



The path to circularity: A literature review of its application in Latin America

El camino hacia la circularidad: una revisión de literatura sobre su aplicación en América Latina

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ABSTRACT

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Present and future generations have a great concern about environmental issues such as the increase of contamination of natural resources and the loss of plant and animal life on earth due to excessive waste and its poor management, poor production practices and consumption habits. As a result of this concern, the main purpose of this research was to present the strategies and the framework that constitute the circular economy (CE) and to consider its application in Latin America. The methodology included a literature review using Scopus and Dialnet databases, applying the key terms “Circular Economy” and “Latin America”, the selection criteria were based on language, number of citations and publication date, which resulted in a statistical sample of 62 articles and reports. After completing the literature review of CE principal concepts, implementation strategies throughout different economic levels, opportunities and disadvantages for use, the researcher was able to see the potential for a global change in the economic system. Because there are clear differences in the application of a circular economy in different regions, the researcher found that an investigation into the socio-economic conditions of any particular region would be necessary before implementing a circular business model. The researcher found that in Latin America a circular economy with a focus on regenerative agriculture and a waste management sector with a waste-to-energy focus provided a high potential for success.

Keywords: Circularity, Sustainability, Innovation, Composting, Circular Business Models.

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RESUMEN

Actualmente, nos enfrentamos a graves problemas medioambientales debido al exceso y mal manejo de los desechos, a las malas prácticas de producción y malos hábitos de consumo, esto genera una preocupación para las futuras generaciones, ya que como consecuencia se da el aumento del calentamiento global, la extinción de la vida salvaje y el deterioro de los recursos naturales. El principal objetivo de la investigación fue presentar la teoría y las estrategias detrás de la economía circular y de su aplicación en América Latina. Como metodología se aplicó una revisión de literatura, la búsqueda bibliográfica se dio en las bases de datos Scopus y Dialnet, utilizando los términos de búsqueda “Circular Economy” y “Latin America”, y los criterios de selección fueron el idioma, número de citas y fecha de publicación, resultando en 62 artículos e informes. Una vez analizado el marco conceptual y las estrategias de implementación en diferentes niveles económicos, se pudo ver una gran oportunidad de cambio para el sistema económico cuando primero se toma en cuenta las diferencias regionales para su aplicación. Como principal conclusión se encontró que para una transición circular exitosa se necesita el análisis de la situación socioeconómica de la región, por ejemplo, en América Latina se encontró que existe potencial en el manejo de residuos, enfocado a la generación de energía, así como en la creación de valor agregado en el sector agrícola.

Palabras clave: Circularidad, Sostenibilidad, Innovación, Compostaje, Modelos de Negocio Circulares.

INTRODUCTION

The deterioration of natural systems, the generation of waste, and the depletion of resources are inevitable consequences of the production processes and the obsolescence of products inherent in the linear model paradigm: extract, transform and discard (Tisserant et al., 2017). One of the objectives of circular economy (CE) is to decrease the consumption of easily replaceable goods.

The trend for this practice can in part be traced to after the Great Depression of 1929 when Bernard London (1932) introduced a theory called planned obsolescence, in which London advocated that a product's lifetime could be modified in order for the product to fail in a certain time, the theory is based on a taxation system to help the government collect money than a certain product meets the obsolete death date, nonetheless the relevance of this theory is the way it helped to change the markets dynamic. This theory did not take into consideration what would happen to these products after they were considered obsolete and therefore discarded, and that is a problem that we are facing now.

According to the United Nations Environment Programme (2021), humans are about to lose the opportunity to limit global warming to 1.5 °C and for this reason it is of the utmost importance to generate changes now. One of the great problems for the environment is what to do about the enormous amount of waste accumulating on the planet. For example, about 40 % of plastics is not accounted for in landfills or recycling sites (Schroder et al., 2020). The design of a zero-waste economy is one of the fundamental pillars of CE, with strategies that start from product design to an optimal waste management system, to maximizing the utility and value of waste.

Due to the pandemic, we've seen that a new recovery plan that it is based in a more resilient, protective, and inclusive model could be a response to the pandemic impacts because of the CE tools for restoration and regeneration. The objective of this research is to provide relevant information about the functioning of circular economy, as well as to identify principal strategies for the implementation of circular economy and to systematize these for their application in Latin America and the Caribbean.

MATERIAL AND METHODS

The research method used in this study is a systematic review of the literature on the theory and applications of CE. Based on the PRISMA 2020 statement methodology (Page et al., 2021) the bibliographic search was carried out in the Scopus and Dialnet databases, for the eligibility criteria the search was divided into two phases, the first one includes a broader study of the concepts, therefore the term "Circular Economy" was used for the search, as well as the exclusion of language discrimination and consideration of articles published within the economics research area. The search produced 1 964 articles. In the second phase, the same process was repeated adding the search term "Latin America", as this study aims to analyze the circular economy in this region. Consequently, the search yielded 95 articles and reports.

The search strategy started with a report analysis from non-profit-organizations beforehand in order to have a better criterion for the data review and maximize certainty on the evidence. The first selection process began with a total of 2 059 articles, it was based on the number of citations and the English language, which produced 200 articles. In the second process, the articles were organized in chronological order for having an easier system to analyze each documents outcome with its compatibility to this research objectives, the variables used to the data sought were based in its relevance with the Latin America region and the study of the CE as a business model for small enterprises. The result of this second filter was a selection of 62 articles for the bibliographic signing process.

The last part of the methodology was the stage of qualitative analysis of the articles selected, the synthesis method consisted in an interpretation and contextualization of the documents carried out with the Excel tool for tabulating each study methodology, objectives, discussion and conclusion, in order to build the bibliographic record.

RESULTS AND DISCUSSION

This research results are divided in two parts, the first is a conceptual framework of circular economy and the different strategies applied in business models, and the second part is about the application of a circular economy in Latin America.

Conceptual Framework of Circular Economy

The term CE may seem new, however, its basic ideas began to gain interest during the Industrial Revolution as new diversification of products and use of materials emerged. The idea of a closed loop economy was introduced in the Spaceship Earth analogy in 1966 to problematize pollution, the scarcity of resources and the dependence of the well-being of the planet on the

processing of resources (Blomsma & Brennan, 2017). Additionally, some ideas were born as a result of the waste management problem caused by the economic acceleration that occurred after the Second World War (Reike et al., 2018).

One of the most cited definitions of CE introduce it as an industrial economy that is restorative and regenerative by intention and design. The potential of CE can be seen in three dimensions: economic, environmental, and social. Its emphasis is on the importance of adding value and quality to material cycles in addition to showing the potential of sustainable production (Korhonen et al., 2018).

D'Amato et al. (2017) compares three concepts: circular economy focused on how resources are used; bioeconomy focused on what resources are used; and finally, green economy, which encompasses the two concepts with a focus on nature by promoting restoration, conservation, and sustainable management. All three represent an opportunity for a sustainable transition to better economic models and they should be considered as complementary concepts. Similarly, Geissdoerfer et al. (2017) discuss sustainability and CE, comparing their different origins, goals, motivations, responsibilities, and beneficiaries, but circularity should be seen as a necessary strategy to obtain sustainable economic results.

CE has been seen as an economic model that seeks the minimization of waste, the efficient use of resources and the retention of value over time, according to Morsetto (2020). In order to achieve a transition to CE, it is necessary to establish clear objectives so that policies and regulations can be focused on specific solutions. There are different combinations of what is known as the R's that are included in the definition of CE. Some researchers propose a framework of 3 R's, others of 4 and some even of 9 R's (Yuan et al., 2008) However, the most frequently used are the 3 R's: reduce, reuse, and recycle (Kirchherr et al., 2017). Among the most common groups of objectives of CE are the efficient application of materials, the extension of product life and the intelligent production or use of products. Each objective is based on different strategies of the 9 R's framework; Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle and Recover.

CE Implementation and Strategies

Rather than being a new method with which to maintain the status quo, CE can be seen as a systemic and fundamental innovation, which therefore would require changes in both production and consumption (Kirchherr et al., 2018). For this reason, during the time of transition and implementation, barriers and challenges would need to be met with the application of new practices.

Kirchherr et al. (2018), describe some CE barriers; the first barrier is cultural, related to the limited level of acceptance that exists on the part of consumers and workers as well as Korhonen et al., 2018 also arguments that inter and intra-organizational limitations directly related to stakeholders and consumers The second barrier is the market, relating to price competition and the lack of financing for sustainable projects. The third barrier is regulatory, including the lack of policies with conceptual frameworks that support CE, or on the contrary laws or regulations that obstruct the CE initiatives in businesses or organizations. Finally, the fourth barrier is technology that is related to the production of goods, such as machinery or the production processes themselves.

The barrier most frequently mentioned in this research is that of culture. Because culture relates to people's attitudes and knowledge about CE, the people and their communities have an important role in the CE transition (Borrello et al., 2017). Camacho-Otero et al., (2018) proposes that it is possible to motivate consumers into becoming supporters of CE. In order to do so, business models have to take into consideration factors such as personal likes and dislikes, product or service offer, understanding the experience and the perception and acceptance of its target market.

Despite the barriers mentioned above, De Jesús & Mendonça, (2018) stresses that there are also opportunities within the barriers

- Socio cultural barrier: use trends to influence consumers.
- Market barrier: use positive drivers in demand to pressure changes in supply.
- Regulatory barriers: apply enablers in legislation focused on environmental standards to redirect processes.
- Technical barriers: facilitating optimization in circular processes through technology.

In addition, the greatest ally for CE today is Industry 4.0 (I4.0), the integration of which could enable a significant improvement in the competitive capacity of CE in the marketplace. The I4.0 represents the fourth industrial revolution related with automation and computing. Rosa et al. (2020) agree that by digitizing CE, I4.0 technologies provide a galaxy of opportunities to support companies to improve their circular performance and business models. There is still no consensus on all the technologies within I4.0, however, the most frequently used are cybernetic physical systems, the Internet of Things (IoT), Big Data analysis (BDA), and Manufacturing Simulation.

Nascimento et al., (2019) as well, discusses how the practices of I4.0 can be integrated into CE within the proposals of business models, such as through recycling, the development of new products, reduction of the use of materials, and optimization of natural resources. Researchers are finding that technology can be considered a bridge rather than a barrier. Through its capacity to enhance the relationship with the consumer, digitization can be viewed as a principal driver of CE by facilitating access to research sources, enabling product-systems-services (PSS) and optimizing material flow processes (Pagoropoulos et al., 2017).

CE Application in Business Models

In discussions about implementing CE, the most cited strategy of its implementation is through a systematic direction, based on economic levels: macro, meso and micro (Kalmykova et al., 2018). The macro level has a national scale that involves cities and regions or countries, in which sustainable development is the role of governments and policies. The meso level has to do with the industrial scale, which incorporates eco-industrial parks and research and development networks. Finally, the micro level pertains to the strategies of companies, whether pertaining to a single product or service, to the organization itself or to consumer habits (Moraga et al., 2019).

Macro Level

At the end of the twentieth century, economic thought began to be more global and holistic and to create policies with an ecological conceptual framework including ideas such as reduction of waste and recycle applied to societies (Smol et al., 2017).

Economic policies and regulations are necessary in order to achieve a positive effect in a CE transition. Although there are different approaches to conceptual framework and instruments, such as top-down or bottom-up, for a transition to CE, government intervention is key to influencing the strategies applied in the industrial sector, supply chains, material flows and innovation in productive processes (Winans et al., 2017).

Meso Level

The CE actions for this level refer to production, such as the development of eco-industrial parks, industrial symbiosis networks and other productive networks. The goal is working together for the exchange of resources or by-products to achieve economic or environmental benefits (Ghisellini et al., 2016).

Eco-industrial parks function as platforms for the management of natural resources and seek to optimize the materials cycle (Lieder & Rashid, 2016). Thanks to industrial ecology (IE), CE has had some theoretical and legal contributions, as Saavedra et al., (2018) cite. Those contributions range through concepts of network synergy, industrial symbiosis, exchange of resources, by-products, and waste, and include tools for sustainable production, such as eco-design, clean production, and analysis of material flows.

Micro Level

CE requires a new mindset that helps to develop capabilities for the creation of competitive advantage and new value propositions. The adoption of CE at this level occurs within production, consumption, and waste management (Ghisellini et al., 2016).

Additionally, the goal of product design strategies is for resources to remain useful before, during and after products' useful life. Incorporating CE concepts early in the product helps to close or slow resource loops (Bocken et al., 2016). For example, a product that is in good condition, my bike, is placed in my garage for years, it has lost its useful life, but this can be solved with an exchange app, an PSS business model with use efficient strategies, with the goal of finding a person that wants to rent my bike for a period of time. With this example, we can see how a CE concept of "reuse" can help two people and the environment.

CE Strategies in Business Models

The CE approach application is increasingly common when creating sustainable businesses (Tunn et al., 2019) based on economic growth, material cost savings and employment growth (Lewandowski, 2016). One of the most common CE concept is based on circular business models that are derived from the principles of preserving and improving natural capital, optimizing the performance of resources, and promoting system efficiency, the most frequently used conceptual framework is ReSOLVE (Regenerate, Share, Optimize, Loop, Virtualize, Exchange).

The Product-Service System (PSS) approach is a highly analyzed business model that according to Micheli et al. (2017) can introduce sustainability principles with business models, apart from complying with CE business models. Nevertheless, Mendoza et al. (2017) point out that a PSS implementation requires collaboration between producers and consumers. An equally important component for a circular business model is supply chain logistics, such as, Reverse Supply Chain Management, which encompasses activities like product design and end-of-life operations management to maximize value creation. According to Genovese et al. (2017) the

supply chain can be either open-loop or closed-loop. Yadav et al., (2020) point out that the high investment cost as well as the need for good communication, logistics, and strategies limit the adoption of sustainable practices, therefore this needs to be taken into consideration before changing the supply chain management.

Nizami et al. (2017) find that waste-to-energy (WTE) supply chains seek to change the negative concept associated with garbage to one based on energy. This idea is supported by Su et al. (2013) by stating the opportunity for industries to add a new role in their operations, as “garbage collectors” or “decomposers” of their own products. However, in order to successfully apply a WTE approach, consumer responsibility is needed, therefore, green consumption would need to be encouraged through such means as campaigns that would help consumers to become familiarized with the benefits of CE.

As stated above, patterns of sustainable consumption (SC) are an important factor to consider within business models, despite their being one of the greatest challenges for companies to face. Integrating the theory of SC within the conceptual framework of business models creates the opportunity to change consumption patterns (Tunn et al., 2019). For a business model to make a successful transition, continuous monitoring and control of changes are required in the main activities of the model. Additionally, it is necessary to verify objectives and correct actions, while considering stakeholders, as well as the product life cycle and its processes (Centobelli et al., 2020).

CE in Latin America and the Caribbean

Currently, the CE approach requires specific considerations when applied in Latin America and the Caribbean (LAC). Because the region is one of the most abundant in natural resources and biodiversity in the world, a CE model is an opportunity to take advantage of the value of resources, regenerate ecosystems and strengthen renewal. In underdeveloped countries, sustainable behaviors such as reuse, repair and waste collection are born from necessity rather than environmental motivation, which provides a promising opportunity for the inclusion of CE through the formalization of the informal sectors (Salas et al., 2021). Betancourt Morales and Zartha Sossa (2020) provide an additional rationale: “It is a fact that the poorest countries are the ones that face most of the consequences of the environmental crisis” (p. 2).

According to Schröder et al. (2020), the transition towards CE in this region is focused mainly on the mining sector, waste management and bioeconomy. First, because extractive activities play an important role in the LAC economies, the scarcity of materials and the transition towards CE can promote a reduction in activities like raw materials extraction, mining is a big deal that so far, we haven't figured out how to fix because of the number of workers and communities that depend on these. Second, the fact that a high percentage of urbanization in the region means that waste management mostly depends on landfills or illegal dumps provides an opportunity for municipalities to redesign waste management systems as post-Covid recovery strategies. Third, the bioeconomy offers some opportunities within the agriculture and food sector thanks to its biodiversity, its resources, a productive type of soil, high capacity to produce diversity of food and biomass.

Challenges and Opportunities of CE in LAC

Before implementing CE, it is necessary to identify potentialities or challenges particular to the region. Challenges include the lack of research on the concepts and applications of CE. According to Cerna et al. (2019), the fact that LAC has one of the lowest levels of international participation in CE suggests the need for public investment in scientific research in that area. Structural barriers also exist in the form of lack of regulations, financing, and inventiveness when implementing circular projects, as well as lack of confidence, fulfillment, and implementation of these regulations in places that have them (Henríquez-Aravena et al., 2021).

Based on the limitations explained by Cerna et al. (2019), they propose the following condition changes for this region's principal challenges:

- Investment tax incentives in favor of circular investment proposals.
- Financing alternatives for machinery, equipment and circular processes.
- Incentive for sustainable demand through public education at all levels.
- Technology transfer for companies to improve production processes and adaptation to new technologies.
- Networks and associations in CE to generate exchange of experience and knowledge.
- Circular territories for the local development of companies and industries in the environment.
- Consumer information through information campaigns about CE benefits and opportunities.

Why should developing countries focus on environmental policies? To address high level of food, water, and energy insecurity within the context of human population growth and greenhouse gas (GHG) emissions, which constitute the most serious threats to the planet. Therefore, there is the need for support for technologies that provide economic benefits, such as waste biorefineries or energy recovery, the creation of added value, and the discovery of new business opportunities (Nizami et al., 2017).

For a transition to CE, it is essential to decarbonize LAC, which means to reduce emissions created by human activities such as the burning of fossil fuels. Therefore, it is necessary to create structural changes in consumption and production patterns to support that goal. According to Saget et al. (2020), this change can create new jobs in certain sectors, such as regenerative agriculture, construction, forestry, renewable electricity, plant-based production and manufacturing but also eliminate jobs in others like fossil fuel electricity, fossil fuel extraction and animal-based production. As we can see, this transition should be accompanied by policies that can help the reallocation of workers, support new business models and promote decent work in rural areas.

Because the creation of new jobs in these sectors does not guarantee optimal work conditions, such a transition would need to be done with the support of adequate policies and regulations. According to data from Saget et al. (2020) in the Inter-American Development Bank (IDB) study, with the right combination of strategies, work conditions and policies, there would be an opportunity to create 15 million jobs in these sectors by 2030. Betancourt Morales & Zartha Sossa (2020) agree, stating, "A change towards the circular model, in the next 5 years could

generate more than 100,000 new jobs and avoid up to 100 million tons of garbage” (p. 2). A CE implementation can offer opportunities for new economic activities and for the transition of those already existing.

Applications within the LAC Region

In recent years, the focus of CE application has been directed towards waste management is particularly suited to face many challenges, such as poor financing for sustainability projects, informal labor and lack of technology (Ferronato et al., 2019). Similarly, Hettiarachchi et al. (2018) found there to be a lack of governmental authority to enforce waste management policies besides creating bureaucratic barriers resulting in services’ inability to collect revenues.

The integration of technologies that optimize waste management and incorporate WTE systems can be done by reconfiguring the informal labor one in which methods such as biorefineries are applied to WTE processes, as well as considering the goals of sustainability through, for example, the generation of commercial products from waste (Nizami et al., 2017). However, to formalize an informal sector requires the support and monitoring capacity of governmental authority. Ferronato et al. (2019) recommend that such transition should focus on strategies to provide technical facilities and change in social behavior.

Calderón Márquez & Rutkowski, (2020) studied the rationales for waste management programs throughout the political history of Colombia, and found the following to be the leading motivations of the programs they reviewed: public health, decentralization, financial sustainability, environmental protection and free market. However, there is uncertainty about the financial sustainability of the projects, about which the researchers cited the fundamental role of the institutionalization of governmental decisions. In Costa Rica, Brenes-Peralta et al. (2020) analyzed alternatives for waste management focused on food waste (FW) and concluded that efforts should be made to optimize the usage of food inside the supply chain to be able to accurately calculate food waste in order to later recover its energy. The researchers also found that the main disadvantage of any WTE strategy was its high cost compared to that of a conventional landfill.

Finally, Vega-Quezada et al. (2017), analyzed the application of CE in Ecuador through the production of biodiesel, based on cooperation between the agricultural sector and that of the generation of energy. In other words, they investigated the feasibility of creating biogas combustion from anaerobic digestion, that could produce electricity without the need to occupy large amounts of land. As expected, it was found that although these kinds of projects have the potential to generate profitability without damaging the environment, they would require the intervention of public policies to diversify energy sources, rural development, and the food sector.

Although it is true that a large part of the focus in LAC has been on waste management, it is neither the only nor the most important aspect of CE in the area. In the agricultural sector, for example, many practices are based on industrialized processes that have caused deterioration of natural resources and for this reason, various models of regenerative agriculture that differ in methodologies within ecosystems and improve their natural resources have been proposed (Ibarra Vrska, 2019). The adoption of regenerative agriculture can reduce the use of pesticides, increase resistance to climate change and provide many ecosystem benefits. Wratten et al., (2019) suggest that these practices could be applied in Chile, where agriculture is heavily dominated by

monoculture and that the lack of scientific knowledge about ecological protocols is one of the greatest impediments in the country.

Within the context of business practices, the application of sustainability principles to supply chains presents an integration challenge and for this reason, corporate leaders with greater negotiating power should be the ones to encourage their adoption. Equally important in LAC is the implementation of industrial parks focused on cleaner production and industrial symbiosis, with the aim of integrating efficiency into their use of resources. Based on the United Nations Industrial Development Organization (2017), countries that already have pilot projects for these parks are the following: Argentina, Chile, Bolivia, Costa Rica, El Salvador, Guatemala, Paraguay and Panama, according to the Development of Industrial Parks into Sustainable Industrial Parks Guide of the United Nations Industrial Development Organization.

To achieve a CE transition, it is essential to create a change in the foundational ideas without neglecting economic growth, which means a production. In order to accomplish this change, it is necessary to consider different strategies at macro, meso and micro levels, including information education, regulations, and community commitment. This set of components have a highly important role for obtaining the established goals.

At the macro level, governments must have clear objectives and assessment methods that support both industries and communities (Winans et al., 2017), while at the meso level, industrial ecology, industrial symbiosis, Cradle-to-Cradle design principles or cleaner production are employed to improve the use of resources together with innovation in technology, machinery, management, and modernization in pollution controls (Yuan et al., 2008). Finally, at the micro level, a firm focus on business model innovation and supply chain management are needed to close material loops (Lieder & Rashid, 2016). The research cited in this literature review reveals that the main advantage of LAC is its resource abundance, which is one of the differentiating characteristics of the region compared to Europe and Asia. Similarly, UNEP (2020) confirms that this region has important resources of renewable energies such as solar irradiation, high wind regimes, tidal and geothermal energy fields, that have the potential to fulfill 22 times the electricity needed for the world economy, thereby demonstrating a clear opportunity to make a difference in the world for power generation and CE models.

With this knowledge about CE within the context of LAC, there are opportunities for investment and job creation in the region based on sustainable practices that seek to reduce carbon emissions. Given that the main sectors for CE application in LAC are mining, waste management and the bioeconomy, the region should invest in research and development to implement sustainable practices, make the most of the use of the I4.0 and reduce the cost of renewable energies (Schröder et al., 2020). Rizos et al. (2016), emphasize the challenges in implementation of circular models, barriers in demand due to uncertainty, lack of investment capital and poor knowledge of SME strategies, given that small and medium-sized enterprises represented 99 % of all companies in 2018 in LAC (Economic Commission for Latin America and the Caribbean, 2020).

How can LAC generate added value and grow economically with CE? It is here that international trade (IC) plays a fundamental role as a facilitator in the transition to CE through processes like the supply chain and waste management. Once these processes are considered profitable, the development of technology and infrastructure will become viable. Enhancing comparative advantages and access to niche markets with circularity requirements in Asia Europe

or the United States will depend on scaling optimization, technological developments, and regulatory incentives (United Nations Industrial Development Organization, 2021).

The challenge of waste management must be a priority for the governments in the LAC region. Achieving benefits in public health, environmental quality and job creation would require a level of investment in management systems, waste reduction and recycling culture in order to bring about a change into a formal waste management sector. Entrepreneurship has an important role in challenging the status quo, and it should be noted that it has greater potential with CE through innovation in business models that involve reuse, exchange, and recycling, even as they require financing aid and research networks to achieve their goals (Schröder et al., 2020).

Throughout this research, it has been noted that cultural factors can limit as well as enable; the key for having a successful transition to CE is consumer support. In the LAC region, there is a long way to go in order to achieve consumer acceptance, socialization about sustainable practices and the inclusion of consumer behavior in business models. In order to achieve a broaden knowledge about the benefits of CE, social education about the sustainable initiatives should be made available for more people. Ultimately, society has the great responsibility to learn about the advantages and disadvantages of these new economic systems, which is manifested through the power of citizens through their purchase decisions. Whenever a person wants to acquire any good, product or service, their choice reflects the business model they finance, and thus, is considered the extended responsibility of both the consumer and the producer.

CONCLUSIONS

It has been seen that CE has a set of strategies that can be applied to achieve sustainability and resource efficiency objectives. It has been shown that these ideas are not new but, in fact, some of them have been applied to linear processes since the Industrial Revolution. However, today, the aim is not to add sustainable strategies to the linear mode, but instead, to change the whole system. To this end, in the LAC region, it is essential that for a successful application of CE, both the public and private sectors need to invest in sustainability, research, innovation and technology projects, while being backed by legislation, regulations, and governmental incentives.

It has been found, for example, that regenerative agriculture would be a means to take advantage of the potential in natural resources and deliver an added value to agricultural products, but without adequate education and training about the benefits of sustainable practices, farmers would be less likely to be motivated to implement or support regenerative farming and consumers would be more likely to continue to buy from companies that apply conventional practices, their decisions largely guided by prices. Similarly, there is great potential for business innovation in waste management, PSS models and eco-design, all of which would need to go hand in hand with education, collaborative platforms, business support schemes and public purchases. For this reason, it can be said that an ecological transition is an economic transition.

Finally, this research shows that CE is an evolving economic model within economic recovery plans worldwide, which cannot be applied in the same way in all regions as each country has different strengths and weaknesses. For this reason, for the application of CE in LAC, companies, and governments need to focus on sectors like mining, bioeconomy and waste management in conjunction with government support and the application of extended

responsibility either of consumers and producers. Even though the ideas that make up CE have been practiced in limited ways for some years, many people do not recognize them and are not familiar with the benefits that result from altering linear consumption patterns towards ones of sustainability. For the future, researchers recommend the creation of spaces in which information about the workings of CE can be shared by communities and stakeholders, in order to generate environmental awareness in both producers and consumers to participate in creating a sustainable future.

AUTHORS' CONTRIBUTION

Maria Emilia Andrade Carrasco: Conceptualization, data curation, formal analysis, research, methodology, writing -original draft.

Luis Bernardo Tonon Ordoñez: Supervision, validation, resources, visualization, editing, writing-review and editing.

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The authors express that there are no conflicts of interest.

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REVIEW PROCESS

This study has been double-blind, peer-reviewed.

STATEMENT OF DATA AVAILABILITY

The data is housed together with the other files of this article, it can also be requested from the corresponding author.

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