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Review

A Systematic Literature Review of Bio, Green and Circular Economy Trends in Publications in the Field of Economics and Business Management

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Abstract: The concepts of bioeconomy, green economy and circular economy share the common objective of developing a sustainable economy, and they attract enormous political, academic, social and business interest. However, an analysis of these concepts in the fields of economics and business management is lacking. The objective of this article is to classify the publications on these topics by subject of study, to analyse trends in publications and to guide researchers interested in selecting articles. The review was performed using Scopus for the period 1960 to 2017. Four hundred and forty-nine publications were obtained and classified into 17 categories. The results show that the existing literature is rich in analysing implemented policies and issues related to the strategies and organizational models of companies looking for a more sustainable path, and research in China and the European Union is highlighted. However, there is still a long way to go in researching implemented case studies and evaluating the economic impact of these concepts. For this to happen, the need to promote, encourage and support companies to implement cleaner production and approach a more sustainable path must be prioritised. Possible gaps in current research that allow future lines of work are also identified.

Keywords: systematic literature review; bioeconomy; green economy; circular economy; bibliometric analysis; sustainability management

1. Introduction

To ensure a sustainable growth model we have to use our resources more efficiently [1], which, in turn, requires focusing on sustainable development, as defined by the United Nations in its 1987 "Report of the World Commission on Environment and Development".

Taking as a starting point the key concept of natural capital as the world's stock of natural assets—such as air, water, soil, geology and all living organisms, whether renewable or not [2]—then it is essential to consider the conservation of this natural capital to ensure the future of humanity. If we continue to reduce reserves of natural resources without replenishment, we run the risk of ecological collapse. Badly managed natural capital becomes a social and economic responsibility and sustainability depends on its maintenance [3]. Consequently, our economy cannot be based on a "take, make, consume and dispose" model, and consumers, governments and businesses must be aware of this reality.

The importance of this issue has led to its inclusion in worldwide agendas, for example, "The 2030 Agenda for Sustainable Development" [4], which seeks to promote countries' commitment to a better future. The United Nations has established seventeen goals for sustainable development, which

should be addressed by all member countries. The three concepts analysed in this article have a direct impact mainly on these goals, which promote sustainable industries focusing on responsible production and consumption through the efficient use of resources and energy and reduction of waste. This situation impacts the creation of new products, increasing competitiveness in new markets, and promoting sustainable economic growth with quality employment without harming the environment. For example, the bioeconomy will contribute to promoting sustainable agriculture (which, in turn, provides food security), accessing energy through the use of clean energies, and guaranteeing the conservation of biodiversity and the sustainable use of ecosystems. Moreover, these new forms of production and consumption will help combat climate change. However, it must be pointed out that these concepts will also have an indirect impact on other established goals, such as clean water and sanitation (6) and life below water (14).

The OECD and the European Union are addressing this subject with the aim of creating international co-operation and promoting its implementation in as many countries as possible. The European Commission's "Europe 2020" strategy considers that developing a smarter and greener Europe is essential [5]. To this effect, various strategies and policies have been published in recent years: in 2008 "Europe's climate change opportunity"; in 2010 "A strategy for smart, sustainable and inclusive growth"; and, in 2011 "A resource-efficient Europe—Flagship initiative under the Europe 2020 Strategy" [6]. The latter declares the need for more efficient use of resources, minimising waste generation and optimising production processes both for the sake of the environment and to be more cost-effective and competitive. The policy document sets out measures and actions to be implemented in the next 10 years with the aim of promoting smart, inclusive, sustainable growth [7]. Each country, region or city must identify its own priorities, needs and goals to be able to promote policies tailored to its particular situation while contributing to global goals. Examples include: OECD (2009), "The Bioeconomy to 2030. Designing a policy agenda"; EU (2012), "Innovating for Sustainable Growth: A Bioeconomy for Europe"; USA (2012), "National Bioeconomy Blueprint"; Germany (2014), "National Policy Strategy on Bioeconomy"; Finland (2014), "Finnish Bioeconomy Strategy"; Spain (2016), "Spanish Bioeconomy strategy–2030 Horizon"; EU (2015), "Closing the Loop—An Action Plan for the Circular Economy EU 2015"; China (2009), "Circular Economy Promotion Law"; Spain (2018), "Circular Spain 2030—Spanish Circular Economy Strategy"; Catalonia (2015), "Andalusian Strategy of Circular Bioeconomy"; Andalusia (2018), "Strategy promoting Green and Circular Economy"; and, Netherlands (2016), "A Circular Economy in the Netherlands by 2050" [8,9].

In this article we analyse the publications that have been grouped under the concepts circular economy (CE), green economy (GE) and bioeconomy (BE), all of which are linked by the common objective of promoting sustainable development [10].

The concept of the GE was first introduced by Pearce et al. (1989) [10,11], who established that the economy and the environment are not separated, but are interdependent concepts. The United Nations Environment Program [12] defines the GE as one that "*improves human well-being and social equity, while significantly reducing environmental risks and ecological scarcities*". It seeks to implement economic models able to generate profit while avoiding damage to the environment, considering eco-innovation, improved resource and waste management, the reuse of raw materials and the transition towards sustainable consumption and production.

Several articles agree that Pearce and Turner introduced the concept of the CE in 1990 [13–15], originating from the desire to substitute the prevailing traditional linear economic model with a circular one whose principal aim was to keep the value of products, materials and resources in the economy for as long as possible. This model minimizes waste and the consumption of resources and foresees that goods generate value through their use at the end of their useful life [13]. It is based on four principles, the so-called 3Rs—reduce, reuse and recycle—and a fourth principle, sustainable design strategies to achieve greater durability in the designed products, incorporated by the Ellen MacArthur Foundation [16–18].

The BE is considered to have been introduced in 1971 by the economist Georgescu-Roegen, who affirmed that "the economy must be a branch of biology (. . .) we are one of the biological species of this planet and as such we are subject to all the laws that govern the existence of terrestrial life" [8,10,19]. In its strategy document, "Innovating for sustainable growth: A bioeconomy for Europe" (2012), the European Commission defines the BE as "an economy that covers the production and use of renewable biological resources (land and sea) and the conversion of these resources and waste into value-added products, such as food, feed, biological products and bioenergy" [20,21]. According to McCormick and Kautto (2013), the BE is based on the more efficient use of resources, reduced dependence on non-renewable resources, mitigating climate change, providing food security thanks to the use of renewable resources for industrial purposes, and increasing competitiveness and employment in companies. At a global level, increased adoption of bioeconomy strategies in recent years can be observed [6,8,22,23].

The current importance of the subjects BE, CE and GE is confirmed by the huge increase in scientific literature. However, just one literature review article currently exists that includes the three concepts and analyses the diversity within and between them with respect to sustainability [10]. Noteworthy is the work [24] in which a theoretical basis is developed to understand the different models applied to companies that want to make a transition towards a more sustainable economy, with a special application to the CE. There is also a systematic literature review that contributes to a fuller understanding of the academic studies but only focuses on CE, which has been taken as a reference [25]. Within this context, we carry out a systematic literature review about the BE, the CE and the GE based on analyzing publications within the field of economics and business management, an area still not addressed.

The first objective of this article is to explore the publications within the field of economics and business management by carrying out a descriptive analysis, which identifies their origin, the most popular sources and the authors. The second aim is to analyse the current literature on the three topics and categorise it according to the subject of study, identifying trends in publications in these fields and determining the most important issues and contributions, in addition to the country and the sector. The last aim is to identify possible gaps in the literature, allowing us to advance some future lines of research. The rest of this work is organised as follows: in Section 2 the methodology applied to carry out the systematic literature review is presented, including the planning and execution stages; in Section 3, the results are analysed; in Section 4, the results are discussed; and in Section 5, the conclusions are drawn.

2. Methodology

With the aim of producing a set of recommendations on the steps to follow to carry out a systematic literature review (SLR) in the area of management, Tenfield et al. (2003) proposed a three-stage process: planning, execution, and reporting and dissemination. This recommended procedure is followed for this analysis [26].

2.1. Planning the SLR

To achieve our objectives, the terms selected were used in the following way to search the title, abstract and key words: "Circular Economy" OR "Bioeconomy" OR "Bio-economy" OR "Green Economy".

The Scopus database was chosen to ensure the quality of the review. It provides a global view of scientific contributions with access to approximately 18,000 scientific publications from more than 5000 international publishers, covering 16,500 journals in the areas of science, technology, medicine, social sciences, art and humanities. It was chosen mainly because it contains more publications and journals than the Web of Science, but also because it offers about 20% more coverage in citations and includes different tools allowing the researcher to visualise, analyse and compare the published scientific information to make a descriptive analysis. In this case, Google Scholar was discarded

because the citations analysis it provides is not accurate and its search filters not useful for this analysis. Scopus is limited to articles published from 1966 onwards and the citation analysis is only available for articles published after 1996. These limitations, however, did not hinder our research, which is based on recent years [27].

2.2. Executing the SLR

The initial Scopus search based on the selected words appearing in titles, abstracts or key words between January 1970 and November 2017 identified a total of 4194 publications. The results indicated a considerable increase in publications since 2009 and particularly since 2016. By limiting the search to "articles", "articles in the press", "reviews", "books" and "book chapters", a total of 3043 publications were obtained. Considering only the publications in journals and books, there were 2594 articles in journals and 377 works in books. After selecting the languages English and Spanish, the total number of documents obtained was 2728.

The fields mainly involved in these articles are: Environmental Science, Social Science, Energy, Engineering, Economics, Econometrics and Finance, Business, Management and Accounting. However, to achieve the aims established in this SLR, of the resulting 2728 documents only those included in the fields of economics, econometrics, finance, business, management and accounting were selected, obtaining a total of 785 publications.

Due to the significant number of articles found and considering that those of greatest interest here would be the ones that incorporated the searched words in the key words, they were included in a new filter, obtaining 410 publications.

Having concluded the selection process, the works not included in the previously selected areas were analysed. It was considered opportune to incorporate 39 of the articles published in journals not classified within the fields chosen because they contained information related to our objective of study (with content related to economic or management issues) and they were cited in previously selected articles (numbering 410) (Figure 1). The "snowball" technique, a data collection method often used when it is difficult to obtain a representative sample in official sources, was applied to include these items [15,28,29]. A final total of 449 publications was obtained. They are detailed in Figure 2 by year of publication, and the huge increase in the importance of these topics in recent years is evident. In fact, 87% of the publications were published since 2013, of which 59% were published in the last two years, 2016 and 2017.

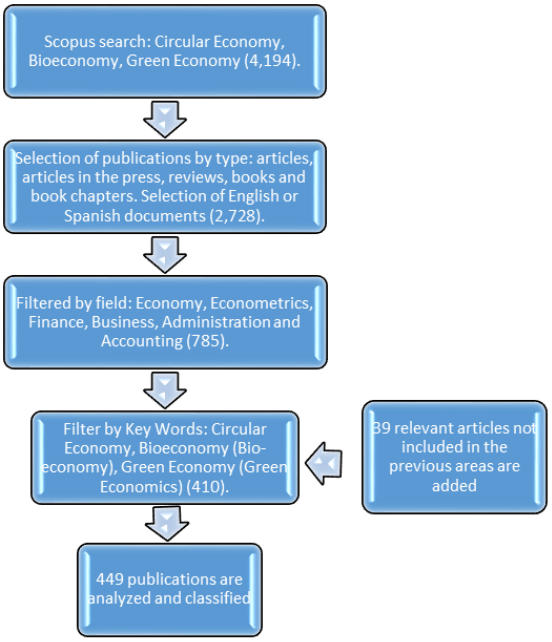

Figure 1. Systematic literature review process.

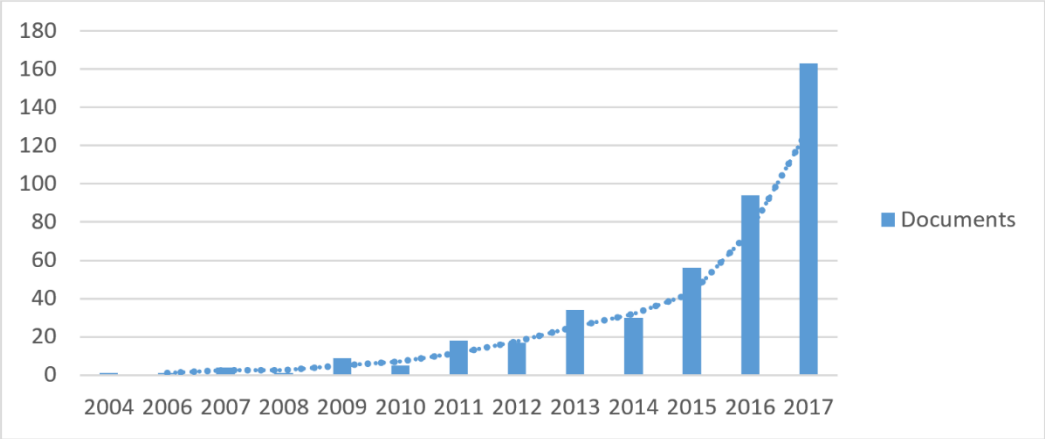

Figure 2. Search including key words.

3. Results

In this section, the results of the bibliography analysis are described, a content analysis to categorise the results by topic of study is made, and trends in publications and most important contributions are analysed.

3.1. Analysis of the Evolution of the Literature

A total of 449 publications were obtained from the execution stage of the SLR. The number of publications in 2015, 2016 and 2017 increased significantly, as did future publications for 2018. These topics were published by 135 journals, with 19 of them publishing four or more articles, representing 64% of the total. Analysing the Scopus impact evaluation of sources with the most publications, 63% were in the first quartile, 21% in the second and 16% in the third, demonstrating the high standard of the publications and the level of interest in the subject. It was also observed that 68% of the journals were indexed in the Web of Science and 47% were in quartile 1, according to the Journal Citation Reports (Table 1).

Table 1. Journals with four or more documents published.

Source	Documents	Ranking SCOPUS
Journal of Cleaner Production	109	Q1
Resources Conservation and Recycling	47	Q1
Quality—Access to Success	19	Q3
Sustainability (Switzerland)	14	Q2
International Journal of Green Economics	14	Q2
Journal of Industrial Ecology	12	Q1
Ecological Economics	7	Q1
Progress in Industrial Ecology	7	Q3
Technological Forecasting and Social Change	7	Q1
New Biotechnology	6	Q1
Environment, Development and Sustainability	6	Q2
Forest Policy and Economics	6	Q1
Futures	6	Q1
International Journal of Energy Economics and Policy	6	Q1
Business Strategy and the Environment	5	Q1
Journal of Commercial Biotechnology	5	Q3
International Environmental Agreements: Politics, Law and Economics	4	Q1
Science Technology and Human Values	4	Q1
Technology in Society	4	Q2
Total	288	

Separating the publications by selected key words resulted in the CE emerging as the most researched topic with 211 publications, followed by the GE with 164 and the BE with 74. The CE is the

concept with the oldest publications, dating back to 2004, and the number of publications on this topic has increased considerably since 2009. The oldest publications on the BE and the GE date back to 2008 and 2009 respectively, with an increase in the number of publications on the GE since 2011 and on the BE since 2013 (Figure 3).

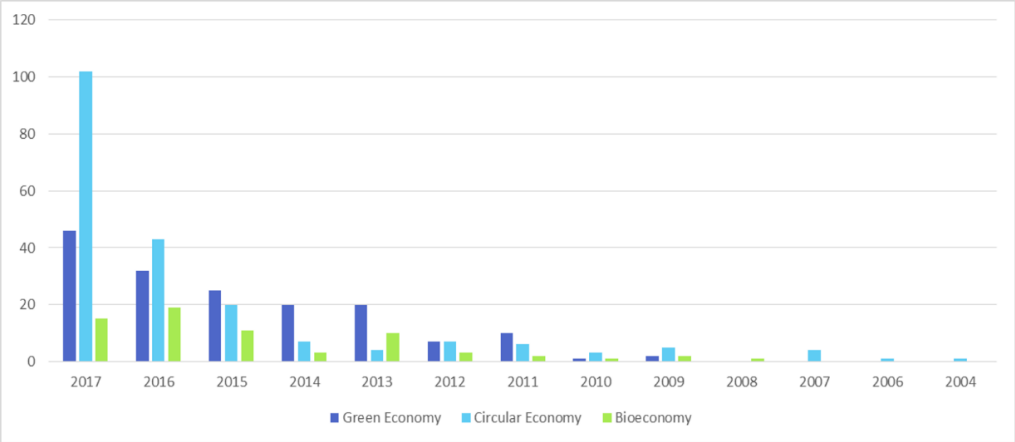

Figure 3. Publications by topic and year.

When the authors' country of affiliation was analysed, the CE was shown to be mainly studied in China and the United Kingdom, followed by the Netherlands and the United States. The United States, Germany, Belgium and Spain were in the leading positions on analysing the BE, and the United States, the United Kingdom, Romania, Russia and Italy appeared most frequently regarding publications on the GE (Figures 4–6).

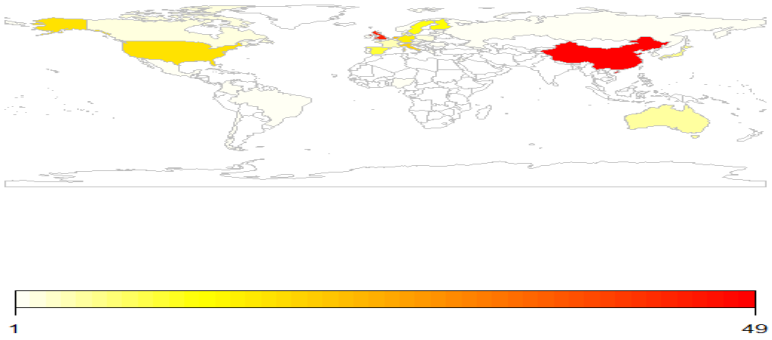

Figure 4. Geographical origin of the literature on the circular economy (CE) according to the affiliation of the authors (number of articles). Software R 3.5.0.

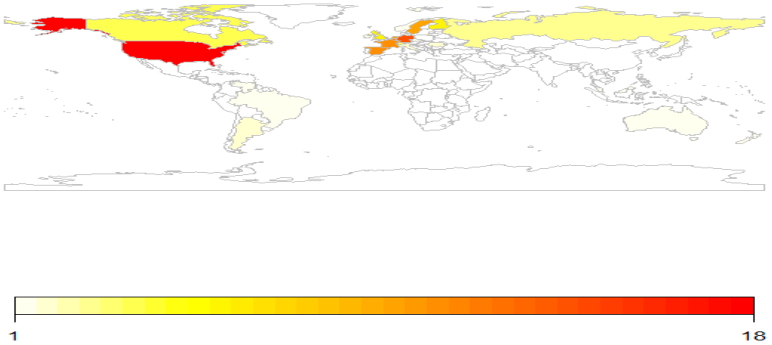

Figure 5. Geographical origin of the literature on the bioeconomy (BE) according to the affiliation of the authors (number of articles). Software R 3.5.0.

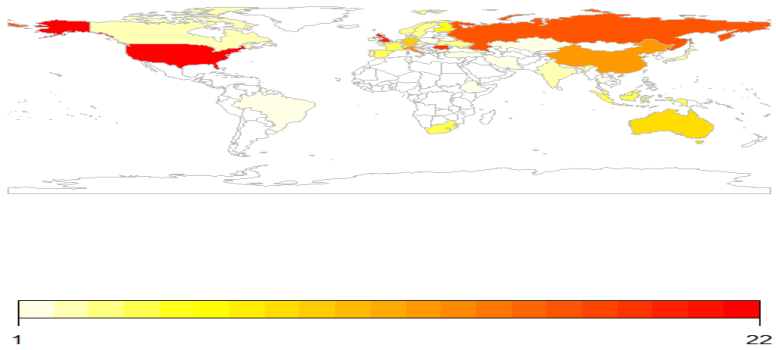

Figure 6. Geographical origin of the literature on the green economy (GE) according to the affiliation of the authors (number of articles)**.** Software R 3.5.0.

An overview of the selected articles indicated that besides the areas of economics, econometrics, finance, business management and accounting they are also concerned with environmental, energy and engineering sciences. When key words were analysed, the following themes were shown to recur: economic and social effects, sustainability, climate change and environmental and sustainable development.

3.2. Categorisation by Researched Topics

An analysis of the content of the publications to achieve a categorisation by theme was considered essential to classify the articles and know the main trends in publications, as well as to ease the researcher's task of searching for articles on their topic of interest. Seventeen categories were defined, bearing in mind that such a categorisation can be subjective. Our objective was to propose a classification comprised of a list of categories long enough to be both useful and establish differentiation. These 17 recognized categories are defined in Table 2.

Table 2. Definition of Categories.

Category	Definition
Design or policy analysis	Including description, analysis and evaluation of policy proposals, implementation studies, decisions and possible solutions to consider.
Sectoral application/cluster	Applications of the studied topics in a specific sector or in a cluster of companies. Includes analyses of business models, and analyses and evaluation of management, profits, performance and the behaviour of companies.
Management Styles	Design, development and implementation of business models and strategies, especially at the company or sector level.
Small and medium-sized enterprises (SMEs)/family businesses	Applications of these models especially in SMEs or family businesses.
Corporate Social Responsibility	Articles focused on corporate social responsibility.
Literature review	Literature review articles.
Theoretical/conceptual framework	Works based mainly on the definition of concepts and the theoretical framework of the topics.
Products design	Application of sustainability in product design.
Life cycle assessment	Life cycle analysis as a tool to evaluate or analyse the impact of products.
Consumer behaviour	Consumer behaviour and preferences regarding aspects such as ecological products, sustainable production, etc.
Case study	Case studies of the concepts applied in companies. Analysis of models, implementation in companies, economic analysis and operations.
Innovation	Cases of eco innovation to improve efficiency and sustainability.
Education	Educational aspects related to the topics studied here.

Table 2. *Cont.*

Category	Definition
Tourism	Articles focused mainly on sustainable tourism
Indicators	Different types of sustainability indicators.
Investment	Decision-making models, risk analysis and investment strategies in these ecological areas.
Others	Items that do not correspond to any previous category.

Appendix A contains the 449 documents analysed, classified by subject and field. Sixteen different categories concerning the CE were obtained according to the research topics, 41% of which were about the first three categories. Regarding the BE, 13 categories were identified, the first four representing 69% of the publications. The GE articles were classified into 15 categories, with the three most important representing 58% of the total. When analysing the three topics together, the most important categories identified were "Design or policy analysis" and "Sectoral application/cluster" (Table 3).

Table 3. Categories of publications by topic.

	Circular Economy	Bioeconomy	Green Economy	Total
Design or policy analysis	12%	34%	34%	24%
Sectoral application/cluster	12%	15%	15%	14%
Management Styles	17%	3%	9%	11%
Life cycle assessment	9%	-	-	4%
Literature review	8%	4%	2%	5%
Theoretical/conceptual framework	7%	8%	4%	6%
Consumer behaviour	7%	-	5%	5%
Products design	5%	-	-	2%
Case study	4%	12%	5%	6%
Innovation	4%	7%	4%	5%
Indicators	4%	4%	5%	4%
Education	2%	3%	3%	3%
Tourism	1%	3%	5%	3%
Investment	-	3%	1%	2%
Corporate Social Responsibility	2%	1%	3%	1%
SMEs/family businesses	3%	4%	1%	3%
Others	3%	-	3%	2%

3.3. Trends in Publications: Main Research Findings

In this section, contributions in the most prominent categories are analysed, as are the categories "Case Study" and "Indicators" because of their relevance to the chosen areas. Figure 7 shows the evolution of publications in the categories analysed.

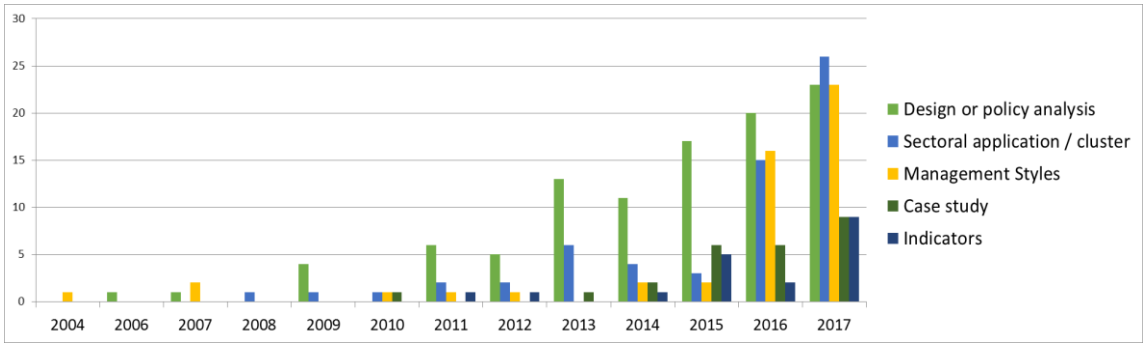

Figure 7. Evolution of main categories.

3.3.1. Circular Economy

In relation to the CE, the categories with most articles are: Management Styles (17%), Sectoral application/cluster (12%) and Design or policy analysis (12%), representing 41% of the articles.

Regarding "Management Styles", two main groups used in other studies can be established: micro and meso [14]. Studies of specific sectors, or those related to industrial symbiosis or eco-industrial parks, are included at the meso level. Studies of specific companies, particularly SMEs and sectors, and especially electronics and electro-domestics companies, are included at the micro level.

Analyses at the meso level account for over 50% of the total and are mainly applied to Europe and China, and to the food and agriculture, technology and construction sectors. Topics discussed in the food and agriculture sector include: how to incorporate CE management and assessment in the production, consumption and waste stages [14,29–31], impact on agriculture, cost reduction, and increased profitability [32,33]. Analysing the CE as a business strategy is also applied to the technology and communications sectors [34,35]. As for the electronics and electro-domestics sectors, articles can be found on implementing new business models [36], increasing life cycles or recycling [37,38], and the choice of greener materials [39]. The analysis of the construction sector focuses on waste management [40,41].

Articles on industrial symbiosis or eco-industrial parks focus on the relationship established to generate economic profit for companies, and they analyse how to integrate and manage the CE within their business models [42–45].

Second, with 12% of publications, was the category "Sectoral application/cluster", 73% of which referred to China (46%) and the European Union (27%). A significant proportion of the articles that refer to China analyse concrete examples of the economic and environmental benefits of opting for industrial symbiosis or transforming into eco-industrial parks. Several articles set out the actions and decisions required for developing the CE in eco-industrial parks; they also emphasise the importance of evaluating its implementation [46–52]. One study [53] addressing the need for government measures for improved efficiency of resources is worthy of special mention.

Within Europe there is only one article related to industrial symbiosis and eco-parks and it concerns Sweden [54]. There are also publications in Spain [55], Italy [56,57], the United Kingdom [58] and Germany [59]. The focus is mainly on studies related to recycling and waste management, analysing the economic impacts of using the CE. In Italy the positive effects of applying the CE in production and employment are observed in the packaging recycling sector [57] and in charges for waste collection [56]. In Sweden, the need for the recycling sector to find new business models and to set up associations or eco-industrial parks is highlighted [54]. An interesting study [58] quantifies waste generation in the UK by sector using an input-output analysis, finding that construction and extractive industries generate most waste.

Due to the importance of the construction and metal industries in generating waste, several articles are identified related to this subject. In the case of construction, the environmental benefits of applying the CE are shown [60], in addition to the need to improve resource efficiency in the cement industry [59]. In the aluminium industry improvements due to implementing the CE are analysed [61,62]. Iron and steel require a greater commitment in terms of the CE, especially if the huge quantity of resources and energy used and the contamination generated are taken into account [63,64].

China was also shown to predominate in the third category, "Design or policy analysis", with 46% of the publications. The research topics in this category refer mainly to correctly implementing CE policies, their durability, evolution and possible evaluation, and government actions such as tax policy applications and regional incentives.

In the articles on China several studies were found [65,66] on implementing a pilot area with the CE and designing a "green" fiscal policy as the main incentive to promoting a green economy. In [67] the concept of the CE and its implementation in China are analysed, and in [68] existing obstacles are considered.

In relation to the recycling sector in China, [69,70] conclude that the main governmental means to promote the CE are tax incentives, encouraging innovation and development and its regulation.

Articles [71,72] analyse regional initiatives in China that have successfully implemented a CE and the challenges they faced in doing so (lack of incentives and financial support and poor public awareness), and they detail ways of meeting these challenges: tax reform, financial assistance and training in CE. These studies help orientate other cities or regions that aim to adopt the CE in their development model.

There is a comparative study on implementing the CE in China and the EU that determines that the Chinese perspective emerges as a response to rapid industrialisation, which has led to increased contamination, waste and use of resources [73]. In Europe, the CE falls within the field of waste and focuses mainly on companies. Although both China and the EU believe that indicators are essential, none have as yet been defined by the European Commission, so China's indicators could potentially be considered by the EU.

On analysing the articles related to the EU it was observed that there is a general analysis of the evolution of environmental policies to mitigate climate change and develop the CE [74]. Existing practices on eco-design are analysed in [75,76] and the conclusion drawn is that there is little research in this field. It is considered that eco-design directives should include more environmental aspects and focus on resource efficiency, and it is recommended that efficiency indicators be established. Within the EU, policy design and analysis were shown to focus mainly on recycling and also on its relationship with ecological design. There is no mention of European countries that have implemented CE strategies, focusing only on EU strategies. Other countries considered in these publications are Australia [77,78], South Korea [79] and Mexico [80].

As we are analysing publications in the field of economics and business management, we consider it appropriate to analyse two of the important categories in the field, "Case study" and "Indicators", which represent only 4% and 4% of the publications, respectively.

Within the category "Case Study", we find cases in both China and the EU. The cases in China research implementing CE as a solution for cleaner production and more sustainable development, providing solutions for problems of resource efficiency, recycling, emissions and seeking economic profits, mainly in the chemical industry [81–83]. However, the cases in Europe mainly focus on the problem of recycling and reusing waste, quantifying the environmental impact of the problem and seeking possible solutions focused on designing specific products and systems [84,85], as mentioned in the previous categories "Design or policy analysis" and "Sectoral application/cluster".

Analysis of the "Indicators" category showed there to be few publications. Some papers have proposed measures to know how the CE has been implemented in certain circumstances and others measure its performance or impact. China was found to be the first country to use indicators and it was concluded that they require a thorough review to include more social, commercial, symbiosis, and prevention-oriented indicators [86]. Regarding indicators applied to companies, publication [87] must be highlighted in that it proposes a practical model called "Expanding Zero Waste" to measure the results and impacts of commercial circular strategies based on reducing waste. Another article [88] proposes a scale for materials' yield to measure the contribution of a material according to the time it is in use (including restoration and recycling). However, the problem with this indicator is that it is not monetary and therefore does not reflect economic yield. An application specific to plastic waste [89] measures the efficiency of the CE by means of the different treatments applied to plastic as waste depending on its quality.

The importance of measuring circularity lies in the possibility of measuring the effects of the CE in terms of return, job creation and environmental impact. In [90] a possible measure is proposed based on the economic value of the parts of the product. In addition, considering only the environmental aspect, a set of indicators is designed to evaluate the efficiency of specific processes in the CE model (efficiency in the use of resources, waste minimization and conversion), which in this case are applied to the pig industry considering the impact of manure. Three important groups of indicators for CE are

determined: the water that provides information on the reduction of water, the biofertilizer related to the production of biofertilizer and biogas, which provides information on the reduction of natural gas consumption. Within these groups, the article details nine useful indicators to evaluate the pig manure treatment process. These types of studies are necessary to allow decision makers to evaluate the efficiency of the CE and decide to implement it [91].

3.3.2. Bioeconomy

Within the BE most publications are in the category "Design or policy analysis" (34%) with a large number of studies from the EU (76%) coinciding with the publication of its Bioeconomy Strategy in 2012.

At the European level, [92] analyses the BE from a political and conceptual perspective, highlighting the opportunities and benefits it offers. Twelve BE strategies are analysed for Europe in general and Sweden, Germany, Finland, Belgium and Holland, specifically, showing that there is a common direction based mainly on research and technological innovation. Also highlighted is the role played at the regional level to foster collaboration between industry and research organisations. Moreover, developing new markets and adopting biological products is considered paramount for the BE to expand. To this end, government participation is recommended to encourage the consumption of biological products and to raise consumer awareness [9]. Continuing to focus on Europe, [93] analyses the current situation of the BE, the challenges facing the European Commission, and future steps it should consider when revising strategy, emphasising the agri-food, chemical, forestry and sea-based sectors, and continuous investment in research.

The importance of policies that promote a positive impact on the BE is emphasised [94], as is the urgent need to take the economic, social and environmental dimensions of the BE into equal consideration [1].

Different countries' strategies were also analysed. For countries in southern Europe (Spain, Portugal, Italy, Greece and Cyprus), it is proposed that politicians, industry and key players take 10 critical steps to develop a BE and to effectively end the economic crises in these countries [95]. In Germany the current BE situation is analysed with reference to wood and biofuels [96,97].

In Finland there is a study that shows how they focuses on forestry policies and highlights the importance of this sector for developing the BE in this country [98]. Spain is one of the EU countries that has published a BE strategy (2016), the main aim of which is to maintain the BE as an essential part of the economy, placing particular emphasis on research, development and innovation in the area, and public-private collaboration [99].

In [6] BE strategies in the EU, the USA, Canada, Sweden, Finland, Germany and Australia are compared, underlining the need for further research and development and highlighting successful cases of BE as a means of promotion. Environmental and social aspects and the availability of resources are addressed to a limited extent in most strategies.

In the case of Asia, only one publication, related to Malaysia and its BE implementation policy (2012), was found [100]. It must be pointed out that although the United States also implemented a strategic BE in 2012, an insignificant number of studies were carried out on this subject in this country.

Last, in Latin America two publications analysed the possible adoption of BE principles, emphasising the need for more research, innovation and investment in the area [101,102].

The category "Sectoral application/cluster" accounts for 15% of the publications. Studies applied to agri-food, forestry and bio refineries in Europe (67%) predominate. At the European level the transition towards the BE is analysed for the cellulose and paper industry, considering the strategic alliances between sectors and the role of policy and regulations as key elements [103]. In the UK the need for further research into bioproducts and related industries was detected [104]. In the case of Holland, the focus is on the use of biomass for producing bioenergy and biochemicals, and the macroeconomic impact in the medium-term is analysed using a computable general equilibrium model and an energy system model. The results show that an increase in the use of biofuels raises GDP and

added value [105]. Research in Germany also focuses on biorefining and highlights the need to foster integration and coordination through specific policies [106]. In Sweden, the forestry sector is analysed, reviewing policies to direct it towards a BE [107]. Biogas production is also researched and the need to research biorefineries is recognised [108].

Twelve percent of the publications are in the category "Case Study". Remarkably, 78% of these correspond to Europe and are mainly examples applied to the agri-food sector [109,110] and forestry [111,112].

Within the agro-industry sector organic waste is studied, confirming that its use leads to both lower costs and less environmental impact [113].

In Finland, the BE is most evident in forestry. Socio-economic impacts (employment and income) are analysed showing positive results which could be improved further if new concepts related to the BE are fostered, thus generating new economic activity [111]. Citizen participation in BE decisions to achieve a more collaborative approach is also analysed [114].

In Brazil, the potential of biomass from sugar cane is studied, identifying its uses and applications and demonstrating that it is a viable alternative to fossil fuels. The need to invest in innovation, promote collaboration between the private sector and research institutions and implement policies to stimulate investment is also established [115].

Last, only 4% of the articles were related to "Indicators", all published in 2017. In [116] measurement methodologies are analysed and three focus points are determined. The most traditional is to approach the BE as part of GDP and to estimate employment rates. Another focus is to measure the proportion of the bio part of products and services of the BE. A third focus is to take the BE as omnipresent and not associate it with specific sectors. However, other impacts must be considered when measuring the BE: reducing carbon emissions and improving water, soil and biodiversity, health and well-being. In light of this point, the first two approaches would be incomplete while the third, which would be the most suitable, is extremely demanding. It is concluded that measurements of the BE are still in the early stages and pose a real challenge for the future.

In the EU, one of the methods found to measure the BE is based on detecting which sectors are either totally or partially related to it and then calculating the income, added value and employment generated by those sectors. Where sectors are partially bioeconomic, a calculation methodology is established to estimate the proportion based on experts' opinion. This analysis is fundamental for developing BE strategies in other EU countries [117].

Another article focuses on analysing the connections between bioeconomy sectors and the rest of the EU economy by using the linear SAM (Social Accounting Matrix) model, using tables specially designed for the BE sector (Bio SAM). The goal is to identify the key sectors potentially related to the BE, which are then considered when formulating policies and taking decisions. The results demonstrate that the BE has not yet reached its full potential in affecting production and creating employment [118].

3.3.3. Green Economy

The three most important categories are "Design or policy analysis", "Sectoral application/cluster" and "Management Styles", representing 34%, 15% and 9% of the publications, respectively. The first category mainly considers the GE as a global requirement and investigates the role of government and policy implementation and strategies to achieve the transition to the GE and meet the established sustainable development objectives. The emphasis is on the importance of creating green jobs for an improved labour market. Analysing these publications by country, Asia stands out with almost 50% of its publications from China and also from Malaysia.

In the case of Asia, in [119] the role of tax instruments in the transition to a GE is analysed, concluding that these measures are being adopted very slowly, which is not helping the transition process. Powerful measures are needed, such as a carbon tax or a tax on natural resources extraction, to boost government income to incentivise the transition to a GE, invest in research, develop cleaner energies, finance ecological projects, and so on.

In China, the GE model was addressed later than in other countries, although transition has been rapid due to the government adopting the GE as the national development strategy [120]. Its implementation has reduced pressure on the environment and promoted more sustainable industrial development. However, in order to obtain more reliable data, a unified system of indicators [121] must be studied in greater depth. As for existing taxation in China, current laws do not use tax as a tool to prevent or reduce contamination and emissions. For this reason [122] states the need for tax reform with a view to green taxes, the income from which would be used to promote a greener economy.

Malaysia is well on the way to a GE [123], promoting investment in energy efficiency, reutilisation, recycling, training, and innovation in technology and materials. However, there needs to be greater focus on subjects related to the financing, regulation and control of the market to promote the GE in smaller enterprises [124] and to raise general awareness [125].

In Europe, the importance of government intervention to ease the transition to a GE by means of regulation, public investment and contracting, incentives and monitoring is clearly established. The publications mainly focus on incentives to improve natural capital and social equity [126]. The energy sector is seen as the most important to reduce gas emissions and promote renewable energy sources [127]. Given the aforementioned importance of green jobs, several articles affirm that integrating this idea into national policies is essential to moving towards a greener economy [127–130].

In the case of Russia the necessary move from a "brown" to a "green" economy requires more investment in technology, government involvement via legal and economic measures that promote and force public and private enterprises to move towards a more efficient and environmentally-friendly economy, and indicators to measure economic development and social and environmental factors [131]. A study carried out in Switzerland analyses energy efficiency as the cornerstone for a transition to a GE with positive results for GDP and employment [132].

There were also some articles from Africa [133–135], America [136,137] and Australia [138]. Other research relates the GE to developing countries [139–142] where green growth can potentially transform the economy and alleviate poverty. However, this must go hand in hand with suitable policies [140].

There were fewer publications in the category "Sectoral/Cluster application" (15%). They are from different geographical regions and they focus on the strategies and initiatives that can potentially be taken in different sectors. In [143] it is shown that green initiatives taken by textile companies have a positive effect on competitiveness at the international level due to reduced costs. In the case of the agro-industry sector, implementing the GE at a logistic level is examined with the aim of reducing production and environmental costs, and raising its profile in society [144].

Energy is another important sector in this category. The case of India, whose main source of energy is thermal, which emits many greenhouse gases, highlights the need to promote increased investment in producing clean energy and its efficient use [145]. This sector is also analysed in Russia, stressing the need for innovation, technological improvements and research in the field to be able to improve the sector and make it cleaner [146].

In third place is the category "Management Styles", which represents 9% of the publications, which are predominately studies on implementing the GE as a strategy in companies, for example proposing management models for companies that want to be "greener" and approach a more sustainable path [147,148]. Other applications found are developing a framework to evaluate and select green suppliers [149], guiding best practice to promote the GE and a model for making decisions related to ecological operations [150–152].

If we also analyse the category "Case Studies", we see that these represent only 5% of the publications, and that they are mainly applied in Europe. Many of the cases attempt to measure the economic impact of the GE, as well as the environmental and social impacts. Several publications also analyse the impact of the GE on creating green jobs [153,154].

Article [155] focuses on managing packaging waste in Portugal, analysing its economic, environmental and social impact. Environmental benefits are assessed using input-output tables for life cycle and economic impact, demonstrating a significant economic impact and employment generation.

Article [156] presents an ecological business model that encourages companies towards a GE via reducing resources and waste, and improving the quality of life, well-being and health of the community.

Article [157] focuses on analysing case studies of implementing the GE in five European countries, with the aim of pinpointing key achievements, lessons learnt and crucial factors in the success or failure of these projects. The main findings are the need for leadership, negotiation of interests between stakeholders and guaranteeing continued finance.

Last, when analysing the category "Indicators", which represents just 5% of the publications, articles that analyse the use of indicators to consider the impact of the GE on job creation, indicators of measurement of progress, resource efficiency and economic and environmental indicators must be highlighted.

Considering the importance given to green jobs, research in Romania [158] using sustainability indicators has shown that these have increased and concludes that efforts must continue to be made to maximize the job-creating potential of the green sector.

Regarding sustainability assessment indicators, in [159] a methodology is established which allows companies to assess growth towards a GE, including indicators for economic transformation, progress, well-being, and resource efficiency.

Another proposed methodology to assess the level of GE applied to Rio de Janeiro is to use partial indicators representative of the economic, social and environmental aspects of the most important sectors [160].

Evaluating GE performance has also been applied to cities in China, considering economic growth and protection of the environment and resources. The results show that most cities have performed inefficiently [161].

Implementing "green econometric models" is recommended to assess energy consumption in production process, in conjunction with other sustainable environmental and economic impact criteria [162].

4. Discussion

4.1. Evolution and Geographical Distribution of Publications

The concepts green economy, circular economy and bioeconomy came into being between the 1970s and the 1990s. However, it was not until the beginning of 2004 that they became popular in the field of economics. In the case of the CE, the number of publications on this topic has increased considerably since 2009, and, based on our analysis of geographical origin, China was shown to be the country where more authors have published on the topic of the CE, influenced by the 2008 passing of a National Circular Economy Law. Following the approval of the EU Action Plan on the circular economy in 2015 [28], publications have also increased considerably and are expected to continue growing in these countries.

As for the BE and the GE, the European Union is the area where most publications have come from, but if we consider single countries the USA is in first position. The increase in publications on the BE from 2013 onwards can be attributed to the publication of the European Bioeconomy Strategy and the US National Bioeconomy Plan, both in 2012. It must be pointed out that although the United States also implemented a strategic BE in 2012, the number of studies carried out in this country is not significant. It is believed that more BE strategies should be implemented and analysed in the United States, Asia and Latin America.

Regarding the GE, the increase stems from 2011 when the United Nations Program "Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication" was launched. It is

worth noting that when performing this geographical distribution analysis the information we obtain is skewed towards developed countries, who may appear more active academically in Scopus [10].

4.2. Interrelation of the Three Concepts

The joint analysis of the three subjects shows that despite certain differences the common goal is achieving sustainable development. On analysing the overlap between them, 11 articles were found, mainly from the last year of analysis. The results suggest that the concept of GE can be taken as a more general concept, considering that both the BE and the CE are components of the GE, while the CE is the most concrete concept of the three. It could be said that the CE is not complete without an adequate BE that addresses, for example, organic waste from agriculture and forestry.

The analysis of the literature shows the evolution of the concepts, noting that the substantial increase of articles has occurred for the GE since 2011. Nevertheless, it is not until 2015 that the articles on CE and BE become more frequent, highlighting mainly those related to the CE.

If we consider the last years, we observe a new paradigm shift, which initially focused on a GE in a general way, then focused on waste and the CE and, finally, considered biological resources through the BE. Because of this, since 2017, the CE and the BE have begun to be treated jointly as the circular bioeconomy. For this reason, in October 2018, the European Commission published the update of the European Bioeconomy Strategy: "A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment" where it involves both concepts and whose objective is to develop a sustainable and circular bioeconomy that serves society, the environment and the economy of Europe [163]. Also in the same year, the "Andalusian Strategy of Circular Bioeconomy" [164] was published in Spain.

In addition, on the other hand, the importance of focusing on the blue economy and the blue bioeconomy to consider the seas and oceans has been emphasized, but so far there has not been much research work.

This literature review has evidenced the close relationship between the three concepts and their interdependency in maximizing their social, economic and environmental impacts to achieve the goal of a more sustainable world [21]. Currently it can be said that the development of bioeconomy, circular economy and also blue economy policies will contribute significantly to world-scale objectives related to climate change, sustainable development, resource efficiency, waste recycling, and increased economic growth and job opportunities [165].

4.3. Analysis of Trends in Publications

Trends in publications point to researchers' recent growing interest in the three concepts, evidenced mainly by publications in the categories "Design or policy analysis", "Management Styles" and "Sectoral/Cluster application". In turn, debating the results of the categories "Case Study" and "Indicators" is fundamental in these fields.

4.3.1. Design or Policy Analysis

"Design or policy analysis" is the most analysed category in terms of all three subjects, with a 24% share of the publications. The existing literature is rich in studies and analyses of implemented policies related to countries where the strategies have been published, in particular in China and in member states of the European Union.

In order to understand them, it is important to consider the articles that analyze and compare the developed strategies. The CE predominates in China and the EU, analyzing, for example, the different strategy approaches, the driving factors and the barriers in their implementation [73,166]. In particular, China is one of the countries that focuses most on the CE, having already implemented it in pilot cities, which serve as a benchmark for others. The CE strategy promoted in China, the "Circular Economy Promotion Law" (2008), covers issues of pollution, waste and resources, while that published by the EU, "Closing the Loop—An Action Plan for the Circular Economy" (2015), has a smaller focus on

waste and resources and its application to businesses. CE policy in China is undoubtedly the most analyzed in the articles [67,68,167]. However, no publications on CE policies have been found in European countries.

The EU is more focused on the BE, coinciding with the publication of its Bioeconomy Strategy in 2012, which mainly affects promoting research and innovation. Although it is known that currently, at the global level, there are several specific or related BE published strategies, this review has identified analyses of countries' strategies: Germany [96], Finland [98], Spain [99], and Malaysia [100], which were promoted in 2013, 2014, 2016 and 2012, respectively. For the countries of southern Europe, a recommended action plan is established to encourage the BE in order to improve its economy and help recovery from the crisis [95]. The articles that analyze BE's policies show us that the focus is on Europe, thanks to the BE strategy "Innovating for Sustainable Growth: A Bioeconomy for Europe" (2012). The studies analyzed offer an overview of the BE in Europe, describe its development, the current situation, the challenges and the need to improve in the future [1,9,92,93,168]. However, different BE policies are also analyzed worldwide (EU, USA, Canada, Sweden, Finland, Germany and Australia) [6], demonstrating that all agree in focusing mainly on the improvement of the economy and employment, missing a deepening focus on sustainability aspects and availability of resources, as well as in the development of adequate instruments to measure progress.

The GE has a far more global focus, but the investigations stand out mainly in Asia [119], and particularly in China [120,121,169] and Malaysia [123,124]. The articles analyzed show us that GE policies are not usually based on a specific policy, but are often composed of a group of policies that deal with several issues related to the environment. With the exception of China and Malaysia, no specific research on GE policies in other countries has been identified.

In this category, the need for government intervention through regulatory and fiscal policies that incentivise implementing sustainable growth models is highlighted. Analysing policies highlights the need for financing and investment to implement these models. The publications in all three areas also show that there needs to be more research, development and innovation and that public awareness of environmental issues needs to be raised, which requires government financial support and intervention.

Focusing on these subjects means addressing new products and markets, which governments must regulate and promote. Specific legislation is needed to guide and motivate sectors wishing to incorporate these economic models, and to serve as a means to help the transition towards a more sustainable and ecological economy.

The three economic paradigms also highlight the lack of suitable indicators that consider social and environmental factors as well as economic growth. They suggest the need for government intervention to implement standardised data collection methods and provide reliable instruments to measure results. Furthermore, they underline the need for liaison between academics, the private sector, society and the government to work towards achieving the United Nations Sustainable Development Goals and other global policies related to the environment, such as the COP21 Paris Agreement and the Kyoto Protocol.

4.3.2. Management Styles

"Management styles" represents 11% of the publications and these are mainly in the field of the CE, focusing at the micro and meso levels applied in China and the EU.

The articles analysed in this category focus on managing at a business and industry level and incorporating these models, which is why there are a large number of articles that analyse possible CE, GE or BE strategies, seeking new business models that can potentially generate economic, social and environmental benefits for businesses. These models are analysed and applied in different sectors, principally eco-industrial parks, electronics and the food industry. There are some proposals for practical guidelines for correctly implementing models, decision-making and later analysis. Their main

contribution is motivational, but they also prepare and facilitate the transition of businesses that are seeking cleaner and more sustainable production.

4.3.3. Sectoral Application/Cluster

This category represents 14% of the publications and the results show that the main application of the CE in China is in eco-industrial parks, focusing mainly on the economic and environmental benefits. Only one study was found for eco-industrial parks in the EU, demonstrating that China is at a more advanced level of implementation regarding the CE thanks to its 2008 strategy, while the European Union did not launch theirs until 2015.

Both the BE and the GE focus on the food industry, forestry and energy, analysing the economic scope and looking for more sustainability, economic growth, added value, productivity and competitiveness.

These studies are important as they can be used as references for constructing and managing new business models, formulating relevant policies and motivating companies to implement them. The publications analysed in this category also stress the importance of government intervention to motivate businesses and coordinate with the private sector and society, and the need for greater investment to encourage research centred on practical methodological aspects to apply to each sector.

4.3.4. Case Study

These represent only represent 6% of the publications and are mainly in Europe and China. For the GE, the studies analysed focus on the impact of creating green jobs, although there are also cases that analyse the social, environmental and economic impact and the application of business models backed by the GE.

For the BE, the cases are centred on the food industry and forestry, mainly analysing possible alternative applications with a lower environmental impact and cost.

For the CE, cases applied in China are more comprehensive, considering the overall impact environmentally, economically and socially, while cases applied in Europe mainly focus on the environmental impact of recycling and waste.

The analysis of the case studies confirms the conclusions drawn in the other categories, for example, the need for financing and investment for their implementation, more research, and more cases implemented that promote the transition and allow for obtaining better economic results and higher employment.

4.3.5. Indicators

"Indicators" represents 4% of the publications, which corroborates the conclusion of the category on analysing policies in the sense that they are very few in number.

In the case of the CE, the indicators analysed focus on measuring its implementation and evolution. However, no publications were found in this category that analyse the social and economic impact of CE implementation.

The GE is the area that focuses most on developing and implementing indicators that consider the economic, social and environmental impacts, placing great emphasis on analysing the creation of green jobs.

The BE, despite very little research found on indicators, has attempted a mainly economic analysis of its implementation, but this is not reliable as there are no suitable databases available.

As can be seen, there is still a long way to go in terms of measurement. For the three fields, the scarcity of publications and their analysis determine the need for a thorough revision of existing indicators and the development of new ones that can adequately measure social, economic and environmental fields globally.

5. Conclusions, Future Lines of Research and Limitations of the Study

During the last decade, the concepts BE, CE and GE and their relation to the goals directed at developing a sustainable economy have stimulated great interest at the political, academic, social and business levels. However, on analysing the literature, it was observed that none of the literature reviews examined focused on the field of economic and business management.

To this effect, a systematic literature review of the concepts BE, CE and GE in the field of economics and business management was carried out, using 449 publications selected from the Scopus database.

The CE represents 47% of these publications, followed by the GE with 37% and the BE with 16%. The importance of the topics analysed has increased remarkably in recent years. Eighty-seven per cent of the selected publications have been published since 2013 and 59% of these in the last two years, 2016 and 2017. The countries with most publications are mainly European, with the UK, Germany, Italy, Sweden, Spain and Finland leading the way, but with a significant number of publications from China and the USA.

Regarding the most important journals for the subjects studied, the first five journals in order of the number of publications are Journal of Cleaner Production; Resources, Conservation and Recycling; Quality–Access to Success; Sustainability; and, International Journal of Green Economics. Together, these represent 45% of the publications.

The results show that the three concepts vary in their geographical distribution. The CE predominates in China and the EU. The BE leads in Europe but has little impact in Asia and the USA. The GE has a far more global focus. These results are largely due to the different public policies implemented by respective governments. The political documents show us that there are several strategies focused on these issues in many countries, therefore, this analysis leads us to the conclusion that it is still necessary to continue with the studies and comparisons of these at the academic level.

An added value of this article is the categorization by themes, obtaining 17 categories. This analysis allows us to identify "Design or policy analysis" as the most prominent topic, represented by 24% of the publications and included within the three most important categories of each concept. In second place is the category "Sectoral application/cluster" with 14% of the publications. Next, is the category "Management Styles" represented by 11% of the publications, particularly on the CE and the GE.

This analysis has allowed us to identify publications related to implemented policies, strategies, case studies and the business models of companies that seek a more sustainable path. This fact is significant, since the exploration of these topics, as well as government regulations and policies, will help organisations see where new opportunities lie, evaluate the impact of implementing them and move towards objectives to approach a more sustainable system. However, when carrying out this categorisation it was seen that there is still a long way to go in terms of business implementation and evaluation of the economic measurement of the impacts. Clear examples are the few works on case studies and indicators found. For these reasons sectorial applications and case studies must be investigated in greater depth, as must the analysis of their socioeconomic impact.

If the aim is progress in achieving sustainable development goals, the concepts mentioned, which propose solutions to produce more cleanly without generating waste or gas emissions using materials and resources efficiently and respecting nature, must not only be known but also applied. For this, these concepts should be disseminated and business decision-makers encouraged to focus on applying GE approaches, such as the CE and the BE.

Several publications conclude that greater collaboration is required amongst academics, companies and government. In Europe there are currently two platforms developed by the European Commission that aim to exchange, interact and share knowledge and information in a "virtual meeting place" for stakeholders across Europe. These platforms are the Bioeconomy Knowledge Centre and the European Circular Economy Stakeholder Platform. It is hoped that these can help disseminate science on these issues, as well as unify concepts and methodologies that can be applied to implement and

evaluate them. Nonetheless, we are also convinced that this review is a great contribution because it will serve as encouragement and a guide for researchers interested in selecting articles.

In view of the results obtained, we consider that a future line of research is to look for different measures to help entrepreneurs to implement cleaner production, minimising emissions and simultaneously raising competitiveness. Moreover, another future line could be to better analyse the most appropriate indicators and to establish homogeneous database criteria to be applied in different situations and countries. This would allow for accurately evaluating the different strategies promoted.

As concluded, coordination between all stakeholders is essential. For this reason, another line of research could be to find the most appropriate way to disseminate this theoretical knowledge, to promote the exchange of information between companies and to describe experiences from different parts of the world and varied institutions to broaden knowledge and increase collaboration on the studied topics. In particular, it would be interesting to analyse the corporate information of those companies that incorporate new management strategies related to these issues, to motivate and encourage other companies to take these models as references.

Considering the BE as the topic with the fewest publications related to this field, most of which refer to the European Union, we believe that future research could focus on studying the BE in the field of economics, considering both Asian countries that are applying policies or strategies and America.

We have observed that the term blue economy has emerged to complement the concept of green economy, with the goal of managing the oceans. Within this concept we also find blue bioeconomy, based on the part of the blue economy that uses renewable biological resources from the sea, for example, fish, seaweed and microorganisms to produce food, materials and energy. Both are recent concepts in the academic literature, but given the importance of the seas and oceans, a future line of research should be to analyse these concepts and their inter-relationships in greater depth.

Finally, several limitations of our work need to be considered. The first is the use of just one database (Scopus), although we justify this because it contains more publications and journals than the Web of Science and includes different, useful tools for more detailed descriptive analyses. Second, the categorisation proposed here took mainly academic articles and books or book chapters into account, but there are also contributions published in the form of reports and other types of documents. Moreover, the researcher's subjective evaluation of the articles when determining the areas and their classification must be considered. Furthermore, as only the most important categories have been analysed in depth not all the articles of the literature review have been cited. They are, however, classified in detailed in Appendix A.

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Appendix A

Table A1. Publications on the CE by categories.

Categories	Journals	Authors/Year of Publication
Design or policy analysis	Asian Business and Management	Mathews et al., 2011
	Asian Social Science	Sun 2013
	Comparative Economic Research	Wysokińska 2016
	Handbook of Contemporary China	Lee et al., 2011
	International Journal of Production Economics	Liu et al., 2012
	Journal of Cleaner Production	Silva et al., 2015; Aguiñaga et al., 2016; Dalhammar et al., 2016; Tsiliyannis et al., 2016; Golev and Corder 2016; Bundgaard et al., 2017; Guo et al., 2017
	Journal of Industrial Ecology	McDowall et al., 2017
	Journal of Material Cycles and Waste Management	Yong 2017
	Marine Policy	Raubenheimer and McIlgorm, A. 2017
	Resources Conservation And Recycling	Mo et al., 2009; Wübbeke and Heroth 2014; Manomaivibool and Hong 2014; Jiménez-Rivero and García-Navarro 2017; Ranta et al., 2017; Jiao and Boons 2017; Cobo et al., 2017;
	Taking Stock of Industrial Ecology	Hill 2015
	Waste Management	Geng et al., 2009
	Journal of Wuhan University of Technology	Zhu 2006
Sectorial application/ cluster	Environmental Engineering and Management Journal	Bartolacci et al., 2017
	Journal of Industrial Ecology	Chen et al., 2012; Pagotto and Halog 2016; Zink et al., 2017
	Science of the Total Environment	Noya et al., 2017
	Waste Management	Salemdeeb et al., 2016
	Environment, Development and Sustainability	Zhao et al., 2017
	International Economics and Economic Policy	Winning et al., 2017
	International Journal of Production Economics	Nasir et al., 2017

Table A1. *Cont.*

Categories	Journals	Authors/Year of Publication
	Journal of Advanced Research in Law and Economics	Beccarello and Di Foggia 2016
	Journal Of Cleaner Production	Shi et al., 2010; Hu et al., 2011; Dong et al., 2013; Yu et al., 2014; Ma et al., 2014; Guo et al., 2016; Supino et al., 2016; Zhao and Guo 2017; Han et al., 2017; Wang et al., 2017
	Resources Conservation And Recycling	Liu and Bai 2014; Krystofik et al., 2017; Saidani et al., 2017; Aid et al., 2017; Hu et al., 2017; Zhang et al., 2011
Case study	Journal Of Cleaner Production	Li and Ma 2015; Ma et al., 2015; Richter and Koppejan 2016; De los Rios and Charnley 2017; Deviatkin et al., 2017
	Resources Conservation And Recycling	Liu et al., 2017; Krystofik and Gaustad 2017
	Taking Stock of Industrial Ecology	McIntyre and Ortiz 2015
	Thunderbird International Business Review	Rattalino 2017
Consumer behaviour	Business Strategy and the Environment	Hazen et al., 2017
	Futures	Hobson and Lynch 2016
	Journal Of Cleaner Production	Liu et al., 2009; Miliute-Plepiene and Plepys 2015; Van Weelden et al., 2016; Mondéjar-Jiménez et al., 2016; Zorpas et al., 2016; Gu et al., 2017; Guo et al., 2017; Mugge et al., 2017; Atlason et al., 2017
	Resources Conservation And Recycling	Xue et al., 2010; Favot et al., 2017; Zhong and Pearce 2018

Table A1. *Cont.*

Categories	Journals	Authors/Year of Publication
SMEs/family businesses	Journal of Industrial Engineering and Management	Ormazabal et al., 2016
	Business History	Norris 2017
	Journal Of Cleaner Production	Franco 2017
	Resources Conservation And Recycling	Singh et al., 2017
	Sustainability (Switzerland)	Zamfir et al., 2017; Rizos et al., 2016
	Thunderbird International Business Review	Goyal et al., 2016
Management Styles	Journal of Economic Policy Reform	Yujing and Huihuang 2007
	Environmental Engineering and Management Journal	Gnoni et al., 2017
	GAIA	Wieser 2016
	Journal Of Cleaner Production	Park et al., 2010; Abu-Ghunmi et al., 2016; Kuznetsova et al., 2016; Iacovidou et al., 2017; Urbinati et al., 2017; Zhou et al., 2017; Parajuly and Wenzel 2017; Densley Tingley et al., 2017; Tecchio et al., 2017; De Almeida et al., 2017; Busch et al., 2017; Zeng et al., 2017; Jiménez-Rivero and García-Navarro 2018
	Journal of industrial ecology	Zhu et al., 2011; Niero et al., 2017
	Logistics and Supply Chain Innovation: Bridging the Gap between Theory and Practice	Zijm and Klumpp 2015
	Procedia Environmental Science, Engineering and Management	Albino and Fraccascia 2015; Fraccascia et al., 2016
	Progress in Industrial Ecology	Strebel and Posch 2004
	Resources Conservation And Recycling	Wen et al., 2007; Maaß and Grundmann 2016; Viani et al., 2016; Ng et al., 2016; Witjes and Lozano 2016; Kuisma and Kahiluoto 2017; Whalen et al., 2017; Martín Gómez et al., 2017; Kane et al., 2017; Li and Hu 2017; Huang et al., 2018; Gómez et al., 2017; Kane et al., 2017
	Sustainability (Switzerland)	Jurgilevich et al., 2016
	Technological Forecasting and Social Change	Despeisse et al., 2017

Table A1. *Cont.*

Categories	Journals	Authors/Year of Publication
Corporate Social Responsibility	Corporate Social Responsibility and Environmental Management	Kuo et al., 2012
	Environment, Development and Sustainability	Kopnina 2017
	Futures	Mathews 2011
	Journal of Cleaner Production	Sihvonen and Partanen 2017; Weissbrod and Bocken 2017
Product design	Industrial Marketing Management	Spring and Araujo 2017
	International Journal of Production Research	van Loon et al., 2017
	Journal Of Cleaner Production	Bakker et al., 2014; Smol et al., 2015; Sabaghi et al., 2015; Ferreiro-Cabello et al., 2016; Singh and Ordoñez 2016; Sommerhuber et al., 2016; Ziyani et al., 2017
	Resources Conservation And Recycling	Vanegas et al., 2017; Akanbi et al., 2018
Education	Journal Of Cleaner Production	Kılkış 2018
	Journal of industrial ecology	Geng et al., 2009
	Local Economy	Andrews 2015
	Resources Conservation And Recycling	Whalen et al., 2017
	Taking Stock of Industrial Ecology	Chertow and Park 2015
Life cycle assessment	International Journal of Product Lifecycle Management	Portillo-Barco and Charnley 2015
	Journal Of Cleaner Production	Deviatkin et al., 2016; Low et al., 2016; Cooper et al., 2017; Cong et al., 2017; Daddi et al., 2017; Oldfield et al., 2017; Oldfield et al., 2018
	Journal of industrial ecology	Mattila et al., 2012; Hass et al., 2015
	Marine Policy	Gilbert et al., 2017
	Omega (United Kingdom)	Genovese et al., 2017
	Resources Conservation And Recycling	Sommerhuber et al., 2017; Miatto et al., 2017; Pauliuk et al., 2017; Lausselet et al., 2017; Zeng et al., 2017
	Taking Stock of Industrial Ecology	Stahel and Clift 2015; Moriguchi and Hashimoto 2015

Table A1. *Cont.*

Categories	Journals	Authors/Year of Publication
Indicators	Journal Of Cleaner Production	Geng et al., 2012; Franklin-Johnson et al., 2016; Adibi et al., 2017; Veleva et al., 2017
	Journal of Industrial Ecology	Linder et al., 2017
	Resources Conservation And Recycling	Huysman et al., 2017; Di Maio et al., 2017
Innovation	Business Strategy and the Environment	Linder and Williander 2017
	Foresight and STI Governance	Hojnik et al., 2017
	International Economics and Economic Policy	Kemp et al., 2017
	Journal Of Cleaner Production	Matus et al., 2012; Scheel 2016; Novais et al., 2017
	The Automobile Revolution: Towards a New Electro-Mobility Paradigm	Fournier 2016
	The Handbook of Service Innovation	Roos and Agarwal 2015
	Vlakna a Textil	Aneja et al., 2016
Theoretical/ conceptual framework	Environment, Development and Sustainability	Kopnina 2015; Koop and van Leeuwen 2017
	Innovation	Balasescu and Seguin 2017
	International Journal of Innovation and Sustainable Development	Webster 2007
	Journal of Business Ethics	Murray et al., 2017
	Journal Of Cleaner Production	Fischer and Pascucci 2017; Iacovidou et al., 2017
	Journal of industrial ecology	Chertow and Ehrenfeld 2012; Yuan et al., 2016
	Prakseologia	Qiao 2013
	Resources Conservation And Recycling	Kirchherr et al., 2017
	Systems Research and Behavioral Science	Chen 2009
	Technological Forecasting and Social Change	Jabbour et al., 2017
	Thunderbird International Business Review	Esposito et al., 2017
	WSEAS Transactions on Business and Economics	Kralj et al., 2017

Table A1. *Cont.*

Categories	Journals	Authors/Year of Publication
Others	Bio-based and Applied Economics	Vollar et al., 2016
	Journal Of Cleaner Production	Cohen and Muñoz 2016; Mohamed Sultan et al., 2017
	Resources Conservation And Recycling	Machacek et al., 2015; Steuer et al., 2018
	Technology in Society	Fox 2016
Literature review	International Journal of Operations and Production Management	Smart et al., 2017
	International Journal of Technology Management and Sustainable Development	Barrie et al., 2017
	Journal Of Cleaner Production	Su et al., 2013; Jiao and Boons 2014; Ghisellini et al., 2016; Lieder and Rashid 2016; Geissdoerfer et al., 2017; Elia et al., 2017; Pomponi and Moncaster 2017; Saavedra et al., 2018
	Organization and Environment	Walls and Paquin 2015
	Renewable and Sustainable Energy Reviews	Winans et al., 2017
	Resources Conservation And Recycling	Burlakovs et al., 2017
	Sustainability (Switzerland)	Lewandowski 2016; Masi et al., 2017
Tourism	Aestimum	Girard and Nocca 2017
	Quality—Access to Success	Giurea et al., 2017

Table A2. Publications on the BE by categories.

Categories	Journals	Authors/Year of Publication
Design or policy analysis	Academy of Strategic Management Journal	Kasatovaa et al., 2016
	Agricultural Economics (United Kingdom)	Swinnen and Weersink 2013; Zilberman et al., 2013
	Foresight	Grebenyuk and Ravin 2017
	Forest Policy and Economics	Kröger and Raitio 2017
	Futures	Sisto et al., 2016
	German Journal of Agricultural Economics	Zilberman et al., 2015; Pannicke et al., 2015; Puttkammer and Grethe 2015
	Intelligent Systems in Accounting, Finance and Management	Jaffé 2015
	Journal Of Cleaner Production	Ramcilovic-Suominen and Pülzl 2016; Blumberga et al., 2016; Koukios et al., 2016.
	Journal of Commercial Biotechnology	Kamal and Dir 2015
	Law and Agroecology: A Transdisciplinary Dialogue	Koukios 2015
	New Biotechnology	Sasson and Malpica 2018; Bell et al., 2018; Lainez et al., 2018; Patermann and Aguilar 2018
	New Medit	Padella and Finco 2009
	Sustainability (Switzerland)	Staffas et al., 2013; McCormick and Kautto 2013; De Besi and McCormick 2015.
	Technology Analysis and Strategic Management	Wield 2013
	Technology in Society	Arancibia 2013
Sectorial application/ cluster	Biofuels, Bioproducts and Biorefining	Jenkins 2008
	Biomass and Bioenergy	van Meijl et al., 2018
	AgBioForum	McFadden and Miranowski 2016
	Economic Development Quarterly	Low and Isserman 2009
	Forest Policy and Economics	Johansson 2016
	Futures	Toppinen et al., 2017
	Global Bioethanol: Evolution, Risks, and Uncertainties	Araújo 2016
	International Business Management	Tatuev et al., 2016
	Journal Of Cleaner Production	Hagman et al., 2016; Giurca and Späth 2017
	Technological and Institutional Innovations for Marginalized Smallholders in Agricultural Development	Virchow et al., 2016
Case study	Environment, Development and Sustainability	Lehtonen and Okkonen 2013; Ravera et al., 2014
	Forest Policy and Economics	Heinonen et al., 2017
	International Journal of Innovation and Technology Management	Golembiewski et al., 2015
	Journal Of Cleaner Production	Pergola et al., 2016; Scheiterle et al., 2016; Mustalahti 2017
	Journal of Commercial Biotechnology	Harvey 2010
	Science and Engineering Ethics	Vochozka et al., 2017

Table A2. *Cont.*

Categories	Journals	Authors/Year of Publication
Corporate Social Responsibility	Forest Policy and Economics	Pätäri et al., 2017
SMEs/family businesses	New Biotechnology Journal of Commercial Biotechnology New Biotechnology	Egea et al., 2018 Festel et al., 2012 Mengal et al., 2018
Management Styles	Journal Of Cleaner Production Science Technology and Human Values	Aquilani et al., 2016 Birch 2017
Education	International Journal of Innovation Management Journal of Commercial Biotechnology	Festel 2015 Festel and Rittershaus 2014
Indicators	Annual Review of Resource Economics Bio-based and Applied Economics Sustainability (Switzerland)	Wesseler and Von Braun 2017 Ronzon et al., 2017 Fuentes-Saguar et al., 2017
Innovation	Journal Of Cleaner Production Journal of the Knowledge Economy Science Technology and Human Values Technology in Society	Egelyng et al., 2016; Purkus et al., 2016 Grundel and Dahlström 2016 Morrison and Cornips 2012 Reis-Castro and Hendrickx 2013
Investment	Biofuels, Bioproducts and Biorefining Journal of Commercial Biotechnology	Abbati de Assis et al., 2017 Festel and Rammer 2015
Theoretical/ conceptual framework	AgBioForum Agricultural Economics (United Kingdom) International Food and Agribusiness Management Review Quality—Access to Success Science Technology and Human Values	Zilberman and Kim 2011 Swinnen and Riera 2013 Boehlje and Bröring 2011 Bran 2017 Birch and Tyfield 2013; Goven and Pavone 2015
Literature review	Sustainability (Switzerland) Journal Of Cleaner Production	Pfau et al., 2014; Bugge et al., 2016 D'Amato et al., 2017
Tourism	Journal Of Cleaner Production Journal of Enterprising Communities	Balata and Tola 2016 Turner et al., 2012

Table A3. Publications on the GE by categories.

Categories	Journals	Authors/Year of Publication
Design or policy analysis	Actual Problems of Economics	Nekos and Soloshych 2014; Dziura 2016
	Applied Energy	Yushchenko and Patel 2016
	Asian Social Science	Bassi et al., 2014
	Capital and Class	Holgersen and Warlenius 2016
	Cities	Ahmad et al., 2013
	Comparative Economic Research	Wysokińska 2013
	Economic Development Quarterly	Harper-Anderson 2012
	Economy and Society	Janković and Bowman 2014
	Economy of Regions	Bobylev et al., 2015
	Energy Economics	Schmalensee 2012
	Environmental and Resource Economics	Gronwald et al., 2017
	Espacios	Apsalyamova et al., 2017
	Futures	Dulal et al., 2015
	Globalizations	Goodman and Salleh 2013
	International Environmental Agreements: Politics, Law and Economics	Bratman 2014; McAfee 2016; Pickering and Mitchell 2017
	International Journal of Ecological Economics and Statistics	Onyusheva et al., 2017; Patlasov and Zharov 2017
	International Journal of Economics and Financial Issues	Dovgot'Ko et al., 2016
	International Journal of Energy Economics and Policy	Abdullah et al., 2017; Bakar et al., 2017; Matraeva et al., 2017; Akinyemi et al., 2017
	International Journal of Green Economics	Yang 2009; Newton 2011; Chichilnisky 2011; Islam et al., 2012; Saidmamatov et al., 2014; Kerckhoven et al., 2015; Megwai et al., 2016
	International Journal of Technology and Globalisation	Schmitz 2015
	Journal Of Cleaner Production	Granek 2011; Puppim De Oliveira et al., 2013; Droste et al., 2016; Chen et al., 2017; Guillen-Royo et al., 2017; Weber and Cabras 2018
	Law and Development Review	Tania 2013
	Local Economy	James and Cato 2014
	Progress in Industrial Ecology	Zenchanka and Korshuk 2015; Folcut and Grigore 2016; Zaharia 2016
	Quality—Access to Success	Ciobanu and Velciu 2011; Ciobanu et al., 2014; Boboc et al., 2015
	Resource and Energy Economics	Barbier 2016
	Review of International Political Economy	Brand and Wissen 2013
	Scandinavian Journal of Economics	Goeschl and Perino 2017

Table A3. *Cont.*

Categories	Journals	Authors/Year of Publication
	Simulation and Gaming	Bassi et al., 2015
	South African Journal of Economic and Management Sciences	Ettmayr and Lloyd 2017
	Technological Forecasting and Social Change	Musango et al., 2014
	Technology Analysis and Strategic Management	Steward 2012
	Transformations in Business and Economics	Rakauskiene and Okuneviciute-Neverauskiene 2015
	World Development	Never and Betz 2014
Sectorial application/ clusters	Applied Energy	Li and Lin 2017
	Academy of Strategic Management Journal	Apsalyamova et al., 2017
	Ecological Economics	Caparrós et al., 2017
	Espacios	Dudin et al., 2017
	Forest Policy and Economics	Kalonga and Kulindwa 2017; Kröger 2017
	Green Economic Structures in Modern Business and Society	Guz and Ivolga 2015; Lescheva and Ivolga 2015
	Green in Software Engineering	Calero and Piattini 2015
	International Business Management	Kundius et al., 2016
	International Journal of Economic Research	Dudin et al., 2016
	International Journal of Energy Economics and Policy	Dudin et al., 2017; Dudin et al., 2017
	International Journal of Green Economics	Sultan 2013
	International Journal of Technology and Globalisation	Kumar and Sinha 2014
	Journal of Environmental Economics and Management	Walls et al., 2017
	Journal of Cleaner Production	Hurmekoski et al., 2017
	Marine Policy	Christiansen 2017
	Review of International Political Economy	DiMuzio 2012
	Sustainable Technologies, Policies, and Constraints in the Green Economy	Jean-Vasile 2013; Filipović et al., 2013; Jean-Vasile et al., 2013
	Technology Analysis and Strategic Management	Kedron and Bagchi-Sen 2017
	Technological Forecasting and Social Change	Gouvea et al., 2013
	World Development	Montefrio and Dressle 2016
Case study	Ecological Economics	Watson et al., 2016
	International Journal of Green Economics	Aryal et al., 2015
	Journal Of Cleaner Production	Pitkänen et al., 2016
	New Technology, Work and Employment	Bozkurt and Stowell 2016
	Quality—Access to Success	Verde 2015; Selvaggi 2017; Ciobanu et al., 2017
	Resources Conservation And Recycling	Ferrão et al., 2014

Table A3. *Cont.*

Categories	Journals	Authors/Year of Publication
Consumer behaviour	Business Strategy and the Environment	Mustonen et al., 2016 and Hinnen et al., 2017
	Ecological Economics	Bauwens et al., 2017; Yadav and Pathak 2017
	International Journal of Green Economics	Widihasta 2013; Pratiwi 2013; Taufique et al., 2014
	Journal of Policy Modeling	Garces-Voisenat and Mukherjee 2016
	Journal of Promotion Management	Bresciani et al., 2016
Management Styles	Actual Problems of Economics	Bryzhan 2016
	Business Strategy and the Environment	Perez-Valls et al., 2016
	Contributions to Economics	Melikhov et al., 2017
	Ecological Economics	Elliott and Lindley 2017
	Economic Modelling	Carfi and Schilirò 2012
	Journal Of Cleaner Production	Lorek and Spangenberg 2014; McCormick et al., 2016; Aiello et al., 2016
	Quality—Access to Success	Andreica et al., 2014
	Resources Conservation And Recycling	Carvalho et al., 2017; Shen et al., 2017
	Review of Radical Political Economics	Kenis and Lievens 2016
	Sustainability (Switzerland)	Zhang et al., 2016; Guo et al.,2017
SMEs/family businesses	Resource and Energy Economics	Cecere and Mazzanti 2017
	Industry and Innovation	Muscio et al., 2017
Corporate Social Responsibility	Ecological Economics	Maggioni and Santangelo 2017
	Progress in Industrial Ecology	Touny and Shusha 2015
	Quality-Access to Success	Viola et al., 2013; Bran et al., 2013
	Sustainability Accounting, Management and Policy Journal	Weber 2017
Education	Journal Of Cleaner Production	Leire et al., 2016
	Problems and Perspectives in Management	Nhamo 2014; Ahmad et al., 2015
	Progress in Industrial Ecology	Angheluță 2016
	Quality—Access to Success	Angheluţă 2016
Indicators	Journal Of Cleaner Production	Houshyar et al., 2015
	Environmental Economics and Policy Studies	Endriana et al., 2015
	International Journal of Social Economics	Lane 2011
	Journal Of Applied Economic Sciences	Markina and Sharkova 2014
	Progress in Industrial Ecology	Aceleanu 2015
	Social and Economic Studies	Moore et al., 2015
	Sustainability (Switzerland)	Li and Lin 2016
	Technological Forecasting and Social Change	Valle and Clímaco 2015

Table A3. *Cont.*

Categories	Journals	Authors/Year of Publication
Innovation	Ecological Economics	Antonioli and Mazzanti 2017
	Economics and Sociology	Urbaniec 2015
	Industry and Innovation	Faria and Andersen 2017
	Journal of Economic Geography	Davies and Mullin 2011
	Quality—Access to Success	Chapple et al., 2011
	Technological Forecasting and Social Change	Mazzanti and Rizzo 2017; Faria and Andersen 2017
Investment	Journal of Economic Issues	Warnecke 2015
	Quality—Access to Success	Dobre and Boboc 2013
Theoretical/ conceptual framework	Futures	Vazquez-Brust et al., 2014
	Prague Economic Papers	Kasztelan 2017
	Quality—Access to Success	Bran 2011 y 2013; Curea 2011; Bran 2013; Ciobotaru and Anghelută 2014
	Small Business Economics	Demirel et al., 2017
Others	Quality—Access to Success	Antonescu 2014
	GAIA	Wäger 2011
	International Journal of Green Economics	Kennet 2009; Bruyeré and Filiberto 2013
	Transitions to Sustainability	Lopes 2015
Literature review	International Environmental Agreements: Politics, Law and Economics	Ehresman and Okereke 2014
	Journal Of Cleaner Production	Loiseau et al., 2016
	Technology in Society	Tariq et al., 2017
Tourism	Bridging Tourism Theory and Practice	DeLacy and Lipman 2010
	Journal Of Cleaner Production	Law et al., 2013
	Journal of Internet Banking and Commerce	Dzhusibalieva et al., 2016
	Journal of Sustainable Tourism	Law et al., 2012 y 2017
	Tourism Geographies	Duffy 2015
	Tourism Recreation Research	Holden 2013 y 2015

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