

## Circular economy in Mexico: success stories and challenges in the face of COVID-19

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### Abstract

The objective of this research work was to analyze the development of the circular economy in Mexico in the context of COVID-19, understanding that the experience put in the spotlight the need to reconfigure the processes in the use of energy, water supply, pollution control, and production of Mexican companies. For this work, we used a qualitative methodology of the descriptive and documentary character of the economic situation of the country, so it was possible to appreciate those companies that have implemented the application of the circular economy. This analysis allowed us to discuss advancements and particular situations of the study, observing that there is a great area of opportunity derived from the circular economy applied in the Mexican territory, which led to a reflection on the growing interest in the circular economy in Mexico and in the efforts to promote it by the companies, to favor the environment and innovate in the way in which their production processes are carried out.

**Key words:** circular economy, COVID-19, environment, sustainability.



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## 1. Introduction

The circular economy (also referred to as CE) has become an essential vision in the plans of business organizations due to circumstances such as population growth, which results in greater utilization of natural and energy resources whose origins have turned into highly polluting. These conditions have caused us to seek alternatives to engender new production models that allow the optimization of natural resources regarding a novel culture of consumption.

Certainly, following the COVID-19 crisis, a reconsideration has been enabled in the way problems stemming from the economic recovery are coped with, as well as the adaptation process of a new orientation of consumption, production, and use of inputs by companies.

In the particular case, for example, in Mexico, the primary problem refers to the need to encourage with greater interest the subject matter of the circular economy — from a legislative perspective to a practical one—, as there is still a long way to go to embrace this type of economy.

Even though the Mexican market has showcased great competitiveness and progress in production processes, it is essential to strengthen the mechanisms that enable economic growth in a sustainable manner, which is expected to be achieved with the inroads of actions made into the circular economy.

Given the foregoing, as far as the application and actions regarding the circular economy in Mexico, the information gathered in this paper poses a general theoretical discussion derived

from a recounting of cases in which various Mexican companies have implemented this type of economy in their practices.

This occurs as a result of the need to boost the protection of the environment, the economic benefit, and the use of actions that allow the optimization of natural resources to the point that they have a positive impact on our present and future.

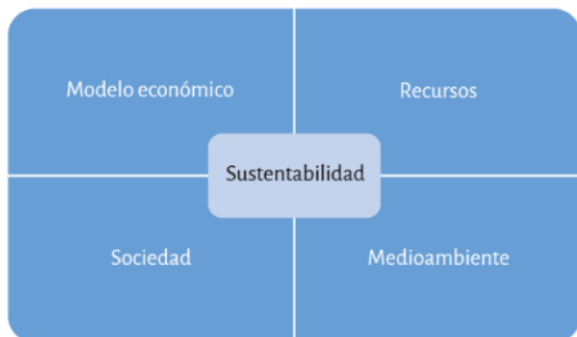
## 2. Theoretical Framework

As a result of the health confinement that hit the world's population, it has become a necessity to take place some changes in nearly every social sector, since the COVID-19 pandemic triggered a series of alterations in certain practices, customs, services, and activities.

In the aftermath of this phenomenon, transformations in production and consumption habits have been visible, since the economy has undergone a series of changes concerning the development of its activities. Consequently, a term that is currently used in the private sector is "sustainability", which is understood as that balance that remains between a community and the environment to meet its needs (Estrella and González, 2017). An example of the aforementioned are the 17 Sustainable Development Goals (SDGs), which according to Sammer et al. (2020), allow us to enhance our environment, tracing a path to go through collectively. For this reason, it is feasible to relate sustainability with the economy, since it is not only the alteration of habits of human activity that has been essential but also the production processes and practices of companies.

Yet, so that it is possible to implement sustainability in companies, it is necessary that when developing their activities, they include

various elements implicit in the process, such as the economic model, resources, society, and the environment (see Figure 1).



**Figure 1.** Sustainability matrix. Source: Panceri, (2021).

If the foregoing elements are taken into consideration during the transition of companies towards sustainability, it will be likely to assure the development of activities and processes without doing any harm to the environment and improving the quality of life.

According to Panceri (2021), it is crucial to make the life quality better for individuals residing in a community. It is therefore essential that companies have a clear vision of development so that they seek to preserve the care of ecological systems and natural resources.

In this sense, a growing interest has arisen on the part of organizations to implement a Circular Economy (CE), which, according to Prieto et al. (2017), is considered necessary to make changes concerning the problems affecting us so as to open new business opportunities. In line with Sammer et al. (2020), implementing CE brings environmental and economic benefits, such as: reduction of gases, care and preservation of ecosystems and nature, resource savings, economic growth, increased employment rates and increased demand for products or services.

Thus, circular economy is seen as a linear or continuous economic model that seeks to preserve and streamline the life of a product or service (Cerdá and Khalilova, n.d.).

According to Esposito et al. (2018), CE arises as an alternative to enhance the present model, as it bolsters maximizing the utilization of products throughout their life cycle, from raw materials, supply chains, consumption, and even after their use, developing waste into new materials (cited in Córdova et al., 2021, p. 26). Even the term CE has gained popularity among some economists, politicians, and businesspeople at local, national, and international levels (Sammer et al., 2020).

In turn, the Ellen MacArthur Foundation (2013) asserts that the primary goal of the circular economy is to maintain the value of materials and products by maximizing their reuse, hence diminishing the generation of waste (De Miguel et al., 2021). Certainly, the aforementioned issues are in addition to the existing global concerns related to pollution, energy and water scarcity, and urban sprawl. Consequently, it is imperative to seek alternatives that can address these challenges and also bolster the development of new opportunities in the market (Arroyo, 2018).

In line with Da Costa's (2022) statement, the CE has a crucial role in the economic and social systems of countries. Therefore, it is critical to advocate for an exploitation model that effectively influences the life cycle of products and minimizes the waste of raw resources. An illustration of this would be for organizations to adopt novel and enhanced work techniques in their day-to-day operations that facilitate the successful implementation of CE. Sandoval et al. (2023) introduce the 6Rs concept, which

focuses on maintaining the product's life cycle. (Refer to Figure 2).

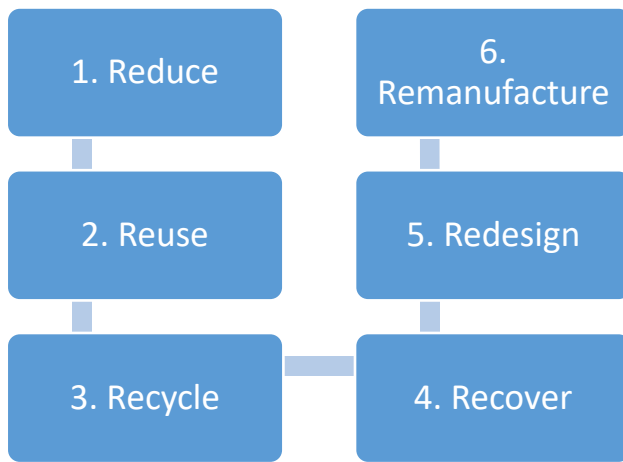


Figure 2. 6Rs. Source: self-made.

Naturally, the previously indicated methodology would comprise the entire life cycle of items in the following manner:

1. Reduce the utilization of energy, materials, and other essential resources required for consumption.
2. Reuse the product again following its first life cycle.
3. Recycle the inputs by transforming them into fresh goods.
4. After the last phase of utilization, strive to recover the maximum amount of the resource for future cycles of use.
5. Optimize the utilization of products and their components by developing new processes based on the previous life cycle.
6. The objective of remanufacturing is to restore resources while preserving their functioning.

According to Chávez and Martínez (2021), every action taken is critical as it may have significant implications for the environment. Therefore, it is crucial to ensure that these acts are conducted ethically, responsibly, and with a

noble regard for the environment. Hence, it is worthwhile to reconsider company methods, as well as revamp and minimize resources (Sandoval et al., 2023).

Furthermore, the United Nations (2020) has conducted an analysis of the economic vulnerability of fragile countries, particularly during the COVID-19 pandemic, as part of its environmental initiatives. The UN acknowledges the necessity of developing a legal framework to promote the utilization of resources that facilitate the establishment of a circular economy.

## 2.1 Mexico and the circular economy in the face of COVID-19

In the context of the COVID-19 pandemic, the approval of the General Circular Economy Act in Mexico on November 17, 2021, becomes significant. This act sets out a vision of environmental protection, sustainable development, and the restoration and preservation of ecological balance. This law gains relevance in a particular scenario, as it is observed a noticeable surge in consumption but also a substantial utilization of raw materials. As a result, this has prompted a closer alignment with the principles of the circular economy within the Mexican legislative framework.

In order to transition from a traditional to a circular economy, it is crucial to recognize the pivotal players who are instrumental in facilitating this change, which entails assessing its impact on the nation's economy and examining the processes that directly involve energy usage, resource inputs, and environmental consequences. (INECC, 2020). This endeavor poses an approach to implementing strategies that foster the development of novel and enhanced productive

processes, with innovation as a cross-cutting focus within a framework of competitiveness.

In this scenario, the government of Mexico will implement a circular economy to enhance resource handling efficiency, reduce waste generation, and maximize resource utilization. This will be achieved by bolstering local production chains, establishing new businesses, and creating high-quality jobs that prioritize all Mexicans' well-being, including the most vulnerable social groups. (The Secretariat of Environment and Natural Resources, 2023).

To give but one example, some of the actions taken by business organizations may focus on water reuse, landfill, and agricultural waste utilization, product redesign, and recycling, among others. For this reason, authors such as Díaz (2023) argue that "merely engaging in reduction, recycling, and reusing is no longer sufficient, but more ambitious actions must be implemented".

When it comes to the implementation of actions to enhance business practices and under the rationale of a diagnosis of the situation in Mexico, it is important to emphasize the research conducted by CEPAL (De Miguel et al., 2021) on Circular Economy in Latin America and the Caribbean, which reveals that approximately 28 tons of waste are produced annually in Mexico, which amounts to 249 kg of garbage per person. This is an alarming amount. Similarly, between the years 2020 and 2021, the COVID-19 pandemic in Mexico resulted in the generation of approximately 2 to 2.2 kg of biohazardous and infectious waste from the disposal of gloves, gowns, glasses, and masks, consequently, there may be significant environmental repercussions as a result of this occurrence. However, a noteworthy aspect is that, despite this, several

sectors, such as the automobile and paper industries, have made significant progress in adopting techniques associated with the circular economy.

According to Beato (quoted in Foro Consultivo Científico y Tecnológico, AC, 2019), waste issues will become more concerning by 2050, with an expected 70% increase compared to current levels. Therefore, it would be worthwhile to collaborate in acknowledging our societal, economic, and environmental roles in promoting circular production and consumption.

Therefore, Mexico must adopt a cohesive vision that promotes the utilization of natural resources in a sustainable manner, facilitated by public policies that result in a contribution to both the environment and the economy, whose objective is to prevent the depletion of raw materials and the excessive exploitation of resources.

## 2.2 Success Story Applied in Mexico

According to Córdova et al. (2021), despite the existing proposals, only a minority of companies based in Mexico implement changes in their processes to control their environmental impact. Accordingly, the successful implementation of a circular economy hinges on the generation of sustainable well-being by reducing resources, non-renewable energy, emissions, effluents, and waste, among others (Vence y López, 2022).

In turn, the Centro de Estudios de las Finanzas Públicas de la Cámara de Diputados, in its LXV Legislature (2022), states that challenges faced by companies in implementing the circular economy so as not to produce waste

revolve around three principles: I) design II) preserve the material value and quality, and III) restore and regenerate the natural systems.

Consequently, it would be worthwhile for commercial companies to consider incorporating the aforementioned concepts to foster a culture of continuous improvement while safeguarding natural resources.

Naturally, Rosas et al. (2020) emphasize the importance of encouraging sustainable economic development while preserving natural resources, biodiversity, values, and cultural identity in society.

Considering the information provided, the following Mexican corporations that have implemented a circular economy model are mentioned: Heineken, Natura, and Danone, among others, along with certain specific business sectors, will also be exposed.

The Heineken brewing business has been a participant in the 'Circular Economy 100' initiative, spearheaded by the Ellen MacArthur Foundation, since 2016, with a focus on sustainability. According to Heineken Mexico's sustainability report for 2021, the company highlights several noteworthy accomplishments in the field of sustainability as seen below.

- 32% decrease in emissions during the production phase.
- 100% recycling rate for all generated garbage.
- The process of treating and safeguarding wastewater.
- Increase in renewable energy sources.

- Decrease in the consumption of electrical energy.
- Promote circularity by incentivizing the recycling or substitution of packaging.

Despite the aforementioned, the brewing company acknowledges significant obstacles arising from COVID-19, particularly in its economy, as Heineken's primary goal is to safeguard its profitability and preserve its operations by using a sustainable approach. In response to the evident difficulties, the organization offers resolutions and support strategies for both themselves and their customers so they can succeed. This is particularly relevant as the majority of consumers, restaurants, and businesses have experienced adverse effects due to the COVID-19 pandemic (Flores, 2020).

Undoubtedly, and as part of Heineken's involvement in the 'Circular Economy 100' program, it demonstrates its strong commitment to enhancing the use of renewable energies and promoting the sustainability of recycled waste, as exemplified by its investment of COP 7.35 billion which allowed the installation of a seventh treatment plant specifically designed for green energy utilization (Córdova et al, 2021).

Similarly, Natura, the cosmetics firm, stated in 2022 that it had successfully recycled 985 tons of plastics by 2021, as 70% of all recovered PET is utilized in the production of its products. To do this, the organization established the so-called program 'More Recycling', in which its team of consultants and leaders are tasked with the segregation, collection, and transportation of recyclable garbage, and by 2021 alone, they successfully gathered a total of 60 tons. In 2022, their primary objective was to retrieve 1,419 tons

of recycled plastic, representing a 44% increase compared to the previous year. They achieved this by implementing the tagline "More beauty, less waste" and adopting lighter and recyclable packaging. This company aims to raise environmental consciousness among its customers by implementing sustainable practices in its supply chain.

Furthermore, Grupo Danone (2022), a company with 34 production facilities across Mexico, has emerged as a pivotal player in promoting the adoption of the circular economy. By integrating sustainability as a fundamental tenet in its operations, it aims to minimize the consumption of natural resources and reduce extraction. Its main contribution resulted in the initiative seeking to offer circular packaging design, which ensures that all packaging materials may be reused, recycled, or composted. Therefore, the packaging for bottles and demijohns used to market drinking water is made from recycled plastic, so encouraging the utilization of recyclable materials.

Kimberly Clark (2021) is a company dedicated to the production of cleaning, care, and personal hygiene products. Besides, it operates eight production sites and has a workforce of over 8,000 direct employees and over 10,000 indirect workers who are part of several production chains. The 2021 sustainability report of the company acknowledges the difficulties posed by the COVID-19 pandemic in multiple domains i.e. the economic, social, health, and environmental; within which include unemployment, vaccine shortages, hospitals operating at full capacity, social distress, and high levels of contamination etc. Furthermore, this company has successfully achieved a 98% zero waste rate, an 8% decrease in water use, and a 33% reduction in greenhouse gas emissions as part of its responsibility to meet

its sustainable commitments. In addition, its environmental policy mandates the implementation of integrated waste management. Since 2021, the company's warehouses have been participating in a scheme to gather cardboard cones by which its products are wrapped. So far, they have collected 4,442 rolls, which were used to wrap 12,690 pallets of inventory, which has resulted in a profit of COP 360,000. Additionally, they assert that 95% of the overall energy consumption is derived from renewable sources such as wind power and cogeneration. Moreover, it has an Integrated Waste Management Policy, which ensures that 98% of the waste generated by the company is reused or recycled and it adheres to the General Law for the Prevention and Integrated Management of Waste (LGPGIR) and its requirements, as well as the Mexican Official Standard NOM-161 SEMARNAT-2011.

In turn, Grupo Bimbo (2022) has implemented a development model that embraces the principles of the circular economy. The overriding objective of this model is to diminish waste in food production, the recovery of waste generated which is then reintegrated into the production process of manufacturing bread bags; as well as the recycling of plastic materials, all of which are fully recyclable. In 2022, it unveiled a new sustainability policy that centers around three key points: 1. To attain a state of emitting no net carbon, by adhering to the guidelines set forth by the Science Based Targets initiative. 2. 100% of major ingredients are to be sourced from land that is cultivated using regenerative agriculture principles. 3. By 2030, it aims to have all of its packaging fully aligned with the principles of a circular economy. Additionally, it strives to decrease water consumption by 20% and reduce food waste by 50% in its operations.

The manufacturing sector has also made remarkable advancements in implementing circular economy principles. Research conducted on small and medium-sized enterprises (PyMes) in Tijuana demonstrates how these companies can incorporate programs into their production chains and optimize waste management. There are two challenges that people in charge need to address. Firstly, they must continue to contribute to the research of circular economy projects by focusing on the established practices. Secondly, they should have a keen interest in environmental management, particularly concerning production processes (Avila et al., 2021).

The circular economy is also evident in the water sector, as this economy model has been utilized in water treatment systems that involve sanitation for human consumption and water reserves for industrial purposes. As an example of this, Audi Mexico has constructed 25,000 reservoirs to replenish an underground water source by collecting rainwater. All of these have a storage capacity of 175,000 cubic meters, which helps reduce the need for extracting water from wells. The water used is treated through both industrial and sanitary processes to make it suitable for reuse in production (Juarez, 2019). The single challenge faced by this industry is the use of more sophisticated technology and increased investments to enhance firm operations, supported by public policies that facilitate other companies, and the implementation of projects focused on circularity.

As shown by the aforementioned companies, they must prioritize efficiency in waste management, the implementation of sustainable practices, and the reduction of their environmental footprint, in addition to enhancing production processes to promote

awareness among their staff and consumers. Thus, they must also undertake specific projects that document the extent of their efforts in implementing a circular economy. Besides, they should recognize the importance of exploring innovative and improved methods of consumption and production within their companies, so that they can enhance efficiency and align with the principles of a genuine and impactful circular economy.

To that end, this context influences the habits and lifestyles of individuals and companies, which in turn become able to shape business models that are attuned to the reality, needs, and emotions of people (Carrillo and Pomar, 2022). Despite the endeavors undertaken by firms, there are specific characteristics that hamper the adoption of a circular economy in Mexico. Based upon this, Aguiñaga and Treviño (2022) assert that:

Although the circular economy has been accepted in Mexico recently, [...] there are very few documented success stories in this field [...] The cause of this gap is mostly attributed to a deficiency in understanding the concept, unfavorable environmental conditions, and insufficient dissemination of successful projects.

Así mismo, para Cadena (2021) la adopción de la EC en México aún es muy básica relativamente, por lo que la falta de documentación, acciones, propuestas, entre otros, pueden ser limitaciones que dificulten llevar a cabo una EC de manera exitosa en las empresas mexicanas.

Similarly, as stated by Cadena (2021), the adoption of CE in Mexico is now at a rudimentary stage, as a result of the absence of comprehensive documentation, initiatives, and



suggestions among others, which may pose significant obstacles to the successful implementation of CE in Mexican businesses.

It is generally imperative to abandon the traditional economic model and for companies to embrace the implementation of a Circular Economy (CE), this “[...] should be done to set roadmaps that facilitate the integration of such systems aligning with the specific characteristics and requirements of various states, municipalities, and industries (Cortinas, 2021, p. 3).

This can be accomplished by engaging in the initiatives endorsed by the Ministry of Environment and Natural Resources (SEMARNAT) and the National Institute of Ecology and Climate Change (INECC), local governments, the Legislative Branch, as well as various business organizations, educational institutions, and civil society organizations. (Cortinas, 2021, page 3)

### 3. Methodology

The research employed a descriptive qualitative approach, drawing from a wide g of sources including research publications, scientific journals, books, reports from several organizations, websites, and others, which enabled the development of a comprehensive documentary collection of information. Furthermore, an exploratory data search was conducted to establish connections between concepts and draw conclusions regarding the implementation of the circular economy in Mexico, as well as its adoption by various companies and other business sectors.

The information in this article is derived from the implementation of a highly descriptive technique, with the aim of understanding the issue of CE and its surrounding environment and with a nationwide scope of its application, especially within the framework of the pandemic. In addition, this study emphasizes crucial factors in its implementation, which aided in the identification and suggestion of overarching context, relevant traits, and successful stories where the CE is implemented.

Yet, it was quite necessary to comprehend the CE and the authors’ perspectives on this subject matter in the first place, aiming to elucidate terminology and interpretations, while also familiarizing oneself with the analytical stances for comparison purposes. Secondly, it was essential to examine some study perspectives on the circular economy in order to create pertinent connections regarding its implementation in the Mexican region, and thirdly, an analysis was carried out on the achievements and progress made by Mexican companies and their influence on the development of the circular economy across the country.

Thus, it was imperative to utilize several sources to compare the progress and challenges companies had faced throughout COVID-19 phenomenon. This allowed the generation of inferences regarding the advancements made in terms of circular economy in Mexican companies, as well as their emphasis on sustainability and the adoption of resource preservation practices, while also considering the needs of individuals.

However, a significant constraint encountered during the development of this scientific study is the scarcity of Mexican companies that have adopted a circular economy

approach. Even those few companies that have implemented a CE are geographically dispersed and lack standardized procedures as it is worth noting that the concept of CE is relatively novel in the context of Mexican businesses (Carrillo and Pomar, 2022). Similarly, there is a scarcity of authors on the subject matter of Mexico's economy during the epidemic, resulting in a constraint on the approach of how this particular economic model was being implemented in the country.

#### 4. Discussion

Based upon the gathered information, it is clear that the COVID-19 pandemic has posed a significant challenge to economic activity as companies have had to adopt a circular economy approach in response to ongoing threats caused by the excessive use of various resources, which are a result of population growth and environmental issues.

Considering this, the COVID-19 pandemic in Mexico revealed a noticeable shortage of specific natural resources, a lack of employment, a rise in waste production, and other adverse impacts on individuals, businesses, and the environment.

Estrella and González (2017) argue that it is necessary to incorporate sustainability into their day-to-day activities and tasks, thereby satisfying needs in a conscious manner; therefore, it is crucial for Mexican companies to adopt the circular economy as an innovative model. Even Prieto et al. (2017) assert that this form of economy enables the creation of new sustainable business prospects. Hence, it would be worthwhile for companies to consider an enhanced development of practices within the

framework of the CE to prioritize the conservation of resources alongside meeting the demands of individuals, similar to the practices adopted by organizations such as Bimbo, Heineken, Natura, and others.

Naturally, this particular economic model not only contributes positively to the environment but also yields several advantages and cost savings in companies' production processes. As per Da Costa (2022) the CE directly influences the economic and social systems of nations. Therefore, it is required to adopt a utilization model that affects the entire life cycle of products in a positive manner, which leads to a reduction in the waste of raw materials. Given that there is an urgent need to manage natural resources more efficiently and enhance the practices of business organizations.

Given the ongoing threats caused by the overuse of resources resulting from population growth, Cerdá and Khalilova (n.d.) suggest that companies can mitigate this issue by reducing their consumption of water and energy. Additionally, they can promote the sharing of renewable and recyclable resources as substitutes for the materials currently in use, and by doing so, companies can lower their contamination levels, create value, and save costs, which entails promoting collaborative consumption, that is referred to a form of consumption involving suppliers, companies, and consumers.

According to Al Torra (2020), there has been progress in establishing a legal framework to promote the circular economy. Yet, it has been observed that not all Mexican companies adopt this type of economy neither engage in activities that foster resource and material conservation. Therefore, it would be beneficial to initiate more

projects that encourage the implementation of the circular economy across various industries.

Certainly, CE is a forward-thinking movement that effectively manages productive processes and has a beneficial influence on human lives, company operations, the economy, and the satisfaction of needs.

## 5. Conclusions

Ultimately, by adopting a circular economy, organizations may establish more environmentally friendly systems and practices that span the entire production and consumption processes, which not only provides financial benefits but also helps to conserve natural resources.

Over time, a circular economy instills a sense of resilience in companies. Therefore it is vital for all the involved parties to collaboratively enhance their processes to minimize the impact and environmental consequences of product and service distribution. In addition, so that there are more favorable outcomes in the implementation of a circular economy, it is advisable for companies to develop and execute more effective strategies that ensure optimal management and provide support to business organizations.

To accomplish the aforementioned goal, it is highly important to focus on consumption and production from a sustainable perspective, prioritizing the pursuit of product or service quality, variety, and availability, while also considering its environmental impact.

Consequently, following the COVID-19 crisis, both individuals and organizations place significant value on products, resources, materials, and practices that promote the circular economy, such as recycling, reuse, and waste treatment.

Nevertheless, this endeavor necessitates collective awareness regarding the detrimental impact being inflicted on the environment. Given the escalating population of the nation, it is the consumers themselves who will determine the rate at which production and consumption patterns will evolve.

Undoubtedly, the analyzed data reveals that the circular economy in Mexico is a significant innovation challenge for companies that have already taken steps towards sustainability, as well as for those that still have not ventured into the implementation thereof. From an economic point of view, this form of economy enables the efficient utilization of natural resources while providing the necessary goods demanded by the market without causing harm to the environment.

Even though Mexico's remarkable achievements in implementing the circular economy, there is a need for further research to substantiate its use and disseminate these findings to society. Moreover, it is imperative to enhance the Circular Economy Law in Mexico, as it should be necessarily updated after the pandemic period, and includes tax incentives for initiatives that improve energy efficiency and reduce pollution in productive value chains, which would create new opportunities for businesses and employment. Without a doubt, the proposed challenge serves as an opportunity to contemplate our experiences over the COVID-19 period. Given the fact that it has been a comprehensive journey of recognizing the

importance of natural and environmental resources, as well as integrating Circular Economy principles into our daily lives.

Accordingly, scientific and business communities are called upon to collaborate in conducting additional research on the circular economy so that research should focus on documenting specific procedures, advancements, and information to assess the implementation progress of this economic model in Mexico.

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