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# Green Supply Chain Management and Circular Economy: Linking Practices from Two Emerging Agenda

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The main purpose of this work was to verify the existence of interface between two important research agenda: green supply chain management and circular economy. For that, all the articles that related to the search terms established were in the two main international databases (scopus and web of science). In total, 97 articles were found that were analyzed by all coauthors. The results point that, in fact, there is a significant interface between Green Supply Chain Management and Economy Practices.

**Keywords:** Circular Economy; Green Supply Chain Management; Sustainability**Introduction**

Globalization has brought numerous benefits; however, several challenges, such as a broader and more competitive market, have made supply chain management increasingly complex [1]. Additionally, environmentally conscious consumers [2], limited resources, a growing rate of global consumption, and the estimate that resource utilization is set to triple by 2050 [3], have driven companies to rethink and design new business models to address these challenges, especially in the supply chain [4]. Thus, there is a need to pursue resilience in supply chains [5] as the current linear model of take-make-consume-dispose is becoming increasingly unsustainable [6].

It is in this context that the concept of Circular Economy (CE) emerges, a kind of regenerative economy [7,8] aimed at prolonging the lifespan of materials/resources/products by “circulating” them for much longer [9,10]. CE has recently become the focus of research, including within supply chains [11,12].

In common, these studies point out strategies for implementing CE in supply chains [11] or highlight the importance of Green Supply Chain Management (GSCM) in adopting CE practices [12]. However, none of them (based on published knowledge in Scopus and Web of Science) clearly delineates the interfaces between GSCM and CE, especially concerning the relationship between the main practices of these two research agendas.

In this context, this article aims to identify the connections between these two concepts through the joint analysis of the main practices of GSCM and CE, seeking to answer the following research question: how can the practices of green supply chain management leverage the practices of the circular economy?

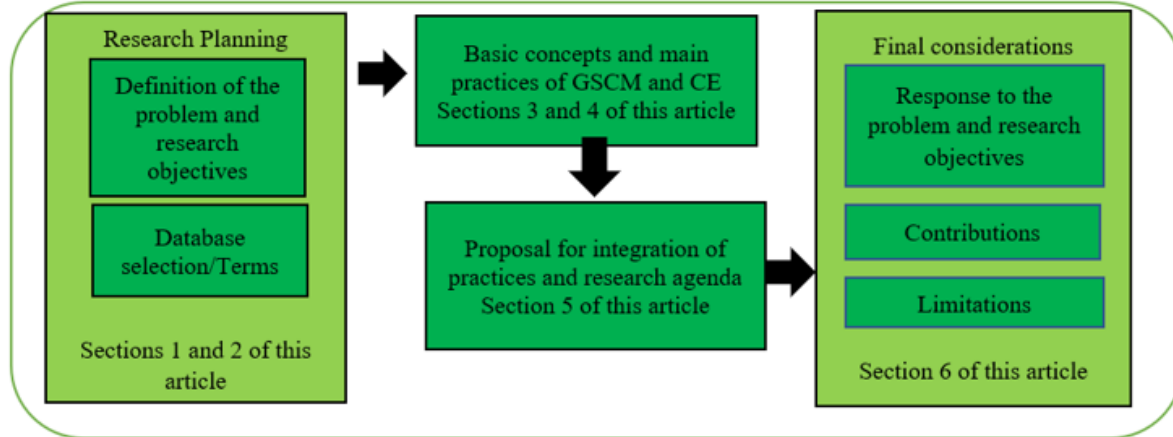
**Research Methodology**

As the aim of this research is to integrate practices from two important sustainability themes, GSCM and CE, we conducted a

search for indexed documents in the Scopus and Web of Science databases, considered the most widely used for literature reviews by researchers from various institutions around the world [13].

Operationally, the research was conducted in March 2021, using the terms “circular economy” and “green supply chain

management,” “circular economy” and “sustainable supply chain,” “sustainability” and “supply chain,” and “supply chain” and “circular economy” as keywords, in the article titles and abstracts. The results returned 94 articles that were individually analysed by all authors. Figure 1 summarizes the methodological steps of this research.



Source: elaborated by the authors  
Figure 1: Research Steps.

## Literature Review

### Circular Economy

Circular Economy (CE) has been identified as an alternative model for more sustainable manufacturing and consumption [14] as it can drive changes to enhance sustainability, increase resilience [15], and ensure economic growth by providing an outlet for “resource scarcity” through reuse and re-consumption, which are essential for the economy, thus contributing to a more sustainable community [16] and the achievement of the Sustainable Development Goals (SDGs) [17].

To seize these opportunities in the supply chain, certain CE practices are necessary. Govindan and Hasanagic [18] conducted a study aimed at providing a diagnosis of the factors, barriers, and practices that drive the implementation of the circular economy in supply chains. As a result, they identified a total of 34 CE practices classified into 8 categories based on the literature and their similarity: governance initiatives, economic initiatives, clean production, product development, management support, infrastructure, knowledge and social, and cultural aspects. These practices are presented in Table 1. Despite the benefits that CE can bring, its implementation in organizations is not a simple task, as there are several barriers, such as: lack and/or complexity of legislation and regulations [18], lack of qualified personnel [19], lack of awareness among stakeholders [20], lack of technology [20], complexity and/or lack of coordination in supply chains [21], cultural/social issues (habits and behaviors, for example) [22], and most of these barriers are also barriers to GSCM [23]. Therefore, since GSCM is already more developed than CE, its

practices can facilitate the implementation of CE in organizations [24]. It is, therefore, mandatory to examine the concepts of CE implementation within the framework of the supply chain, where studies are insufficient [18], offering a new vision for sustainability to supply chains [25].

### Green supply Chain Management (GSCM)

It is understood that industrial development is of paramount importance for economic growth; however, it is necessary to balance economic success and pollution mitigation to maintain sustainability at acceptable levels [26]. In this context, organizations are adopting GSCM practices as a means to achieve economic benefits and minimal environmental damage [27]. Sarkis, Zhu, and Lai [28] consider GSCM as the application of environmental concerns in the practices of managing a common supply chain. Zhu, Sarkis, and Geng [29] further argue that GSCM is considered an indispensable approach for organizations aiming to become environmentally sustainable. According to Awan, Kraslawski, and Huiskonen [30], GSCM practices are considered important by academia as they promote sustainable development and positively influence environmental, social, and financial performance aspects [31], as well as increasing customer satisfaction and attraction [32].

Several authors have presented the main GSCM practices that can be adopted by an organization; in particular, Zhu, Sarkis, and Lai [33] brought to light a set of 23 practices categorized into 5 groups: internal environmental management, green purchasing, customer cooperation, eco-design, and return on investment. These GSCM practices can minimize resource consumption and improve corporate image while enhancing operational

performance and compatibility among customers, suppliers, society, and the environment, which can favor CE. Furthermore, GSCM can help organizations expand their market participation, increase competitive advantage, achieve sustainable development, and maintain a balance between economic, fiscal, social, and environmental benefits; therefore, a positive interface between GSCM and CE practices is perceived [24].

## Results and Discussions

### GSCM and EC Practices: A Perspective of Linkage

Considering the arguments presented in the previous sections, this section aims to present the possible synergies between GSCM and CE practices. Thus, in Table 1, GSCM practices and their interfaces with CE practices are listed.

**Table 1:** GSCM Practices and Interface with Circular Economy.

EC Practices	Interface between GSCM and EC Practices
Governance Initiative	Governance initiatives are considered by De Oliveira, et al. [49] as direct influencers of the adoption of green management practices. The authors find that governance initiatives also directly influence CE. Thus, it becomes unequivocal that the themes have interfaces, and that cooperation may exist.
Pilot projects for CE in SC (Supply Chain)	Green supply chain practices have been developed to promote the reduction of negative aspects of the production process on the environment. Simultaneously, the topic of CE has been receiving more attention in the literature and in organizations.
Performance indicators in recycling, reuse, and remanufacturing in SC	In a CE, GSCM requires a more coordinated development of socioeconomic and ecological environments and requires organizations to consider environmental protection factors in product design, packaging, procurement, production, sales, logistics, waste, recycling, and remanufacturing [52]. As a result, we can infer that GSCM can contribute to CE so that it achieves recycling and remanufacturing indicators. According to Caniato, et al. [42] and evaluating and monitoring suppliers' environmental performance and selecting them based on this would have a positive impact on their participation, as well as improve the implementation of GSCM practices throughout the SC.
Commercialization of remanufactured products in SC	In the GSCM practice of investment recovery, the idea is to recover part of the money invested in recycling or reselling products at the end of their useful life [72], which can contribute to the marketing of remanufactured goods.
Increasing employment rates in SC for CE (economic initiatives)	Sarkis, et al. [28] points out that adopting GSCM practices leads organizations to significant improvements, such as increased market share. Such an increase can mean higher employment rates and consequently support CE in this regard.
Separating the economy in SC and environmental impacts	Zeng, et al. [70] conceptualize that it is necessary to include GSCM in EC supply chain management. According to the authors, this enables organizations to achieve an ideal balance of economic, social, operational, and environmental performance.
Increasing environmental accounting in SC for companies	[48] state that environmental accounting addresses the expression of environmental and social liabilities as environmental costs. Therefore, the increase in environmental accounting becomes important for both EC and GSCM.
External Taxes	According to Al-Ghdabi, et al. [38], green supply chain management practices can provide benefits for adopting organizations, such as obtaining investment funds, operational licenses, and tax exemptions. As a result, it can be observed that GSCM practices can contribute in this aspect to EC practices.
Tax Benefits	GSCM helps companies expand market participation, increase competitive advantage, achieve sustainable development, and maintain a balance between economic, fiscal, social, and environmental benefits [24]. Thus, GSCM is capable of integrating EC into this practice [24].
Taxation of non-renewable energy to make the purchase of renewable products by suppliers attractive	Green, et al. [53], Cosimato and Troisi [44], consent by emphasizing that GSCM is increasingly incorporating innovation into SC management practices. Jabbour and Jabbour [56] corroborate, illustrating that innovation is often used for environmental purposes, aiming to increase energy efficiency, reduce companies' dependence on fossil fuels, and introduce green and renewable energy sources. Given the above, it can be concluded that GSCM can assist EC in renewable energy use.
Setting the right product price in relation to the cost of reuse / remanufacturing / recycling in SC	According to Bing, et al. [39], return on investment in the context of EC through the principles known as the 3Rs (reduction, recycling, and reuse of materials). The main activities of these principles include reverse logistics, product return programs, recycling systems, and sale of surplus materials, such practices can also be found within GSCM.
Economic initiatives to reduce risk for companies, as there are high initial investment costs in SC	GSCM can help organizations expand market participation, increase competitive advantage, achieve sustainable development, and still achieve a balance between economic, social, and environmental benefits [24]. Therefore, GSCM has the potential to assist EC in economic initiatives that attract organizations and also reduce implementation risks.
Clean production	According to Dawei, et al. [46], one of the goals of GSCM is to reduce environmental pollution through sustainable production. It is inferred, therefore, that GSCM practices aim for clean production, which can integrate EC practices.
Cleaner procurement	The success of GSCM within EC encompasses the entire organization. Chavez [45] points out that the relationship with suppliers for obtaining ecological inputs, through clean purchasing, is essential for achieving success.
New strategies in SC	For Kazancoglu, et al. [59], GSCM in the context of EC provides new strategies for optimizing resources, being seen as a resource for solving environmental issues.
Cooperating with other companies to enable reuse / recycling / remanufacturing	Sarkis [62] considers that the main element of GSCM is the reduction of environmental impacts through reduction of resources, component reuse, recycling, and remanufacturing, which can be maximized with the cooperation of other organizations.

Introduction to reclassification in production	Current production needs to be reclassified for clean production, which aims to eliminate the negative impact of production processes and products on the environment [47]. According to Silva, et al. [64], production should consider reducing resource and waste usage, life cycle analysis (LCA), eco-design, and pollution prevention, such considerations are part of GSCM practices and can support EC.
Implementing new logistics system pathways	Authors consider that one of the GSCM practices (green/reverse logistics) can promote the circular economy while also promoting the overall economic development of countries [58].
Standards for refurbishment quality	According to Tseng, et al. [68], the EC vision in production does not consider the overall quality of the product and its effects on production and remanufacturing efficiency and sustainability. This gap can be filled by GSCM, as according to Sarkis [62], GSCM aims to reduce environmental impacts by focusing on reducing, reusing, recycling, and remanufacturing.
Measurable data to measure environmental performance regarding CE initiatives implemented in SC	The article by Yu; Chen [24], after investigating the trajectory of knowledge dissemination in the SC, supports that theoretical innovation topics of the performance assessment method of the entire supply chain and EC based on the triple bottom line may be a possible research direction for scholars in the field; as it can provide measurable data for measuring the environmental performance of initiatives adopted by the organization.
Appreciable design and durable design to enable implementation in SC	The GSCM practice called eco-design can support EC in this aspect, as according to Green, et al. [54], this GSCM practice aims at designing sustainable products and processes through the use of recyclable and reusable materials, reducing energy consumption, and emissions of waste.
Top management support for introducing CE in SC	Senior management support is essential for implementing GSCM as well as for EC, as the implementation of these practices involves a more coordinated development of socio-economic and ecological environments and requires companies to consider environmental protection factors in product design, packaging, procurement, production, sales, logistics, waste, and recycling [52]. Therefore, it is inferred that the themes have interfaces as they require senior management support.
Sustainable infrastructure to facilitate CE implementation for companies	Carter and Rogers [43] consider that GSCM consists of the strategic alignment of the organization's social, environmental, and financial objectives. The authors argue that alignment occurs through the coordination of infrastructure and business processes among chain organizations with the aim of improving economic performance. Thus, it can be inferred that GSCM can support the implementation of EC through its sustainable infrastructure.
Efficient information system to track materials in recycling.	Hu and Hsu point out that one of the critical success factors for GSCM is information management, as according to the authors such information can be used to demonstrate compliance with environmental standards and specific requirements. Thus, it becomes notable that GSCM can support EC by providing a path to an efficient information system.
More awareness of the circular economy to make it attractive for suppliers and consumers to purchase remanufactured products.	Authors Simpson and Samson [65] and Dubey, et al. [50] consider that GSCM becomes more attractive to suppliers and consumers when implementing quality management and ISOs 9001 and 14001 because in this way environmental performance is improved, facilitating the implementation of green practices. In view of this, GSCM can contribute to EC by showing how to make it more interesting from the stakeholders' perspective.
Education on recycling, remanufacturing, and reuse.	According to Yang [71], one of the paths for GSCM in the context of EC to achieve recycling, remanufacturing, and reuse is through the application of the 3Rs principles. Zeng, et al. [70] includes that GSCM is necessary for EC because through the 3Rs it is possible to achieve an ideal balance of economic, social, operational, and environmental performance for a company.
Training regarding CE in the supply chain.	The implementation of GSCM practices requires employees to be able to adopt sustainable practices, for this, it is necessary for them to be trained on environmental aspects [60, 66]. JABBOUR, et al. [56] complement by considering that employee involvement and the use of incentive programs to stimulate initiatives and develop methods and ideas aimed at improving the environmental impact of the company and SC activities were strongly associated with success in implementing GSCM practices.
Visionary thinking	Bonera [40] considers that green management practices are unique to each country's reality, thus organizations aiming to go green need to think beyond the traditional. In view of this, EC requires organizations to have a visionary vision, so that it is actually implemented.
Changing attitudes throughout society towards recycling, reuse, and remanufacturing	The GSCM practice that can assist EC in this aspect is called eco-design, considered by [33] as the design of products for reduction, reuse, recycling, or recovery of materials and components, in addition to avoiding or reducing the use of hazardous and toxic products.
Consumers shifting from the linear model to the CE	For Zhu, et al., [33], the critical success factor for the "green product/process development" practice is its connection with the "cooperation with customers" practice, as the joint work of these practices leads to success in developing products, services, and processes that include environmental issues.
Simplified lifestyle by end consumers	A minimalist lifestyle is considered by Kang, et al. [57] as a strong trend among consumers. The authors also consider that this lifestyle will begin to influence organizations to seek more sustainable production methods that align with the minimalist style. One of the GSCM practices is cooperation with customers [33], thus cooperation can meet the customers' need for a minimalist lifestyle, as well as bring advantages to the organization. Additionally, it can contribute to EC so that it provides products that meet consumer needs through sustainable production.

**Source:** Prepared by the authors.

## Final Considerations

Sustainable supply chains and circular economy (CE) principles can provide long-term pathways for building economic resilience

and supply chain robustness while contributing to social and environmental sustainability [34]. In this sense, this study aimed to demonstrate the potential interfaces between these two important and promising research agendas: GSCM and CE.

To achieve this, Table 1 was constructed, in which, for each CE practice, interfaces with GSCM practices were presented. This proposed relationship, detailing the connection between GSCM and CE, had not yet been presented in the specialized literature to the best of our knowledge. Thus, this study contributes to the GSCM and CE literature by demonstrating that their practices indeed have similarities [35], that GSCM is an important step towards CE [36], and therefore, they possess significant synergy [37-72]. Additionally, this work contributes to organizational practice by listing and correlating the GSCM practices capable of favoring the adoption of CE in organizations. For future research, it is suggested that scholars empirically identify how and why this relationship occurs and which GSCM practices contribute most to the adoption of CE in organizations, through case studies and surveys.

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## Conflicts of Interest

There is no conflict of interest.

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