Revista AMBIENTE & SOCIEDADE

SciELO

Re-thinking the Academic Role in the Circular Economy Discourse

Giovanna del Pilar Garzón Cortés [I]
Krystle Danitza González Velandia [II]
Helmut Espinosa Garcia [III]
Camilo Torres Sanabria [IV]

[I] *Universidad Santo Tomás, Bogotá, Colombia.*

[II] *Corporación Universitaria Minuto de Dios, Bogotá, Colombia.*

[III] *Universidad Distrital Francisco José de Caldas, Bogotá, Colombia.*

[IV] *Universidad de Bogotá Jorge Tadeo Lozano, Bogotá, Colombia.*

Abstract: The article discusses the debate that calls the academy and the generation of scientific production to contribute to the substantial contributions of public policy from the areas of the Circular Economy - CE, especially for industrial sectors that have a high economic and environmental impact. The bibliometric review (30 years) allows arguing the limitations in the contributions to face the challenges posed by the Sustainable Development Goals (SDGs) from the regulation and political instrumentation. The results show investigative biases in the institutional order of the food packaging industry that has massified production towards the consumption of single-use glasses (SUG). The discussion states that the generation of knowledge should re-evaluate social responsibility without bias in thematic trends. Finally, it is proposed that academic contributions should focus on the review of incentives for efficient production that minimizes the massive consumption of materials.

***Keywords*:** Circular economy (CE); sustainable production and consumption; single-use glasses (SUG); comprehensiveness in the CE.

São Paulo. Vol. 24, 2021

Original Article

DOI: http://dx.doi.org/10.1590/1809-4422asoc20200046r1vu2021L2AO

All the contents of this journal, except where otherwise noted, is licensed under a Creative Commons Atribution License.

Introduction

Hygiene and health standards have had a relevant impact on the intensive use of materials, water and energy, guaranteeing the quality of food products and market derivatives, whose production logic challenges the supply system with demanding processes in the supply chains of supply of raw materials. This historical tendency of intensive dependence has unleashed production models of economies oriented to the extraction of natural resources and inefficient disposal of waste (1). In this way, different essential elements of the industry are designed for single-use and in a massive way; such as single-use disposable cups (SUC). Massification generated from production to consumption, complicating industrial challenges and the discourse of responsibility towards society, despite transferring its inefficiencies to the consumer by externalizing costs in the final disposal of the constant flow of materials. In the case of mass SUC in the food industry, they have made with a representative variety of materials or mixtures, which start from virgin materials manufactured with multiple sizes with multiple purposes for single-use (2). These essential mass-use elements are referred to in the literature as single-use or disposable disposables (3), being disposed of in the short term in open dumps, in sanitary landfills or other means unbalance the environment (3) (4), leaving out any possibility of applying actions to achieve their use or efficiency in their re-circularization (5).

In context, these types of industries make the comprehensive management of supply and consumption chains more challenging for today's competitive world; limiting actions, goals and indicators framed in the Sustainable Development Goals (SDG - Goal 12: responsible consumption). Also, the global problem of mass consumption is imposed, referring to the demographic discourse (4), such as the population increase conditioning consumption that affects the proliferation of inefficient processes of human activity. In contrast, these industrial challenges are growing sharply in a short time, but at the same time sustainable, inclusive and innovative, seeking clear information with product traceability that encourages the efficient disposal and re-circulation of materials (6).

This problem leads to the question: What has been the role of academic and scientific contributions with the current global challenges that call for the sustainability of production and consumption? This article reviews and analyzes metrics that describe the academical contribution or high-impact scientific studies historically recorded in different databases. The current results obtained from the applied bibliometric method, part of the hypothesis of the existence of thematic biases in the areas of knowledge published from the theoretical framework of the Circular Economy (CE), in effect, does not contribute substantially to the resolution of the global problem of massification of SUC, without contributing more to its production and the externalization of costs to the consumer. This contribution presents the role of academia and scientific research in normative regulation that promotes positive impact changes in the massification of single-use products in different industries or productive sectors. This article shows the limitation in academic contributions in regulatory scenarios that lead to the desired development, which should be oriented towards a political model derived from applications and concepts in CE, which achieve the goals contemplated in SDG 12.

Indeed, a call is made to the academy to develop and contribute arguments from applied sciences to promote political reconfiguration, which allows transforming the linear economic system towards a system with regulations towards CE. Thus, in the article emerge this question: What have been the contributions of the scientific community to address regulatory issues in the EC area, especially in industries highly dependent on raw materials that promote the massive consumption of SUC?. In this argument, the first part of this article sets out the context for this question within the conceptual framework that has led academic research in the last 30 years in EC. The second part summarizes the methodology used, followed by the results that demonstrate the thematic trends that occur in the academy in the CE areas and, finally, the role of scientific production which is discussed in this article in the middle of the CE discourse of sustainability.

Trends in the metrics of scientific publications

The scientific work that has been addressing the issues related to SDG 12 (sustainable and responsible production and consumption) focuses on production debates (7), (8), technological innovation (9), (10) and efficiency energy (11), highlighting the great demand for raw materials that come from raw natural resources (12), where 75% of the resulting goods end up being massively manufactured for single-use (13). In contrast to this, few academic debates can be framed in the milestones of public policy from the point of view of CE and the massification of production that is directed to consumption. In this sense, the case of academic synergy with the political regulation given in the city of Toronto (Canada) refers, which exposes an interesting vision of regulation. A city where more than a million cups of coffee are consumed per day in SUC made of multiple materials historically disposed of in landfills through planned planning for the last stage of the supply and consumption chain. In this case, the application of the own instruments that give the integrality of the CI is highlighted, focusing on the design of regulatory systems that reflect on the entry of materials to the supply chain of mass goods (e.g. SUC), minimizing the consumption and the respective final disposal (2), (4).

In contrast, in 2016, The Stand Better Cup Campaign gave evidence that more than eight thousand paper cups are wasted per minute in an inefficiently way around the world, without any regulatory framework that discourages overcrowding (14). This figure is related to the complementary generation of other elements that accompany the SUC, accumulating large quantities of food packaging filled a sanitary landfill. Some calculate measures are over 69.5 million tons per year of these materials across the world (15). It's known that the United States is among the world's largest consumers of glasses, with 130 billion glasses of the world total, which reached 220 billion tons by 2016 (16). Despite being a global problem, the largest number of scientific publications referring to CE are registered in this country, but, they focus on elements of innovation and technological development that have driven massification, with minimal contributions to the design of political regulations in production and consumption that encourages the application of CE. This last point focuses on discussion arguments of the article on the academic role

in the changes and challenges in the search for sustainability.

The production of SUC is biased to the transformation of petroleum-derived plastic materials, including the use of other materials with mixtures to produce thin covers that make it impossible to separate materials at the end of the cycle use, making their use costly and limiting the recovery of parts. The biotechnological balance to all this has brought to the food market packs made with organic materials, such as bioplastics; highly efficient material to be disposed and circulated, with significant biodegradation rates but partial decomposition, with low mass consumption due to low production scalability (17). However, when determining any option and the impact on the environment, different factors must be addressed in line with the regulation and environmental efficiencies, such as the origin of the material, its useful life, the energy used in its production, quantities of material required, technology, use, and ease to be reincorporated again in productive cycles (18) (19).

The effects caused by the dominant system of linear production (make, use and wasted) are de facto unsustainable both in terms of material flows and energy efficiency (13), which reflects the need for actions that promote the application of EC elements in the production and consumption of materials that incorporate materials for single-use and even more so if these manufactured products are for mass consumption. On the other hand, this particular industry gets the circularity concept in a non-unified way, and its seen with many approaches that limit regulatory progress to regulate market failures in massification (13) (20).

Epistemological literature starts from the dimensions of sustainable development and integrates the regulatory framework of this type of industries from the casuistic applications of CE (21), finding other configurations that start from the seven operating principles for CE, leaving behind the clarity of the normative application guidelines (20). In contrast, other contributions expose the CE from substantial variations to value and take advantage of the elements from restorative, reconstructive and renovating processes (22), which proposes the production phase as the point of intervention in the supply chain of the SUC. The literature has applied three of the seven principles that are consistent with the SDGs: i. Preserve and enhance natural capital; ii. Optimize the use of resources and iii. Promote the efficiency of the system. This last position is used in this article to categorize the scientific contributions to the regulation and normativity. Categorization proposed in this article proposes the mass regulation of SUCs from production and not from consumption, where consumption must have the optics of the circular design of materials and must be amplified from the role of scientific production in regulatory advances of the EC.

The following concept of CE is the fundamental basis and the conceptual position for this bibliometric work, which is configured from the action plan of the European Union (EU) driving by the following way: "value of products, materials and resources maintained in the economy circuit as long as possible, minimizing waste generation". This conceptual position board the answer of this research question by categorizing and measuring scientific production on CE issues, using 10 impact indicators grouped

into (4) four scenarios or phases of the supply chain: i. production and consumption, ii. waste management, iii. secondary raw materials and vi. competitiveness and innovation (23). Hand in hand with the normative frameworks developed by the United Nations (UN), in favour of the development of actions towards the mitigation of climate change that have made it possible to carry out actions to "guarantee sustainable production and consumption" (8).

The tools of the SDGs that involve the principles of CE validate the categorization proposed by bibliometrics, which highlights issues in clean production, green markets, green growth and the like, linked to the circular production system with actions that arise from the academic debate in the political construction essential to achieve changes towards sustainability (6), (24), (25), (26).

Academic contributions differ in quality guidelines driven by the CE approach, analyzing the different kinds of actors along the supply and supply chain. Chain points immersed in the analysis of academic contributions on CE issues (26), highlighting a: i. the actors that directly exploit renewable and non-renewable resources as raw materials (wood, oil, among others); ii. to the transformers of raw materials or inputs, manufacturing processes, technology providers and the production industry; iii. transport actors; iv. marketing agents; v. consumers; besides, disposition agents and institutions. The categorization of the actors involved in the supply chain (of the SUCs) makes it possible to assess the potential environmental impact generated by mass goods within the Life Cycle Assessment (LCA)[1] framework.

For the analysis of scientific contributions on CE issues, LCA should be considered throughout the supply chain of materials, evaluating manufacturing and final disposal technologies, as considered in the literature on the subject (18) (19) (17). The academic publications that address this material traceability analyze show that no process is "better" than another or leads to more efficient evaluations to design elements of policy regulation. The life cycle of materials omits the linear arrangement at each stage or phase of the chain - in other words: the linear model of production is planned to an inefficient end, even decoupling the actors from joint regulation scenarios that involve everyone. The main contributions of the LCA have served in the construction of public policy to evaluate the associated impacts on the flow of materials, as well as the behaviour of the actors during their final disposal, guiding the regulations that describe the properties that make up the traceability of the materials (25) (17) (27) (28). The EU has promoted the use of LCA to improve the environmental performance of products, stimulating regulations that allow the design of instruments that the efficient promotion use of resources, to facilitate consumer decision-making from the economic incentives that they slow down the massification of consumption, for the articulation in the dynamics of the dimensions of sustainable development (23).

1 - This methodology has carried guidelines (Environmental Management. Life Cycle assessment Requirements and guidelines - ISO 14040, 2007) and has made it possible to evaluate biophysical measures of the potential environmental impacts of a product, from the extraction of materials to the final disposal. It is based on mass and energy balance calculations to determine relevant impacts.

We can merge previous conceptual elements; thus, we can propose the production regulation of single-use materials using the novel concept defined as the integrality of CE (29). This is the result of a change in the traditional and neo-classical economic approach of the CE that turns towards the creation of incentives and economic instruments that manage production and consumption, seeking the improvement of production processes. This response to public policies that act to change socio-environmental values that are adapted to sustainable development and its objectives. This integral approach is close to the concept of dynamic efficiency from the areas of the ecological economy (30), which has emerged from advances in research and technological development, reflected in regulatory positions throughout the production chain, applying incentives and instruments that favour the re-circulation of materials and energy.

This reference frame makes it possible and identifies the application of CE concepts on normative design. This debate on scientific contributions/biases that are substantially away from CE aim is desired comprehensiveness of a regulatory framework, which leads to attacking possible reasons, interests or circumstances that may limit scientific contributions, triggering the fragmentation of information from different approaches and substantial areas of CE. Such a process requires the critical analysis of CE as an integral concept and its application in sustainability by conserving the use of resources throughout the chain, taking advantage of its potential and the possibilities of restoring or reincorporating in new uses or products or raw materials (29).

Methodology

Information source worked in this article was used to identify academic trends and the conceptual framework that guides the research and the comprehensiveness advance of CE arises from the historical review of research articles hosted in the ScienceDirect databases and Scopus repository since 1988 to 2018. The method that was developed by search categories, making use of the "reference chain" or "snowball" model (31). The focus search was in areas that address elements of the CE integrality and the relevancy for the normative design should drive regulation of the SUC industry (Table 1).

Table 1. Search in the circular economy approach and disposable or single-use cups or cups – SUC

Search words	ScienceDirect SD	Scopus SC
Production of disposable cups	6	23
Disposable cups plastic materials	3	26
Types of disposable cups	8	22

Reduction of disposable cups	2	16
Reuse disposable cups	3	4
Recycling disposable cups	3	13
Recycling in the manufacture of disposable cups and circular economy	19	Does not apply
Total	44	104

Source: Own elaboration, 2020.

Table 1 consolidates 148 articles, categorized by the search words that meet the (3) three principles of CE and the (4) four dimensions of sustainable development (environmental, social, economic and political). In this work, 67 articles were selected in relevant content, for the design of regulatory instruments through the clear trend (32). This addressed relevant results from their contributions to the regulatory design. This made it possible to carry out the following search categories in a 30-year spectrum that in one way or another relates to the food industry, finding 1541 interactions between scientific documents and the proposed categories that address issues of CE comprehensiveness in:

1. A horizontal analysis (23 subcategories proposed in this article) of the publications related to SUC for the industry, allowed to organize the thematic content according to the comprehensiveness of the CE. The environmental dimension in academic production was established, based on nine relational subcategories that are oriented to avoid the production and commercialization of the mixture and combination of materials (EMyMM), which limits their circulation in the system; the use of recovered materials (AMR); the use of renewable resources (URR); the development of appropriate technologies and optimization of materials (TAOM); sustainable energy applications and energy self-supply (ESA); incorporation in other processes and lower consumption of virgin raw material (MCMV); reduction in the generation of Greenhouse Gases with a lower carbon footprint (HC); minimal toxicity (MT) and waste reduction Zero waste (BC). For the social dimension, four relational categories were established: Change in consumer behaviour (CCC); Innovation and Entrepreneurship (IE); Increased cognitive development workforce (IFL); improvement in public health and risk reduction (RR). In the economic dimension, there were six categories as follows: Greenmarkets and job creation (MVGE); Lower cost of production (MCP); Competitiveness preferred markets (CMP); Incentives to reduce emissions (IRE); Reduction of negative externalities (REN); waste treatment costs (TR). From the political-institutional dimension, four categories were defined, which are: natural capital conservation strategies (CCN); Low Carbon Development and Climate Change Adaptation and Mitigation (DBC); Prevention and attention to public health (PASP); and Sustainable production and consumption (PCS). These 23 subcategories proposed in this article organize the 1541 documents from the possible regulatory instruments addressed by category (horizontal analysis), which was qualified in their dimensional relationships with the support of the Scoring model (33).

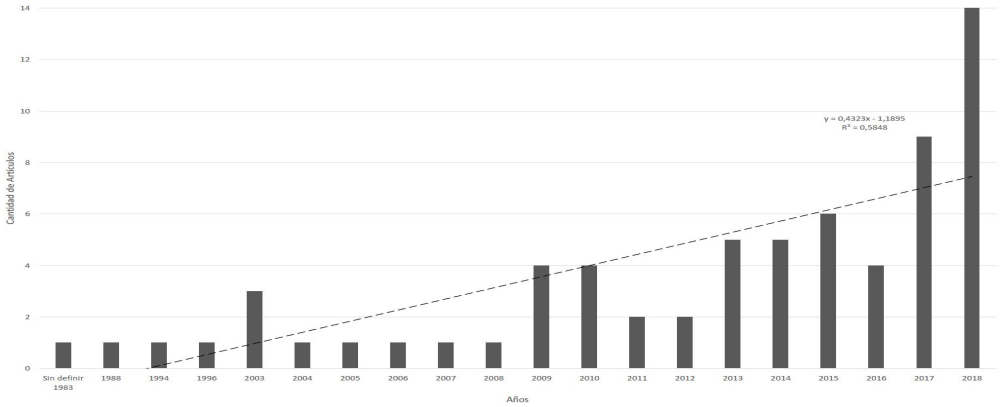
2. The development of a comparative analysis model that makes it possible to relate the categories inherent to the comprehensiveness of CE with each of the dimensions and principles proposed by the European Union in the framework of CE monitoring (23). The analysis structure related the CE principles with (9) nine categories that are contained in the (4) four dimensions of sustainable development defined by the SDGs, which validated the proposal of 23 subcategories that would allow evaluating the academic contribution in the political guidelines provided by the CE within the EU framework (vertical analysis).

We proceeded to establish the temporal trend of the publications that call SUC as mass products in the food industry, parallel, the geographical tracking of the origin of the academic publications was carried out, which allowed observing the global preference of the academic production on these areas through the development of a trend map. As a result of the geospatial information, a matrix with double-entry as a tool that identifies scientific production by country and by category (Microsoft 3D Maps). The result is heavily weighted in favour of the network geographical diagram of academic interest, which shows responses of homogeneity or not, in the trends of academic production in the area of CE. Finally, with the results obtained, we can infer those trends that allow identifying possible gaps or research bias far to the normative design, which is an important point to be discussed in this article.

Results

In general terms, the historical trend in the publication on issues related to CE, which address the intervention of mass products in the food industry (e.g. SUC), indicates a continuous growth in the decade (1987-2018), finding that in In the last two years, the disclosure of results related to the CS of SUC increased significantly (82%), however, this does not give the particularity in the participation in the issues of regulation, normativity or institutionality clearly and explicitly, or the production that addresses the concept of the integrality of the CE concept (Figure 1).

Figure 1 - Articles related to EC and SUC for the databases of Scopus and Science Direct period 1988 -2018.

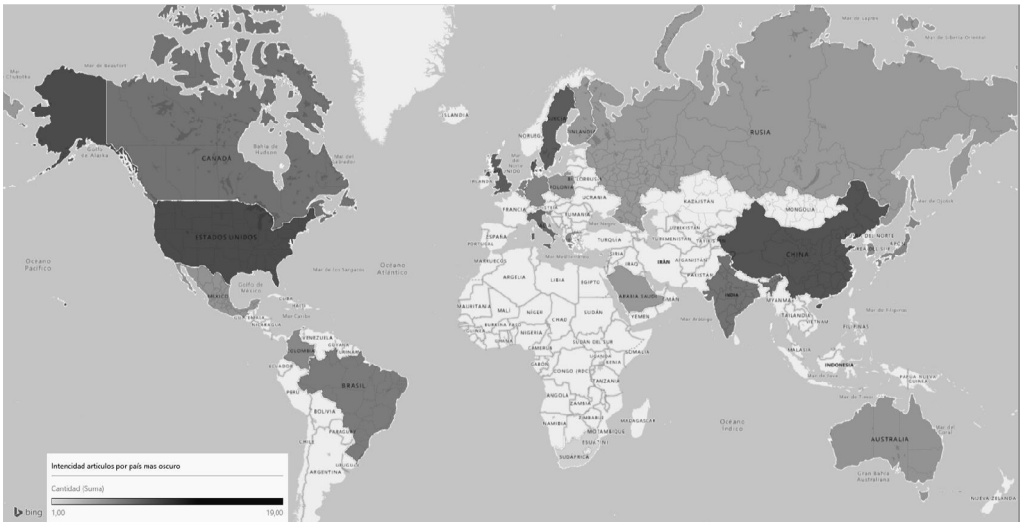


Source: Own elaboration, 2020. ScienceDirect and Scopus databases. Number and years of publication of articles related to SUCs and CE applications.

Figure 1 shows the analysis in the first decade of study (1987-1998), at which time 7% of the publications related to the analysis of the life cycle of SUCs were developed. It is important to remember that in this decade actions were developed worldwide such as the Kyoto Protocol (34), the United Nations Framework Convention for Climate Change - UNFCCC (35), among other international treaties and conventions of high relevance in the global environmental management. In the second decade of analysis (1999-2008), 12% of publications were registered, with a significant increase for 2003. A relevant moment in the development of the Conferences of the Parties (COP) of the UNFCCC and the promulgation of the objectives of the Millennium, which fostered growth in research activity. In the third decade (2009-2018) the increase in articles was important, with records reaching 81%, especially on issues related to scientific debates that addressed regulatory actions to address the loss of forest cover, water pollution and the effects on ecosystems due to the disposal of solid waste.

The trend line presents a positive slope that indicates the incremental variation of academic production for each year, that is, there is a trend of growth of research that contributes elements in the design or implementation of policies from the concepts of CE (the annual increase has been 40.3% for each article produced in the previous year). Additionally, the relationship between research production and geographical origin varies throughout the world; in Europe, 49% of scientific production has been generated in this thematic area, followed by the United States of America with 28% (Figure 2).

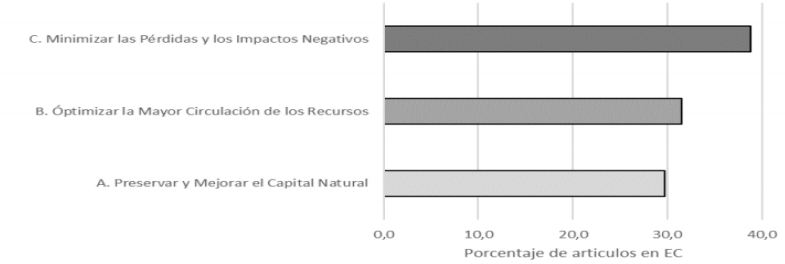
Figure 2 - Geographical distribution in the academic production of articles related to CE and SUC



Source: Own elaboration, 2020. Production of articles of new knowledge in EC by country of origin and continent. Made using Microsoft 3D Maps.

Thus, the geographical trends show a heterogeneous and unbalanced pattern on each continent where contributions of scientific production in Europe are more relevant to the areas surrounding the concept of comprehensiveness of CE, addressing relevant elements for political debates or regulations, industrial development, and international socio-environmental commitments. In some way, the European continent should be considered a pioneer in the first contributions on these issues, without ignoring the progress of Latin America and the regulatory achievements that have been taking place in China, especially in the last decade. The thematic grouping that is most closely with the concept of comprehensiveness of CE, from the 23 sub-categories in the vertical analysis, is represented in Figure 3. The distribution of the scientific production of articles concerning the three (3) principles of CE.

Figure 3 - Academic production in the principles of CE on issues related to SUC

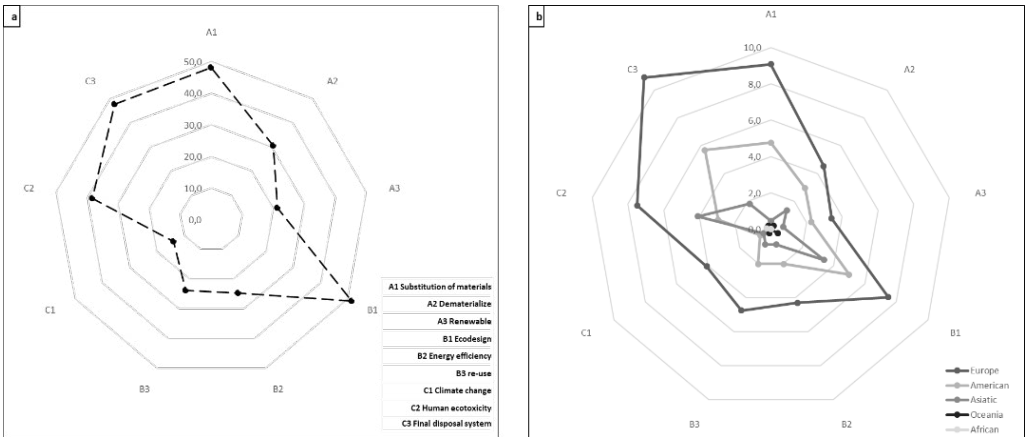


Source: Own elaboration, 2020. ScienceDirect and Scopus databases. Grouping by categories by the principles of CE in the framework of the EU (30 years of publication of articles).

The previous figure presents the distribution of articles in the (3) three principles of CE, where the most relevant topics in the publications are: (A1) Substitution of materials; (A2) dematerialization; Renewable Resources (A3); Ecodesign (B1); energy efficiency (B2); reuse of materials (B3); Climate change (C1); Human eco-toxicity (C2); final disposal system (C3). The results of the academic production show a trend in the development towards the category (C3) or final disposal system, with 18.6%, followed by (B1) ecodesign and (C2) the issues derived from the effects on human ecotoxicity. Globally, these results allow us to identify that academic production concentrates on issues that have driven development, innovation and technology for the massification of SUC throughout the world.

The results of the horizontal analysis show for the 23 proposed sub-categories that the environmental dimension is the one with the greatest thematic scope, with 40%, similar to the social dimension with 38% of the total number of articles published. While the economic dimension presents a record of 20% in academic contributions, and only 2% of the contribution addresses substantial elements for normative regulation and political guidelines that can serve for the implementation of solutions to the global problem -consumption irresponsible of materials of massive use in the food industry (such as SUC).

Figure 4. The trend of academic production on CE topics since the principles of CE by sub-categories (a) and by continent in each sub-category (b)



Source: Own elaboration, 2020. ScienceDirect and Scopus databases. Matrix analysis of CE principles of the EC (a) and (b).

This content distribution can be analyzed in the network diagram, both in part (a) and in part (b), differentiating the concentration on topics that are far from the concept of the integrality of the CE that goes to the balance in the proportion of the publications that are organized in each of these sub-categories (Figure 4), that is, a more symmetric distribution would be expected in the diagram, which is not evidenced by sub-categories or in the different geographical areas. In the last 30 years, there has been no scientific knowledge that contributes in a balanced way (comprehensiveness) in the key issues in CE that address normative scenarios to growing problems, such as the massive consumption of SUC.

Discussion

The evaluation of the scientific production in the applied subjects of the CE that go towards the intervention of global objectives shows a deficiency in the integrality of key subjects to approach and propose normative scenarios. The reason is that academic production in EC is characterized by the lack of homogeneity in the academic contributions that can provide support to the regulatory framework of supply chains that demand high amounts of raw materials (such as SUC), and that, also, they are massed from production to market. According to the results of this article, academic production is concentrated in a few of the sub-categories that give comprehensiveness to CE. The academic generation that goes towards the demand in the innovation of materials that require high levels of raw materials, which often supply economic sectors that have a high impact on the final disposal of materials, to be used only once. The results show a great tendency to produce academic contributions that go towards the development of strategies that measure

stroke, with the greatest contributions in the areas relevant to group C (climate change, ecotoxicity and disposal). However, the greatest trend by sub-category is concentrated in academic production that proposes actions of eco-design, innovation and substitution of materials (areas of interest for the industry that tends to massify products). This leads us to think about the academic bias towards these topics of interest to publishers and the purposes they pursue in the search for impacts on bibliographic metrics with citation indicators - a discourse that goes against the academic contributions that allow reaching from the overall goals and purposes of the SDGs.

Here is evidenced by the differentiated trend in the use of CE principles for academic production that intends to address relevant issues for a regulatory framework throughout the supply chain of SUC. Whose interpretation identifies the need to produce thematic analyzes that detail the traceability in the handling of materials and the integral management of solid waste with each of the actors involved. This review of the sources of publications that concentrate and group in a large proportion study on CD-related topics are characterized by having a high indexing impact (16% of the total of the most cited articles in this area are published in the magazines Waste Management and Journal Clean Production of the Hindawi and Elsevier publishers, respectively). These journals show a distributed trend in stroke-oriented publications, distancing their arguments in debates that move away from the comprehensiveness of CD, which is a common pattern in 32 more journals. Need to promote areas of intervention to the most relevant and challenging social problems for the political framework that requires the application of sustainable and inclusive models (22).

This calls on the academy to reduce biases in the production of themes in "box office" areas for publishers (and their corporate sponsors) seeking to increase metrics in their indexing. We find this posture of academic bias linked to the need to strengthen the level of the economic well-being of business sectors that has a great contribution to the national accounts that are represented in the Gross Domestic Product (GDP), increasing investments in scientific research in these areas of CE that are of interest to these productive actors in the chain, which has increased the various particular benefits that have marked the trend of topics in some countries, such as academic production in the innovation of materials and technical applications of the in the USA and China (32). The relevant country in the generation of excessively massive goods that are directed towards the consumer market in large quantities (36).

This calls on the academy to reduce biases in the production of themes in "box office" areas for publishers (and their corporate sponsors) seeking to increase metrics in their indexing. We find this posture of academic bias linked to the need to strengthen the level of the economic well-being of business sectors that has a great contribution to the national accounts that are represented in the GDP, increasing investments in scientific research in these areas of CE that are of interest to these productive actors in the chain, which has increased the various particular benefits that have marked the trend of topics in some countries, such as academic production in the innovation of materials and technical applications of the in the USA and China (32). The relevant countries in

the generation of excessively massive goods that are that which are directed towards the consumer market in large quantities (36).

Some academic positions expose that economic growth and contributions in science, technology and innovation (STI) may be affected by actions of corruption (32), further skewing academic progress in structural areas of regulation for crucial issues in society and Her future. This discussion that seeks the integrality of a circular economic model, transcends from the technical debate that calls for innovation in the flow of materials, water and energy from the application of EC regulation instruments, to the approach of the epistemological literature that takes LCA to the normative and regulatory plane, which has been seen in few articles, but with great success in the cases, they address. This should redefine those interests declared by companies with the greatest capacity to promote research and investment in studies aimed at LCA to stop the massification of goods and products from a single (37), being necessary to take actions to strengthen the implementation of CIs comprehensively with the objective and independent participation of academia, government and the community (38).

It is really knowns that large productive economies have greater investment capacity in research and scientific production, demanding high levels of STI based on progress in production (39). Besides, they are the countries that distribute products under the framework of trade agreements that have flooded other countries with the flow of materials that are massed in the market, leaving regulatory gaps in the handling, use and disposal of waste, increasing the volume of materials. discarded or discarded in developing countries (40). The greatest contribution of publications in CE is developed in the European Union and China, registering important numbers in the journals that have a high impact on the citation metrics. However, the academy must rethink its role of focus and studies, by articulating the issues from a comprehensive perspective (as defined in this article) as an effect and not as the reason to correct production and consumption patterns; academic contribution with the vision to act in regulatory policy scenarios that allow achieving the goals of the SDG. Thus, the academy must promote the counterweight of the actions of the political economy that transcends the spaces of academic production, and that limits its independence in the contributions, as seen in the present bibliometric case. This shows that the problem of the massification of SUC is approached as a minor issue of the CE and without importance to expand the scientific debates that propose political, academic and sustainable changes.

References

1. Barbier EB. Scarcity and Frontiers How Economies Have Developed Through Natural Resource Exploitation. Cambridge University Press; 2010. 748 p.

2. Foteinis S. How small daily choices play a huge role in climate change: The disposable paper

cup environmental bane. J Clean Prod [Internet]. 2020;255:1–8. Available from: https://doi.org/10.1016/j.jclepro.2020.120294

3. Jahani A, Dehdari T, Farzadkia M, Mansourian M. Iranian experiences in terms of consumption of disposable single- use plastics: Introduction to theoretical variables for developing environmental health promotion efforts. Environ Toxicol Pharmacol [Internet]. 2019;65(November 2018):18–22. Available from: https://doi.org/10.1016/j.etap.2018.11.004

4. Loschelder DD, Siepelmeyer H, Fischer D, Rubel JA. Dynamic norms drive sustainable consumption: Norm-based nudging helps café customers to avoid disposable to-go-cups. J Econ Psychol [Internet]. 2019;75(102146):1–13. Available from: https://doi.org/10.1016/j.joep.2019.02.002

5. Häkkinen T, Vares S. Environmental impacts of disposable cups with special focus on the effect of material choices and end of life. J Clean Prod [Internet]. 2010;18(14):1458–63. Available from: http://dx.doi.org/10.1016/j.jclepro.2010.05.005

6. Vargas González AP, Garzón-Cortés GDP. International experiences of sustainable use of disposable paper vessel. Prod y Limpia [Internet]. 2018;13(2):37–54. Available from: http://www.scielo.org.co/pdf/pml/v13n2/1909-0455-pml-13-02-00037.pdf

7. United Nations Environment Programme. The 10 Year Framework of Programmes on Sustainable Consumption and Production: Rio+20 Adopts The 10YFP. UNEP [Internet]. 2013;1–4. Available from: https://sustainabledevelopment.un.org/content/documents/944brochure10yfp.pdf

8. Herrera F, Ardila M, Gutierrez E, Herrera D. ODS en Colombia: los retos para 2030 [Internet]. PNUD, editor. PNUD. Bogotá D.C.: Grafik Multimpresos; 2018. 74 p. Available from: https://www.undp.org/content/dam/colombia/docs/ODS/undp_co_PUBL_julio_ODS_en_Colombia_los _retos_para_2030_ONU.pdf

9. Unctad. La ciencia, la tecnología y la innovación como catalizadores de los Objetivos de Desarrollo Sostenible. In: Conferencia de las Naciones Unidas sobre Comercio y Desarrrollo [Internet]. 2017. p. 1–17. Available from: https://unctad.org/meetings/es/SessionalDocuments/ciid36_ES.pdf

10. Unidas N. Cooperación Internacional para el Desarrollo que promueve la Facilitación Tecnológica y la Creación de Capacidad para la Agenda 2030 Resúmenes de las Políticas del Foro sobre Cooperación para el Desarrollo 2016 [Internet]. Vol. 2016. Nueva York; 2016. Available from:https://www.un.org/en/ecosoc/newfunct/pdf15/dcfuganda_policy_brief_tech2_es.pdf

11. Capron M. Iso 26000. Dict Crit la RSE [Internet]. 2016;1–20. Available from:https://www.iso.org/files/live/sites/isoorg/files/store/sp/PUB100401_sp.pd

12. OECD. MATERIAL RESOURCES, PRODUCTIVITY AND THE ENVIRONMENT : KEY FINDINGS Material Resources , Productivity and the Environment Key Findings [Internet]. Green Growth Papers. 2007. Available from: https://www.oecd.org/greengrowth/MATERIAL RESOURCES, PRODUCTIVITY AND THE ENVIRONMENT_key findings.pdf

13. Korhonen J, Honkasalo A, Seppälä J. Circular Economy: The Concept and its Limitations. Ecol Econ. 2018;143:37–46.

14. Jimenez E. Environmentalists target Starbucks cups in SoDo action [Internet]. The Seattle Globalist. 2016. p. 5. Available from: https://www.seattleglobalist.com/2016/07/08/starbucks--cups-recyclingstand-earth-sodo/53471

15. Geueke B, Groh K, Muncke J. Food packaging in the circular economy: Overview of chemical safety aspects for commonly used materials. J Clean Prod [Internet]. 2018;193:491–505. Available from: https://doi.org/10.1016/j.jclepro.2018.05.005

16. Larsen L. Recycling costs, participation pile up for Weber County [Internet]. Standard.Examiner. Weber; 2017 [cited 2019 Nov 20]. p. 1–4. Available from: https://www.standard.net/news/environment/recycling-costs-participation-pile-up-for-webercounty/article_6fcf3d24-262e-584e-919d-b11270f00546.html

17. Van der Harst E, Potting J. Variation in LCA results for disposable polystyrene beverage cups due to multiple data sets and modelling choices. Environ Model Softw [Internet]. 2014;51:123–35. Available from: http://dx.doi.org/10.1016/j.envsoft.2013.09.014

18. Garrido N, Del Castillo MDA. Environmental evaluation of single-use and reusable cups. Int J Life Cycle Assess. 2007;12(4):252–6.

19. Pladerer C, Meissner M, Dinkel F, Zschokke M, Dehoust G, Schüler D. Comparative Life Cycle Assessment of various Cup Systems for the Selling of Drinks at Events [Internet]. Bmlfuw. Viena; 2008. Available from: http://www.meucopoeco.com.br/environmental_study.pdf

20. Suárez-Eiroa B, Fernández E, Méndez-Martínez G, Soto-Oñate D. Operational principles of circular economy for sustainable development: Linking theory and practice. J Clean Prod. 2019;214:952–61.

21. Korhonen J, Nuur C, Feldmann A, Birkie SE. Circular economy as an essentially contested concept. J Clean Prod. 2018;175:544–52.

22. Fundación Ellen MacArthur F. Hacia Una Economía Circular: Motivos Económicos Para Una Transicion Acelerada [Internet]. Ellen MacA. Ellen MacArthur Foundation, editor. Londres: Ellen MacArthur Fundation; 2013. 21 p. Available from: https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Executive_summary_SP.pdf

23. European Commission. A monitoring framework for the circular economy. COM (2018) 29 final.16.1.2018. COM/2018/29 Final [Internet]. 2018;29(final):1–11. Available from: http://ec.europa.eu/environment/circular-economy/index_en.htm

24. Lieder M, Rashid A. Towards circular economy implementation: A comprehensive review in context of manufacturing industry. J Clean Prod [Internet]. 2016;115:36–51. Available from: http://dx.doi.org/10.1016/j.jclepro.2015.12.042

25. Vercalsteren A, Spirinckx C, Geerken T. Life cycle assessment and eco-efficiency analysis of

drinking cups used at public events. Int J Life Cycle Assess. 2010;15(2):221–30.

26. Velenturf AP&, Purnell P. Resource recovery from waste: Restoring the balance between resource scarcity and waste overload. Sustain. 2017;9 (1603)(9):1–17.

27. Van der Harst E, Potting J. A critical comparison of ten disposable cup LCAs. Environ Impact Assess Rev [Internet]. 2013;43:86–96. Available from: http://dx.doi.org/10.1016/j.eiar.2013.06.006

28. Van Buren N, Demmers M, Van der Heijden R, Witlox F. Towards a circular economy: The role of Dutch logistics industries and governments. Sustain. 2016;8(7).

29. Mativenga PT, Sultan AAM, Agwa-Ejon J, Mbohwa C. Composites in a Circular Economy: A Study of United Kingdom and South Africa. Procedia CIRP [Internet]. 2017;61:691–6. Available from: http://dx.doi.org/10.1016/j.procir.2016.11.270

30. Common M, Stagl S. Ecológical Economics, An Introducction. Reverté S. Editorial Reverté S.A., editor. Barcelona, Bogotá, Buenos Aires; Caracas y Mexico: Cambridge University Press; 2008. 40 p.

31. Geissdoerfer M, Savaget P, Bocken NMP, Hultink EJ. The Circular Economy – A new sustainability paradigm? Vol. 143, Journal of Cleaner Production. 2017. p. 757–68.

32. He B, Luo T, Huang S. Product sustainability assessment for product life cycle. J Clean Prod [Internet]. 2019;206:238–50. Available from: https://doi.org/10.1016/j.jclepro.2018.09.097

33. Ochoa JC, Galeano W, Gabriel AL. Construcción de un modelo de scoring para el otorgamiento de crédito en una entidad financiera. Perf Coyunt Económica. 2010;(16):191–222.

34. Naciones Unidas/CEPAL. Protocolo De Kyoto de la Convención Marco de las Naciones Unidas Sobre el Cambio Climático. Nac Unidas [Internet]. 1998;61702:1–25. Available from: https://unfccc.int/resource/docs/convkp/kpspan.pdf

35. Unidas N. Convención marco de las naciones unidas sobre el cambio climático. 1992;62301:1–27. Available from: https://unfccc.int/resource/docs/convkp/convsp.pdf

36. Xue B, Chen XP, Geng Y, Guo XJ, Lu CP, Zhang ZL, et al. Survey of officials' awareness on circular economy development in China: Based on municipal and county level. Resour Conserv Recycl [Internet]. 2010;54(12):1296–302. Available from: http://dx.doi.org/10.1016/j.resconrec.2010.05.010

37. Rave JP, Rodríguez CP, Manco OÚ. Uso de herramientas de mejoramiento y su incidencia en costos, fallas y factores de éxito de grandes y medianas empresas industriales del valle de aburrá. Gest Prod [Internet]. 2010;17(3):589–602. Available from: https://www-sciencedirectcom.bdigital.udistrital.edu.co/science/article/pii/S0186104215000315

38. Hanumante NC, Shastri Y, Hoadley A. Assessment of circular economy for global sustainability using an integrated model. Resour Conserv Recycl [Internet]. 2019;151(November

2018):104460. Available from: https://doi.org/10.1016/j.resconrec.2019.104460

39. Kaza S, Yao L, Bhada-Tata P and, Van Woerden F. What a waste 2.0 A global snapshots of soild wast management to 2050 [Internet]. World Bank. World Bank Group, editor. Washington D.C.: Urban Development Series; 2018. 1–295 p. Available from: https://openknowledge.worldbank.org/handle/10986/30317

40. Türkeli S, Kemp R, Huang B, Bleischwitz R, McDowall W. Circular economy scientific knowledge in the European Union and China: A bibliometric, network and survey analysis (2006–2016). J Clean Prod [Internet]. 2018;197:1244–61. Available from: https://pdf.sciencedirectassets.com/271750/1- s2.0-S0959652618X00225/1-s2.0-S0959652618317682/main.pdf?X-Amz-SecurityToken=IQoJb3JpZ2luX2VjEOb%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIEYnLBb09onkcnUjoeXoNSwQBThJDRP3zuJehyXQalkwAiEA6c2FbKdaPYbK

Giovanna del Pilas Garzón Cortés
✉ giogarzoncortes@gmail.com
ORCiD: https://orcid.org/0000-0002-9964-6009

Krystle Danitza González Velandia
✉ kgonza25@uniminuto.edu.co
ORCiD: https://orcid.org/0000-0002-6982-2569

Helmut Espinosa García
✉ hespinosa@udistrital.edu.co
ORCiD: https://orcid.org/0000-0001-9341-3995

Camilo Torres Sanabria
✉ camilo.torres@utadeo.edu.co
ORCiD: https://orcid.org/0000-0001-9935-8536

Submitted on: **05/05/2020**
Accepted on: **28/10/2020**
2021;24e:00461

How to cite: GARZÓN, G.; GONZÁLEZ, K.; ESPINOSA, H.; TORRES, C. Re-pensando el Rol Académico en la Economía Circular. . **Ambiente & Sociedade.** São Paulo, v. 24, p. 1-19, 2021.

Revista AMBIENTE & SOCIEDADE

SciELO

Repensando o Papel Acadêmico no Discurso da Economia circular

Giovanna del Pilar Garzón Cortés
Krystle Danitza González Velandia
Helmut Espinosa Garcia
Camilo Torres Sanabria

São Paulo. Vol. 24, 2021

Artigo Original

Resumo: Este artigo aborda o debate que envolve a academia e a geração de produção científica, com o objetivo de contribuir substancialmente para as políticas públicas relacionadas à Economia Circular - CE, especialmente para setores industriais de alto impacto econômico e ambiental. A revisão bibliográfica (30 anos) permite argumentar as contribuições limitadas para enfrentar os desafios colocados pelos Objetivos de Desenvolvimento Sustentável (ODS) da regulamentação e implementação de políticas. Os resultados mostram preconceitos de pesquisa institucional em relação à indústria de embalagens de alimentos, que tem copos de uso único (CSU) produzidos em massa. A discussão estabelece que a geração de conhecimento deve reavaliar a responsabilidade social sem preconceitos nas tendências temáticas. Finalmente, propõe-se que as contribuições académicas se concentrem na revisão dos incentivos para uma produção eficiente que minimize o consumo de massa de materiais.

Palavras-chave: Economia circular (CE), produção e consumo sustentáveis, copos descartáveis (CSU), integralidade em CE.

Como citar: GARZÓN, G.; GONZÁLEZ, K.; ESPINOSA, H.; TORRES, C. Re-thinking the academic role in the circular economy discourse. **Ambiente & Sociedade**. São Paulo, v. 24, p. 1-19, 2021.

DOI: http://dx.doi.org/10.1590/1809-4422asoc20200046r1vu2021L2AO

Todo o conteúdo deste periódico, exceto onde está identificado, está licenciado sob uma Licença Creative Commons.

Revista AMBIENTE & SOCIEDADE

SciELO

Re-pensando el Rol Académico en el Discurso de la Economía Circular

Giovanna del Pilar Garzón Cortés
Krystle Danitza González Velandia
Helmut Espinosa Garcia
Camilo Torres Sanabria

São Paulo. Vol. 24, 2021
Artículo original

Resumen: El artículo aborda el debate que llama a la academia y a la generación de producción científica a contribuir a los aportes sustanciales de la política pública desde las áreas de la Economía Circular – EC, especialmente para sectores industriales que tienen alto impacto económico y ambiental. La revisión bibliométrica (30 años) permite argumentar las limitaciones en los aportes para afrontar los desafíos planteados por los Objetivos de Desarrollo Sostenible (ODS) desde la regulación e instrumentación política. Los resultados evidencian sesgos investigativos en el orden institucional de la industria de empaques de alimentos que há massificado la producción hacia el consumo de vasos de único uso (VSU). La discusión plantea que la generación de conocimiento debe re-evaluar la responsabilidad social sin sesgos en la tendencias temáticas. Finalmente, se propone que los aportes académicos deben enfocarse en la revisión de incentivos para la producción eficiente que minimice el consumo masivo de materiales.

***Palabras-clave*:** Economía circular (EC); producción y consumo sostenible; vasos de único uso (VSU); integralidad en la EC.

***Como citar*:** GARZÓN, G.; GONZÁLEZ, K.; ESPINOSA, H.; TORRES, C.. Re-pensando el Rol Académico en el Discurso de la Economía Circular. **Ambiente & Sociedade**. São Paulo, v. 24, p. 1-19, 2021.

DOI: http://dx.doi.org/10.1590/1809-4422asoc20200046r1vu2021L2AO

Todo el contenido de esta revista, excepto dónde está identificado, está bajo una Licencia Creative Commons.