018). For example, a case study of the Circular Economy application and improvements was done in the Chinese iron and steel industry. The authors showed that Circular Economy could be implemented and improved, which causes energy recycling, improvement of water use, which reduced consumption, and reduction of solid waste discharge (MA *et al*., 2014). Thus, the authors argue that Circular Economy might reduce the use of resources during the production process.

Another important concept in the literature is Bioeconomy. The concept was first defined by R. Martinez and J. Enriquez in 1997 (KALAYCI *et al*., 2017), and it is based on a program developed in the European Union (EU) to develop biotechnologies that identify new solutions to reduce the negative impacts of old technologies (GÂRDAN, 2018; PATERMANN; AGUILAR, 2017). It is noteworthy that the Bioeconomy addresses concepts from different fields, such as biotechnology, biological resources, and bioecology, applying such knowledge to the production of goods based on biological resources (GÂRDAN, 2018).

Bioeconomy has stood out as a significant and comprehensive economic and productive sector that covers renewable biological resources, along with waste and the subsequent conversion into food, feed, products, and energy of biological composition (PHILIPPIDIS *et al*., 2018). This concept has become necessary since it aims to replace productive systems based on fossil and non-renewable resources with biological resources, increasing productive sustainability. Renewable sources, raw materials, and biodegradable energy have generated a more excellent range of knowledge, aiming at transforming production systems, which increases investments in technologies that make processes more efficient.

Renewable sources and biodegradable raw materials and energy have generated a wider range of knowledge and studies aimed at such a replacement of production systems, leading to significant investment by developed and developing countries in technologies that make processes more energy-efficient in environmental and economic terms (DAL POZ *et al*., 2017).

For example, in Brazil, in 2019, the Brazil Bioeconomy Program was established, in addition to laws, such as Law 13,123/2015, to facilitate the development of the Bioeconomy

in the country. Such development is of paramount importance since Brazil has advantages that can provide opportunities for it to occur, such as more extraordinary biodiversity (42,730 plant species) and great economic dynamism of agribusiness (annual surplus in 2016 of US$ 63 billion) (SILVA *et al*., 2018). In this way, sectors such as agriculture and health can increase the yield with the Bioeconomy because it tends to expand the various uses of biological systems, which provides a favorable environment for the sector's evolution (NUNES *et al*., 2017).

3. METHODOLOGICAL PROCEDURES

The Systematic Literature Review (SLR) method organizes relevant information on a given research topic to clarify the main theoretical concepts and methods used by researchers, the proposed variables, and gaps that the scientific papers proposed for future studies (REIM *et al*., 2015). The differential of this method is the possibility of replication by other researchers (SAYFOURI, 2014), which avoids bias during the analysis, makes the data more reliable, and the conclusions more elaborate (TRANFIELD *et al*., 2003). However, the Systematic Literature Review needs to delimit exclusion criteria and careful analysis of the selected articles, enabling the literary synthesis and facilitating the understanding of the state of the art in a theme (TRANFIEL; DENYER; SMART, 2003).

The systematic review proved to be a suitable method for this article due to the possibility of advancing and systematizing knowledge about the concepts of Circular Economy and Bioeconomy. This study focuses on international works, considering the low number of publications in Brazil. It is also noteworthy that systematic reviews on the subject were not found. In this sense, we prepare a strategy to systematize articles in this research field. Table 1 summarizes our strategy.

Table 1 – Steps of the Systematic Literature Review

Step 1 - Review planning Step A - Is there a need for a literature review? Step B - Revision proposal (delimitation of the theme); Step C - Research protocol preparation; Step 2 – Collection and selection D - Research of the published articles according to the established protocol; E - Analysis of the quality of the articles researched; F – Criteria for choosing the relevant articles; Step 3 – Results and analysis G - Extraction of selected files; H - Summary of the systematic review; I – Results, gaps and discussion.

Source: TRANFIELD *et al*. (2003).

Table 2 - Research protocol

Keywords searched	*Investment, innovation, sustainable development, sustainable innovation, sustainability, bioeconomy, circular economy*
Boolean operator	*AND/OR*
Database	*Web of Science e Scopus*
Research domains	All areas related to Production Engineering and Economics.
Research areas	*Engineering and Economics.*
Selection criteria	Combinations of keywords in the title, abstract and/or keywords of the articles.
Language	English
Types of document	Article
Years of publication	1992 to 2019

Source: Elaborated by the authors (2021).

The search protocol contains the procedures and general rules to be followed (YIN, 2015). The search criteria by combining keywords occurred by title, abstract, and keywords, as proposed by Sordi (2013). Relevant journals constituted the domain for the areas of knowledge in Production Engineering and Economics areas. To ensure the sample's relevance and quality, we selected journals with a high impact factor. Table 2 presents the research protocol.

In this sense, 345 articles were analyzed, of which 114 were related to Bioeconomy,

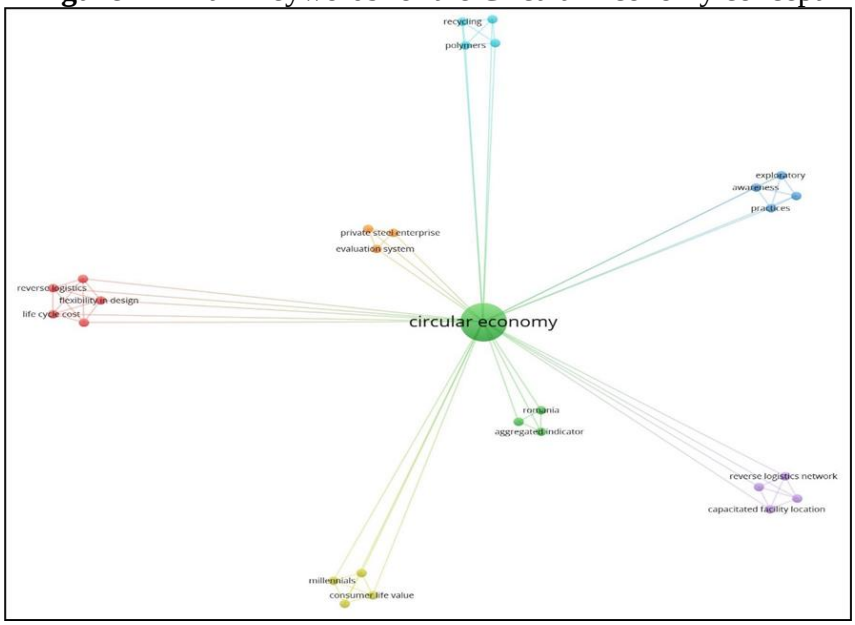
and 231 were related to Circular Economy. Content analysis occurred for the 24 most relevant articles based on the number of citations. This ensures that RSL occurs on the articles that have been most used by experts in the field. However, only 21 articles were read and tabulated, as 3 articles were not available for reading. We used the software VOS viewer version 1.6.16 to generate main keywords and journal network figures.

4. RESULTS AND DISCUSSION

4.1 Bibliometrics

According to the analyzed database, it is possible to approach the articles according to dimension, keywords, journal, year of publication, citations, method (qualitative or quantitative), and country of publication. It should be noted that the concepts approached using the keywords are aligned with the definitions found in the articles analyzed, as in the case of Circular Economy (Figure 1) concerning the aspects of the cyclical production process and an increase in the life cycle of the products, in addition to recycling practices that minimize the exploitation of resources, generating more excellent added value.

Figure 1 – Main keywords for the Circular Economy concept

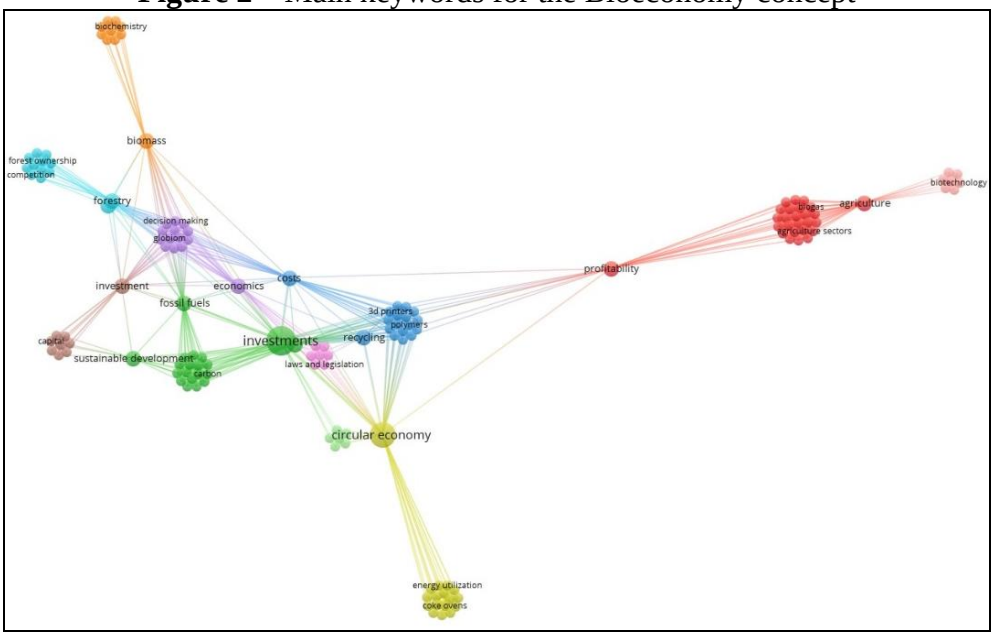


Source: Elaborated by the authors (2021).

Figure 2 highlights the main keywords of Bioeconomy, although it does not appear in the center of the Figure. Surprisingly, however, it shows the use of the expression Circular

Economy, adhering, thus, to such words as biochemistry, biomass, and biotechnology, whose association, unlike Figure 1, is with recycling, reverse logistics, product life cycle, among others. Moreover, Figure 2 shows an association of keywords with the term sustainability. Note that the studies analyzing Circular Economy deny this term.

Figure 2 – Main keywords for the Bioeconomy concept



Source: Elaborated by the authors (2021).

Among the 21 articles analyzed, 61.9% refer to the Bioeconomy and 38.1% to the Circular Economy. Regarding the type of approach, there was a prevalence of qualitative methods (66.7%) over quantitative methods (33.3%) in both concepts. On Bioeconomy, most studies proceeded with a qualitative approach (76.9%), based on structured or semi-structured interviews, bibliometric mapping, Computable General Equilibrium simulation (CGE), and Delphi. The few studies exploring a quantitative approach (23.1%) used as a method the simulation, statistical analysis with data from companies in the Bioeconomy area, and the Multivariate Generalized Autoregressive Conditional Heteroscedasticity (MGARCH) model. Note that the prevalence of qualitative studies may be caused by the lack of a database on Bioeconomy due to the recent progress of studies in this area. Concerning Circular Economy, some studies use quantitative methods (50%) based on methods such as hybrid models, financial marketing, and the Mixed Integer Linear Programming (MILP) model. Qualitative

approaches (50%) are based on data collection and analysis through direct observations, case studies, questionnaires, and file consultation.

Gap 1: Few studies are using quantitative methods, in particular with the Bioeconomy approach.

Regarding the geographical distribution, the studies analyzed correspond to 7 countries, namely: Brazil, Cambodia, Chile, China, Turkey, Italy (4.76% each) and Romania (19.05%); 2 regions, being the Mediterranean and the European Union (4.76% and 9.52%, respectively); and global analyses (38.1%). It should be noted that the Bioeconomy is mainly associated with the analysis of European countries (53.8%), which can be explained by the fact that this concept originated based on a European Union program. On the other hand, the Circular Economy is analyzed mainly in developing countries (37.5%), such as Brazil, Chile, and Cambodia, representing 4.76% each, in addition to China and Romania (25%), representing 4.76%, and Global (37.5%) representing 14.29%. The preference for the Circular Economy in developing countries may stem from the possibility of replacing the productive model without applying (bio)technologies that are difficult to access. Thus, the second gap in the literature found by the present study is verified:

Gap 2: There is a geographical concentration of studies per analyzed theme:

Gap 2A: Few bioeconomy studies in countries outside the European Union;

Gap 2B: Concentration of studies on Circular Economics in developing countries.

In addition to the method and the geographical concentration, this study analyzed the number of citations of the selected articles. Among the 742 citations, 85.98% are associated with the Bioeconomy and 14.02% with the Circular Economy. This result suggests that the Bioeconomy has been used more for green finance studies than the concept of Circular Economics. This result may also be related to the geographical factor, as studies in European countries have generated more citations than studies in emerging economies. However, the crossing of citations and geographical distribution needs to be better analyzed by future studies. Table 3 summarizes the results.

Table 3 - Number of publications and citations according to the analyzed journals

Journal	Circular Economy			Bioeconomy		
	Published articles	%	Citations	Published articles	%	Citations
Additive Manufacturing	1	12.5	5	-	-	-
Amfiteatru Economic	1	12.5	2	3	23.08	7
Business St. and Environment	1	12.5	9	-	-	-
Int. Jour. Production Economics	1	12.5	5	-	-	-
Journal of Cleaner Production	1	12.5	58	-	-	-
Production Planning & Control	1	12.5	19	-	-	-
Rege-Revista de Gestao	1	12.5	2	-	-	-
Thunderbird International Business Review	1	12.5	4	-	-	-
Ecological Economics	-	-	-	1	7.69	6
Energy Economics	-	-	-	1	7.69	2
Energy Policy	-	-	-	1	7.69	35
Forest Policy and Economics	-	-	-	3	23.08	80
Journal of Peasant Studies	-	-	-	1	7.69	472
Procedia Manufacturing	-	-	-	1	7.69	1
Proceedings of ICTIM 2017	-	-	-	1	7.69	0
Science and Public Policy	-	-	-	1	7.69	35
Total	**8**	**100**	**111**	**13**	**100**	**631**

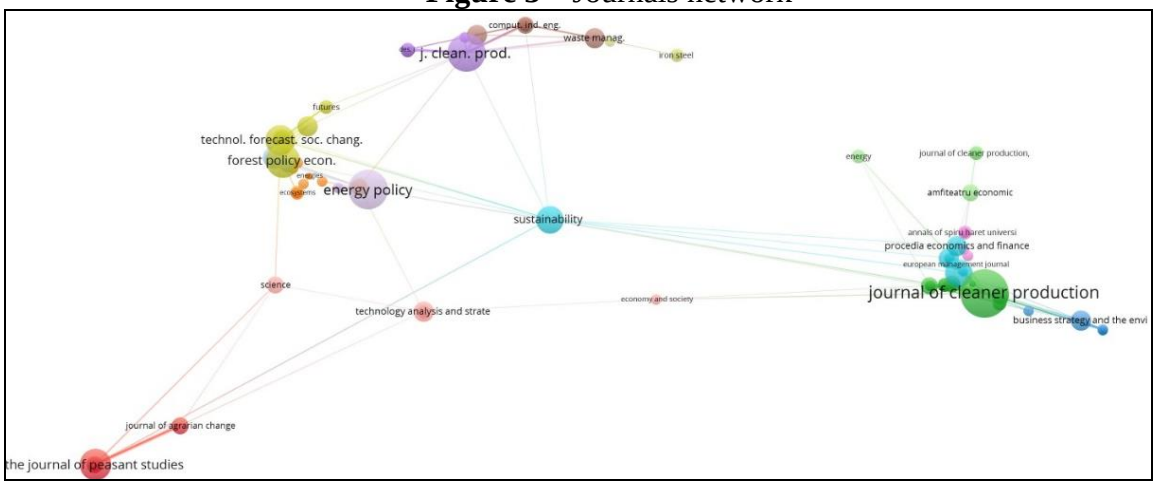
Source: Elaborated by the authors (2021).

Concerning scientific journals (Table 3), 8 journals were observed in the Circular Economy area, representing 12.5% each. The publications in the Bioeconomy area were found in 9 different journals, with 7 journals representing 53.85% of the total and 2 journals representing 46.15% of the total articles analyzed. The two journals with the highest concentration of published articles are Amfiteatru Economic and Forest Policy and Economics.

Figure 3 shows the main journals that publish on both concepts. Thus, the Journal of Cleaner Production, from the United States, has a high impact factor given by its Journal of Citation Report (JCR) equal to 7,246 and whose scope includes such areas as cleaner production and technical processes, sustainable development and sustainability, sustainable consumption, products and services, among others. The Journal of Peasant Studies, from England, has a JCR of 4.75 and addresses themes related to rural development and policy,

promoting a critical analysis on social structures, institutions, actors and processes of change in the rural world, as well as agrarian power relations between classes and other social groups. Energy Policy, whose origin is also English, has a JCR of 5,042 and a scope that addresses the political implications of energy supply and use of its economic, social, planning, and environmental aspects. Finally, Forest Policy and Economics journal, from the United States, has a JCR of 3,139 and a scope covering peer-reviewed political and economic research related to forests, forest landscapes, forest-related industries, and other land uses.

Figure 3 – Journals network



Source: Elaborated by the authors (2021).

In addition, this study verified the gradual growth of publications on Bioeconomy and Circular Economy. In recent years, the number of publications has been growing: 38.1% of articles were published in 2018, 19.05% in 2019, 4.76% in 2017, 19.05% in 2016, and 9.52% in 2013, and 9.52% in 2012. Besides, the Circular Economy publications represent 62.5% in 2018, compared to 25% in 2019 and 12.5% in 2013, while those related to the Bioeconomy represent 23.08% in 2018, against distribution of 15.38% in 2019 and 7.7% in 2013. However, several years (2012 - 15.38%, 2016 - 30.77% and 2017 - 7.7%) presented only studies on Bioeconomy.

4.2 Content analysis

The Bioeconomy and the Circular Economy are concepts that approach the sustainable issue. They seek to replace production processes and systems with forms of production that minimize the misuse of resources (ABOULAMER, 2018; KALAYCI *et al*., 2017; BUREL,

2012). Both concepts are based on sustainability as a means of reducing the negative impacts of production systems. However, these concepts use different means to achieve sustainable development. The Bioeconomy uses a multidisciplinary approach, using different scientific areas such as biotechnology and bioecology. This demonstrates that bioeconomy studies seek solutions supported by technological aspects through innovation and application to make biological resources available. The Circular Economy is based on the principles that generate a closed productive cycle of energy and material, increasing the lifetime of products, and reducing procedural losses. Therefore, the studies analyzed on Circular Economy show more significant concern with the production process, administrative and product design than biotechnology.

This study also proceeded with the content analysis of the articles on Bioeconomy and Circular Economy. This section aims to analyze the different concepts and approaches, results obtained, and the limitations of each area analyzed by this project. In this way, it was possible to perform a vertical analysis, compare the articles of the same area, and horizontal analysis, compare the articles of different areas.

a) Vertical analysis

Regarding the concept of Bioeconomy, it is noted that the literature converges to the description of an operational and conceptual approach, covering the use of technologies, interdisciplinarity, and a set of economic activities and productive processes involving changes in the use of traditional fossil and non-renewable raw materials for the use of bio-based materials, whose goal is to achieve sustainable development. It is also possible to observe that some authors consider this process as a form of substitution of productive processes and as an opportunity to obtain energy sources of biological and even renewable nature.

However, what differentiates the definitions among the authors is the applicability of each case under analysis. Each article has a specific objective, from the feasibility study of applying this concept for waste reduction and waste to integrating the concept in the wood bioproducts sector, for example. Besides, one aspect of being considered is the association of the term with a particular aspects: biotechnology, biological resources, and bioecology.

Concerning the definitions of the concept of Circular Economy, it appears that the authors shift to the substitution of the traditional open linear production system for a closed cyclic and loop material system, based on remanufacturing, in order to achieve economic development by maximizing resource use and minimizing waste and waste generated during the process, mitigating environmental problems and contributing to sustainability. However, some authors approach the concept of Circular Economy associated with the provision and/or maintenance of services, which increases integration and the long-term relationship with the customer.

In the case of the Bioeconomy, the results converge to clarify the positive effects that the concept has on organizations, pointing out the implemented aspects and/or factors that need to be improved to generate investments for sustainable development. However, there is a difference between the applications or proposals of specific applications of each case and their resources and means of occurrence, from the need for political measures and incentives to the practice of ecological education in universities. In the case of Circular Economy, part of the authors based on case studies applications, which ultimately tapered the perception of functionality and applicability, since specificity delimits the approach on the concept.

b) Horizontal analysis

The horizontal analysis allowed a comparison between the concepts of Bioeconomy and Circular Economy. Regarding aspects of similarity, it is noted that both concepts approach the perspective of minimizing and, if possible, extinguishing the use of resources, materials, and energy of fossil origin. Of course, both concepts are concerned with sustainability and the scope of environmentally conscious production processes. In other words, the Circular Economy and the Bioeconomy seek sustainable development through the elimination of environmental problems caused by traditional industrial processes. To achieve these objectives, both theories understand the importance of the various economic agents involved, such as entrepreneurs or investors, and consumers.

However, the horizontal analysis demonstrated that the Circular Economy and the Bioeconomy might differ concerning how to achieve the proposed objectives. The Bioeconomy seeks to achieve sustainable development through bio-based resources and an interdisciplinary association, involving technological and ecological aspects and building a

process that eliminates dependence on non-renewable resources; while the Circular Economy seeks such development through the reformulation of the productive system, replacing the current cyclic system with a closed system (loop).

This divergence of strategy may present advantages or disadvantages for interested economic agents. Firstly, the Bioeconomy can be more adherent to countries that dominate (bio)technological bases. In other words, emerging countries that depend on the technology developed by European, Asian, and US multinationals may present more incredible difficulty in obtaining the knowledge necessary for the development of the Bioeconomy. Secondly, the Circular Economy can be more adherent to emerging countries because the concepts of recycling, reuse, productive maintenance, and others depend more on the reorganization of the production system than on advanced technological bases. Thirdly, note that the technological limitation of the Bioeconomy is contradictory since the geographic regions with the highest biodiversity (for example, the Amazon) are concentrated in emerging countries, which do not yet have the appropriate technical knowledge to develop the Bioeconomy.

Concerning the results presented by the studies analyzed, it was found that, in general, the application of both concepts generates results and positive effects for organizations, mainly concerning aspects of waste and waste reduction. However, as previously stated, they differ in the focus of each concept's articles since the articles related to the Bioeconomy address the improvements implemented or achieved in organizations. In contrast, those related to Circular Economics have an approach based on case studies.

Concerning the limitations of the articles, in general, the studies presented limitations related to the scope of action, which induces a specific analysis of each approach, especially regarding the sectors analyzed. Thus, we note the third gap found by this study:

Gap 3: There are limitations on global and regional databases, especially in emerging economies.

In summary, there is a lack of quantitative methods and robust databases, and there may be less complexity of application and choice of analyzed variables.

5. CONCLUSION

This study analyzed the theoretical concept of Circular Economy and Bioeconomy in green finance scientific articles. The Systematic Literature Review technique was used to review high impact articles published in the Web of Science. In this way, the systematic review of this article shows that the concepts of Circular Economy and Bioeconomy can be similar or different. These concepts approach due to the concern with economic development in a sustainable way. However, the concepts differ because they use different focuses to achieve sustainable development.

While the Circular Economy uses concepts related to the differentiation of the paradigm from a linear productive system to that in the form of a loop through reuse, recycling, maintenance, and others, the Bioeconomy is more concerned with biological resources and biotechnology. The geographical distribution of the studies can also observe the differences, number of publications and citations, and methods used. However, both approaches align on database scarcity to improve quantitative techniques and the scope of the analyses. Thus, this study's essential result is to demonstrate the need for robust databases for Circular Economy and Bioeconomy.

Finally, there was a concentration of studies on Bioeconomy in the European Union, while several Circular Economy applications were found in developing countries. This is an important finding since developing regions can develop Bioeconomy strategies. Developing countries present great biodiversity, such as the countries that make up the Amazon Forest in South America. On the other hand, developing countries may find it challenging to implement bioeconomic strategies, given the technological backwardness and patent dependence of developed countries. However, there was a greater synergy of the Circular Economy approach with the production processes in different economic sectors of developing countries.

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