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Circular economy and sustainable consumption behavior for green recovery

Economia circular e comportamento de consumo sustentável para a recuperação verde

Economía circular y consumo sostenible para una recuperación ecológica

Marc François Richter[1]
Andreia de Bem Machado[2]

[1]Postdoctoral research at the Institut Pasteur in France, and a second one as CNPq visiting researcher at the Center of Biotechnology, Federal University of Rio Grande do Sul (UFRGS). PhD in Biochemistry and Chemistry graduate from Albert-Ludwigs Universität Freiburg (Germany). Currently, he serves as adjunct professor at the State University of Rio Grande do Sul as adjunct professor. Since March 2018 he is teaching and acting in research and extension projects in the areas of Environmental Management and Biotechnology. He is also a member of the Council of the Technological Innovation Nucleus (NITUergs). In 2019 he started his activities as professor-supervisor in 2 professional Master's degrees: 1) Environment and Sustainability (PPGAS-Uergs); and 2) Food Science and Technology (PPGCTA-Uergs). Editor-in-chief of Blog REPENSE, which carries out dissemination and awareness of issues related to sustainability. **E-mail:** marc-richter@uergs.edu.br, **Orcid:** https://orcid.org/0000-0002-0868-9127

[2]Postdoctoral fellow at the Federal University of Santa Catarina (UFSC). PhD in Engineering and Knowledge Management. Evaluator of the National Institute of Educational Studies and Research Anísio Teixeira (Ministry of Education in Brazil). She is an *ad hoc* evaluator of the National and International Journals. Evaluator in the PNLD Infantile Education program. Consultant in the production of low vision UNESCO teaching material. She has been working in the educational field for over 25 years. She is part of the scientific committee of national and international journals. Currently the areas of study are: innovation, innovation in the public sector, entrepreneurship, smart cities, education, special education and digital pedagogical model. She likes to innovate in the art of researching and disseminating knowledge. **E-mail:** andreiadebem@gmail.com, **Orcid:** https://orcid.org/0000-0002-4404-0341

Abstract: Environmental challenges, such as lack of basic sanitation and environmental pollution, impact people's quality of life. In order to promote sustainable consumption for a circular economy, the article attempts to emphasize green recovery. To this end, a bibliometric analysis was conducted from a systematic search in the Scopus database. The aim of the research was to highlight sustainable consumption initiatives for a circular economy via green recovery in light of this contextualisation. To encourage the circular economy and a more sustainable development, the green economy stands out, in addition to the need for greater environmental and consumption awareness, thus generating greater quality of life.

Keywords: circularity; consumer behavior; sustainability; bibliometrics.

Resumo: Os desafios ambientais, como a falta de saneamento básico e a poluição ambiental, têm impacto na qualidade de vida das pessoas. A fim de promover o consumo sustentável para uma economia circular, o artigo tenta enfatizar a recuperação verde. Para tanto, realizou-se uma análise bibliométrica a partir de uma busca sistemática na base de dados Scopus. O objetivo da pesquisa foi destacar iniciativas de consumo sustentável para economia circular por meio da recuperação verde à luz dessa contextualização. Para incentivar a economia circular e um desenvolvimento mais sustentável, destaca-se a economia verde, além da necessidade de uma consciência ambiental e de consumo maior, gerando, assim, uma maior qualidade de vida.

Palavras-chave: circularidade; comportamento do consumidor; sustentabilidade; bibliometria.

Resumen: Los retos medioambientales, como la falta de saneamiento básico y la contaminación ambiental, afectan a la calidad de vida de las personas. Con el fin de promover el consumo sostenible para una economía circular, el artículo intenta hacer hincapié en la recuperación ecológica. Para ello, se realizó un análisis bibliométrico a partir de una búsqueda sistemática en la base de datos Scopus. El objetivo de la investigación fue destacar las iniciativas de consumo sostenible para una economía circular a través de la recuperación verde a la luz de esta contextualización. Para fomentar la economía circular y un desarrollo más sostenible, se destaca la economía verde, además de la necesidad de una mayor concienciación ambiental y de consumo, generando, así, una mayor calidad de vida.

Palabras clave: circularidad; comportamiento del consumidor; sostenibilidad; bibliometría.

1 INTRODUCTION

The way society currently consumes, reflects the values and social background of its members. Life quality and happiness are becoming more and more correlated with monetary success, which creates a vicious cycle in which people labor to consume more and more. The amount of natural resources consumed in our planet's cities might range from 60 to 80%. By 2050, 66% of the world's population is expected to reside in urban areas, according to the UN. As a result, numerous regional and international planning projects are being developed. These shown reuse, recovery, and recycling activities for resources (materials, water, energy, land, and infrastructure) could help reduce resource scarcity and waste in urban areas.

Since the first industrial revolution, which began in the 19th century, people have consumed to establish their social identities, in order to become part of a group, and to form bonds. However, because to the excessive use of natural resources and the significant amount of waste produced, this consumption pattern is not environmentally sustainable. People all over the world are becoming aware of environmental issues and their effects, particularly the greenhouse effect, as well as the pollution of water resources and oceans and global deforestation, among others. As a result, people are realizing that the modes of economic production and consumption must drastically change. One of the global initiatives under discussion is green recovery. In order to lift people out of poverty and create jobs, there would be a restart of economic growth through investments in strategic industries, the provision of new technology, improvements in production techniques, and a more efficient use of both public and private resources.

The circular economy (CE) is a major component of sustainable development, which displaces linear economy and takes inspiration from ideas such as economic permaculture, green economy, usage economy or functionality economy, performance economy, and industrial ecology. The primary idea is that residues or waste from an industry can be recycled and used as recycled raw material by that same or another industry. Additionally, CE aims to create items with the intention of being reused, retaining resources in the production cycle. Therefore, the following sustainability initiatives

based on CE are relevant toward the green recovery: 1) Reuse/recycling, which entails the steps of disassembling the used product, cleaning its different components, repairing or replacing damaged components, and then testing the product's quality; and 2) a process by which a solid waste substance that would otherwise be useless is being transformed, including changes to its physical, physicochemical, or biological state, to give the waste characteristics in order to become a raw material or a new product.

The study's purpose in this article is to highlight initiatives on sustainable consumption for CE through the green recovery in light of this contextualization. In order to achieve this, the study is divided into 4 sections, apart from this introduction, with the "Methodological Procedures" section presenting the methodological approach. The bibliometric result based on scientific papers produced in this field is described in depth in the third section. Finally, the fourth section present the conclusion of the present article.

2 METHODOLOGY

The study is categorized as exploratory-descriptive to address the issue of the current research and to characterize the theme and expand the researchers' knowledge with the subject as well as explain the concepts inherent to the topic under study. An online database was systematically searched, and a bibliometric analysis was performed. The goal of bibliometrics is to map publication patterns from bibliographic records kept in databases using mathematical and statistical methodologies (Walsh; Rowe, 2022). For authors, bibliometric studies provide pertinent data on production by region, publication timing, research by subject area, number of publications cited in the study, and impact factor. When studying a certain issue, mathematical and statistical data help to improve study results and minimize biases.

The study was divided into three independent stages: planning, collecting, and obtaining results for the bibliometric analysis. These efforts are crucial in order to respond to the research's central question: How might sustainable consumption practices promote green recovery and the circular economy. The survey was carried out in December 2022, using a time-period from 2000 until December 2022. Given the vast number of

documents in the Web search bases, a number of conditions were defined throughout this procedure as a restriction of the search to electronic databases, such as not considering physical catalogs in libraries. Due to its importance in the academic environment and its interdisciplinary nature, the Scopus database was specified as relevant to the research area in the planning scope. Additionally, Scopus is one of the biggest databases for bibliographic references and abstracts of current, peer-reviewed scientific publications (Machado, 2021).

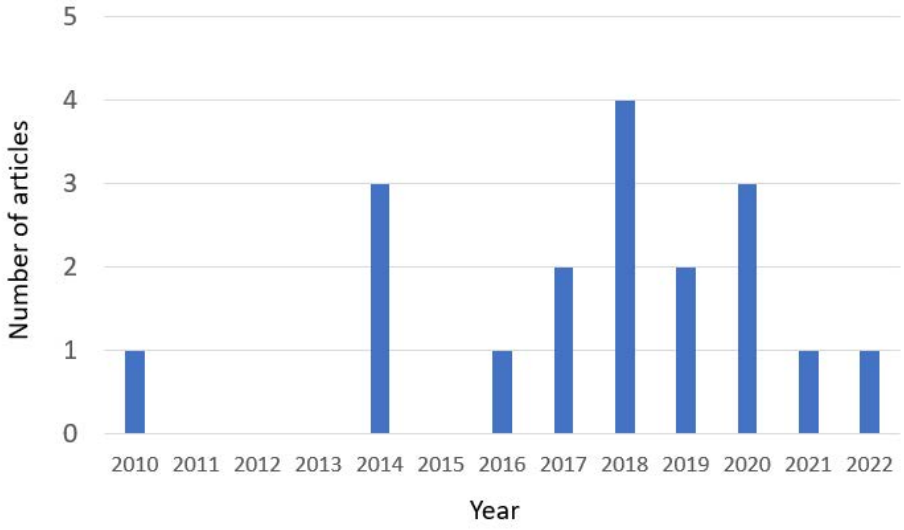
In the planning stage, the search keywords "circular economy", "green recovery" and "sustainable consumption" were defined in light of the research challenge. As a general rule, it was chosen to use the mentioned terms in the "title", "abstract", and "keyword" fields without putting any constraints on them regarding time, language, or any other factors that would limit the results.

3 RESULTS

The research planning data retrieval yielded a total of 18 indexed publications, indicating a first publication in 2010. They are distributed over 12 fields of expertise and 4 types of publications, were produced by 46 authors, affiliated with 48 institutions, and located in 15 different countries. A total of 181 keywords were utilized to identify and index the publications.

In the first instance, the temporal distribution of the papers was examined, revealing that there were very few publications in the time starting in 2010 and only 1 (one) scientific article. There were no recorded publications in 2011, 2012, or 2013. There were 3 (three) publications in the region in 2014. No publications were found in the year 2015, however 1 (one) paper was published in 2016 and 2 (two) more were in peer-reviewed journals in 2017. There were 4 (four) papers published in 2018, and two additional papers published in the year of 2019. The years of 2020, 2021 and 2022 resulted in 3 (three), 1 (one) and 1 (one) publications, respectively, as shown in figure 1. To make these results more easily visible, figure 1 was created.

Figure 1- Time distribution of the papers

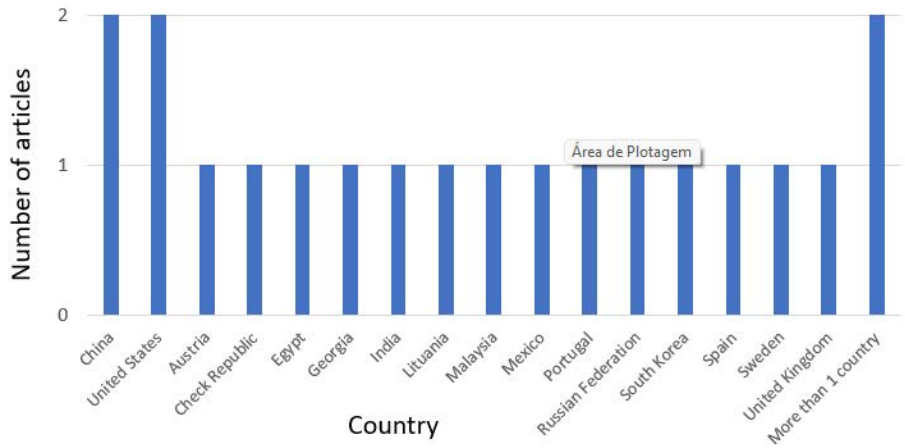


Source: Prepared by the authors (2022).

The 18 papers that were obtained as result of the bibliometric search contain a diverse group of authors, organizations, and nations that stand out in the research on the "circular economy", "green recovery", and "sustainable consumption", demonstrating that main topic of the article is of general interest.

Both, China and the United States, stand out among the nations that publish the most in the area's scientific peer-reviewed journals with an average of 11.1 % of the total publications, as opposed to the other nations, which each publish an average of 2 papers. Figure 2 displays the participating nations:

Figure 2- Distribution of the papers by country



Source: Prepared by the authors (2022).

Brazil is not indicative of the published scholarly works in this field, as shown in Figure 2. How might green recovery help promote sustainable consumption practices that lead to the CE?

Based on the reading of the title and abstract of the 18 (eighteen) articles, 8 (eight) articles that clearly answered the research question were chosen to compose Table 1, in with the year, authors and title of each article, as well as a systemic summary is provided.

Table 1- Systematic summary

Year	Author	Title	Summary
2016	Mohan *et al*.	Waste biorefinery models towards sustainable circular bioeconomy: Critical review and future perspectives	According to the article, biorefineries will employ several technical models of processing that will pave the way for sustainability as well as the growth of a bio-based society and a CE.

Year	Author	Title	Summary
2016	Witjes and Lozano	Towards a more Circular Economy: Proposing a framework linking sustainable public procurement and sustainable business models	The article describes how procurement and supply practices are related and suggests changing the typical public procurement procedure from one that is based on business models for selling things to one that is more focused on providing services.
2017	Mishenin and Koblianska	Perspectives and mechanisms of "circular" economy global development	The article addresses the conceptual, theoretical, and organizational underpinnings of the CE in an effort to "green" the economy and achieve sustainable development.
2018	Kalmykova, Sadagopan and Rosado	Circular economy- from review of theories and practices to development of implementation tools	The article gives a summary of the literature on the CE, as well as theoretical perspectives, strategies, and practical examples.
2018	Bradley *et al.*	A total life cycle cost model (TLCCM) for the circular economy and its application to post-recovery resource allocation	In the paper, a paradigm of potential solutions having sustainability at their core is explained.
2020	Atabaki, Mohammadi and Naderi	New robust optimization models for closed-loop supply chain of durable products: Towards a circular economy	The paper's goal is to redesign a closed-loop supply chain network for durable goods in order to advance the CE.
2021	Pattanaik *et al.*	A study of the adoption behaviour of an Electronic Health Information Exchange System for a Green economy	The article explains those SDGs that are related to good health and well-being, responsible production and consumption.
2022	Negrete-Cardoso *et al.*	Circular economy strategy and waste management: a bibliometric analysis in its contribution to sustainable development, toward a post-COVID-19 era	The paper is using a bibliometric analysis to describe five major themes on CE/waste: greenhouse gases; circular economy, waste management and recycling; life cycle; waste treatment; and anaerobic digestion and recovery. Trend research is related to policy interventions and regulatory enforcement by authorities to promote the transition to CE, increase the use of recycling and reuse practices, and discourage an increasing consumption culture.

Source: Prepared by the authors (2022).

4 DISCUSSION

As the globe transforms – many of these changes accelerated by the Coronavirus pandemic – discussions concerning environmental protection, sustainable development, economics, and green recovery are gaining more and more traction. After all, "change" best describes the recent era, particularly during the coronavirus pandemic (Leach *et al*., 2021). When we consider this situation, we would like to see beneficial changes in the environment, companies and industries, and overall society.

The movement that seeks to renew post-COVID-19 economic activity in a more sustainable manner in all areas raises concerns about things like lowering pollutant gas emissions, reducing deforestation, promoting the CE, and using water, sanitation, and clean, renewable energy in an intentional manner. As the discussions about climate change intensify, the harm done to the environment increases each year. In addition to the COVID-19 pandemic, urbanization has risen over the past few decades, leading in a significant rise in energy and material consumption as well as the production of anthropogenic waste (Mohan *et al.,* 2016). It is obvious that we cannot polarize and restrict rights in an effort to return the world to the policies currently in place. However, we must immediately change our behavior in order for sustainable acts to counteract the unfavorable effects. Another benefit of the epidemic and the need for change is that society has given these issues, as well as the daily routine and interpersonal interactions, more thought during the quarantine period.

Therefore, finding ways to embrace this preventative behavior and promote a "greener" economy can have a greater influence than ever at a time when many businesses are returning to operation. Companies who are already adapting their business strategies for this new era will likely suffer in the future if they do not incorporate a bias of concern for the environment (Ding *et al.*, 2021).

The population is guided by education and awareness to take more responsible actions and recognize the significance of regularly addressing issues related to environmental concerns. Additionally, they can promote behavioral shifts that are better for the environment. Because of this, it is

crucial that we talk about environmental consciousness, conscious consumption and CE as a whole, if we want to make the world a more sustainable place. The goal of a CE is to close the gap between production and consumption by turning waste into resources. Sadly, not many have been realized to take action, before pandemic (Witjes; Lozano, 2016).

The authors argue in favor of a transition from the current public procurement system, which is centered on commercial product sales patterns, to a more collaborative one that is more service-oriented. This mindset throughout the procurement process can encourage the creation of new, more sustainable business models that are in line with green recovery and a more circular economic model, while also reducing the consumption of raw materials and waste generation. These commercial tactics would need to result in a greater economic gain for both parties.

If we take the moment to think about it, we will see that many of the environmental issues of which we are becoming more and more aware have developed since the World War II as a result of changes in industrial production and consumer behavior. People can therefore conclude that society has increased a significant portion of the pollutant emissions that harm the planet as a result of urbanization, industrialization, and human behavior. In addition, society produces waste in enormous quantities nowadays that harm nature because they are hazardous, toxic, and many of them frequently take hundreds of years to degrade. The world has to transition from a linear to a CE so that waste can be recycled and reused to create new products and stop further exploitation of the planet's finite natural resources. In the 19th and 20th centuries, linear economics served as the cornerstone of industrial production, as it still does today. It is a manner of life centered on the ever-increasing exploitation of natural resources, in which the products generated from these resources are used up until they are thrown away as garbage without being reused (Smol *et al.*, 2020).

The greatest quantity of natural resource extraction and the creation of valued items increase product value in this kind of economy. It is crucial to spread awareness of CE concept and its use as the one-of-a-kind alternative to the linear model that can benefit the environment and the entire society. A CE has an ongoing cycle of development that protects and enhances na-

tural capital, maximizes resource production, and reduces risk exposures by trying to manage finite stocks and renewable flows. It also provides a number of ways to generate value that is separate from the use of nonrenewable resources. The only basis for consumption is natural resources. These resources are now either recovered and restored during the technological recycling process or regenerated during the biological cycle. Regarding the biological cycle, both with and without human interference, natural living processes regenerate materials. Regarding the technical procedure, human interaction recovers materials and establishes order in a certain amount of time as long as there is sufficient energy (Witjes; Lozano, 2016).

Circular economy is founded on three principles: 1) protecting and enhancing natural capital, managing finite stocks, and balancing the flow of renewable resources; 2) maximizing the production of resources, circulating goods, and materials at their maximum usefulness at all times through projects based on recycling, so that these items continue to circulate and contribute to the economy; and 3) enhancing the system's effectiveness, identifying harmful externalities and removing them from initiatives, and preventing risk to goods and services (Witjes; Lozano, 2016).

The importance of environmental health has increased recently across the globe. Being environmentally conscious is realizing how much of an impact humans have on the environment and how our actions toward the natural world actually affect how we live our own lives. Continuous lifelong learning should be incorporated into this ecological consciousness, with a focus on the complexity of environmental concerns and educational strategies that are open to all members of society. The consumer's environmental and social understanding of the manufacturing process will be improved as a result of this education. Environmental awareness, which encompasses issues like global warming, carbon footprint, sustainable development, urban mobility, and renewable energy, is also viewed as a crucial component in the fight against climate change. Therefore, there is an urgent need for both individual and communal environmental responsibility as well as active participation from both society and governments (Simsekli, 2015).

According to Mohan *et al*. (2016), biorefineries provide a green and sustainable alternative to typical petrochemical refineries for a better use

of waste by generating a variety of marketable bioproducts apart from bioenergy. Through a variety of biotechnological processes that support the CE, leftovers and garbage that would typically be discarded in a linear economy are therefore valorized, gaining more and more societal acceptance in today's society.

To encourage the use of renewable energies, the global economy has invested in environmental education and climate awareness programs, yet the outcomes are still insufficient. Businesses are putting more emphasis on their socio-environmental responsibilities in an effort to contribute to a more sustainable world and to appeal to consumers who are becoming more conscious of the issue. Being environmentally conscious, socially responsible, and implementing improved governance procedures all help organizations' balance sheets (Barman, 2018). Organizations that follow best management practices, such as adopting socio-environmental best practices, probably end up with more sustainable operations in a number of areas, such as risk and economic management, and as a result, produce better outcomes over time (Witold; Koller; Nuttall, 2019).

ESG (environmental, social, and corporate governance) metrics have a number of beneficial effects, including increased profitability and even a gradual increase in market value. CE is being adopted by companies in an effort to "design out" waste. Green take-back, considered the cornerstone of the CE, reduces wastage of residues and creates less waste as products are engineered for easy disassembly and multiple reusability cycles. CE is distinguished from disposal and even recycling, where significant amounts of energy are lost, by these rigid component and product cycles. Second, circularity clearly distinguishes between a product's consumable and durable parts. In the CE, humans are users rather than consumers. In the CE, sharing or renting commodities takes the role of the linear model's buy and consume logic. The fact that products are returning to the productive system is essential. This is why it is crucial to make everyone aware of their duty in light of the depletion or exhaustion of the planet's resources (Seroka-Stolka; Ociepa-Kubicka, 2019).

Kalmykova, Sadagopan and Rosado (2018) evaluate both theoretical approaches – such as papers providing case studies of CE implementation

– and implementation tactics in order to assess the current stage of CE implementation in various companies. While certain components of the value stream, such as consumption and recycling, are prominent, other elements, such as manufacture and distribution, are seldom ever highlighted, according to the authors. In contrast, the author emphasizes that several market-ready solutions currently exist based on the levels of execution of the tactics employed to create CE.

To counter the existing status quo of expensive green choices, Bradley *et al*. (2018) propose a "Total Life Cycle Cost" model in favor of the adoption of the CE and its applicability to post-recovery resource allocation. Considering that more and more consumers are calling for changes in this regard, the foundation of this model should also necessitate a general process innovation in support of the adoption of CE in order to achieve a favorable net cost-benefit of the entire life cycle of products.

The employment of multi-objective closed-loop supply chain models for durable goods, taking into account energy, emissions, and recovery facilities in the direction of a CE, is also suggested by Atabaki *et al*. (2020). These many models, which were created to address various sorts of uncertainty, demonstrate the advantages of circularity in comparison to the conventional linear economy. According to O'Connor *et al*. (2016), these models include the creation of new materials to replace non-recyclable materials, manufacturing procedures that allow for the use of recycled materials, the design of devices for disassembly, technology interventions and fabrication efficiency, that enable the recovery of residues, and new techniques to acquire and separate these residues.

The globe must seek energy efficiency and decarbonization, while putting a priority on renewable energy. To achieve sustainable growth that leaves no one behind and meets the needs of communities who still rely on fossil fuels and are at risk of energy poverty, there should be an urgent focus on CE and a just energy transition. According to Mohan *et al*. (2016), a CE is an economy in which the generation of bioenergy and biomaterials is growing in importance and so reducing a nation's carbon footprint.

To encourage conscientious consumption, it is essential to increase knowledge of how people consume. This notion expands as more people

become aware of the effects of each good produced, from the use of natural resources to make a good to the end of its useful life and its disposal. Every step of this procedure has positive effects on the surrounding environment. Basic attitudes can help us change the current situation by lowering waste production, pollution, and deforestation, which will slow down the damaging effects on the environment. As a result, the idea of a CE places more emphasis on resource production and creation than just resource use, creating the theoretical groundwork for resource management in line with the objectives and duties of the "green economy" and sustainable development (Mishenin; Kobliansla, 2017). The CE idea places equal emphasis on resource formation and resource generation as it does on resource usage, creating a novel methodological foundation for resource management that is in accordance with the objectives of a green economy and sustainable development.

Sustainable consumption refers to a notion that describes a series of deliberative decisions about the acquisition, use, and disposal of goods that are no longer useful. Understanding how human attitudes affect the environment and have the potential to harm it and jeopardize life on Earth makes the aforementioned activities possible. Therefore, it is up to each individual to make decisions that benefit the environment or at the very least lessen its negative effects. Sustainable consumption is defined as encompassing responsible consumption across the full supply chain, green consumption, and aware consumption strategies (Gillani; Kutaula, 2018).

Sustainable consumption entails picking out goods that 1) required fewer natural resources in production, 2) ensured adequate employment for people who made them, 3) must be easily reused or recycled, and 4) the consumer actually needs. Particularly following the discussions in Rio 92, the United Nations Conference on Environment and Development, this approach gained popularity. Unsustainable consumption and production patterns, particularly in developed nations, are the principal contributors to the world environment's ongoing decline. Such consuming tendencies of production and consumption exacerbate poverty and imbalances, which is a key source of worry. In order to ensure sustainable and ongoing development, it became clear that the social, environmental, and economic

spheres needed to be balanced. In other words, even if consumption is one of the key factors influencing a country's economy, it is crucial to consider its effects on nature and adjust it to stop the earth from degrading (Young *et al.*, 2010).

Sustainable consumption is important because it raises everyone's awareness of the need for individual environmental preservation efforts. based on the idea that every action matters and that it is possible to change the game gradually, allowing for more sustainable progress each time. However, for this to happen, everyone needs to take part rather than relying primarily on governments and other authorities to fight reckless consumerism. Without a concerted effort by everyone, environmental deterioration will continue to increase, aggravating an already worrisome situation (Machado; Richter, 2020).

The Earth lost around 60% of its vertebrate animal species between 1970 and 2014, according to data gathered for a United Nations report. Around one million species are currently in danger of going extinct because of human actions that endanger ecosystems. 42% of terrestrial species, 34% of aquatic species, and 25% of marine species in invertebrates are currently under danger of going extinct. Anthropogenic pollution is a further danger to marine life. Approximately eight million tons of plastic are discarded into lakes, rivers, and oceans each year. Another element that endangers life on the planet is global warming, which is brought on by an increase in the greenhouse effect as a result of the production of toxic gases. The average temperature has increased between 0.8ºC and 1.2ºC, since the end of the 19th century, which has an impact on survival and quality of life in diverse parts of the world. By 2050, researchers predict 4.5 million to 7 million premature deaths if degradation keeps up its current rate (UNEP, 2019). As a result, there is a need to increase public awareness of the value of sustainability and to take individual and communal steps to reverse the situation, with an emphasis on sustainable consumption and circular economy. It's crucial to shift to more mindful consumption because this offers numerous benefits for the environment, organizations, and society as a whole.

5 CONCLUSIONS

One example of environmental consciousness is Green Recovery. The global movement stands for a more sustainable and inclusive economy that makes investments in key industries and uses resources wisely, creating more employment and enhancing the economy and environment, such as through lowering greenhouse gas emissions. The coronavirus pandemic gave rise to the concept because it raised the possibility that restarting economic activity based on natural resources and a linear economy logic could lead to more problems than it would solve in the long run. Furthermore, considering a "greener economy" promotes CE and the development of more sustainable cities with higher quality of life. Utilizing technical advancements, activities of sustainable consumption for CE through green recovery will pave the path for sustainability and the growth of a bio-based society by enabling CE.

Another activity is aimed at the growing global movements for conscious consumption. People who incorporate the concept into their daily lives are more likely to take actions that have long-term social, environmental, and economic advantages in addition to those that have immediate benefits, such as not wasting, but recycling waste. Some instances of more proactive behavior for the common good include supporting environmental protection policies with your vote.

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