

ENVIRONMENTAL INITIATIVES IN SUPPLY CHAIN MANAGEMENT: PERSPECTIVES FROM THE AUTOMOTIVE INDUSTRY

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ABSTRACT

This paper explores how supply chain management (SCM) contributes to organizations' ESG objectives, with a specific focus on the “E” (Environment) and a big focus on the automotive industry. This paper is built by integrating content from key studies to examine how SCM practices contribute to a company’s ESG initiatives – specifically the Environmental pillar. The analysis reveals that institutional pressures, eco-design, green purchasing, reverse logistics, and collaborative governance play pivotal roles in aligning operational performance with ESG goals, generating competitive advantage, and meeting regulatory and stakeholder expectations. However, despite these advances, significant challenges remain in transforming environmental initiatives into true strategic objectives within supply chain management. From a practitioner’s perspective, accelerating this transformation will require stronger cooperation across multiple spheres including supply chain tiers, governmental bodies, and local communities to ensure that environmental goals are not treated as isolated projects, but as integrated drivers of long-term business strategy.

Keywords: Green Supply Chain; ESG; Supplier Management; Organizational Processes; Sustainability; Innovation; Automotive Industry.

1 INTRODUCTION

The increasing demand for organizations to integrate ESG principles into their operations has reshaped the role of supply chain management. ESG practices are no longer a peripheral concern but a core element influencing risk management, competitiveness, and long-term value creation (Yuan et al., 2025). Supply Chain Management (SCM) traditionally focused on efficiency, cost reduction, and responsiveness, now extends to environmental stewardship as companies seek to meet the growing expectations of regulators, customers, and investors.

SCM can therefore play a pivotal role in achieving Environmental (ESG) targets, particularly through green procurement practices such as supplier assessment, suppliers’ processes audits, and collaborative sustainability initiatives. By embedding environmental criteria into supplier evaluation and relationship management, firms not only ensure compliance but also foster innovation, enhance resilience, and strengthen legitimacy in increasingly complex global markets.

Despite growing recognition of its strategic relevance, many organizations still face challenges in translating environmental commitments into operational practices across their supply chains. This gap between intention and implementation represents a critical area of study, especially in industries with high environmental impact, such as the automotive sector.

This study addresses the core issue of: How can supply chain management (SCM) initiatives effectively support the environmental dimensions of ESG targets, bridging the gap between strategic intent and measurable impact? Accordingly, this paper examines how SCM contributes to ESG objectives, with specific emphasis on the integration of environmental criteria into supplier selection and collaboration.

The analysis builds upon a systematic literature review and positions the automotive industry as a compelling context to understand both the opportunities and the limitations of green supply chain practices in advancing corporate sustainability agendas. The Systematic Literature Review (SLR) was conducted following a structured protocol based on the

methodology proposed by Tranfield et al. (2003). To ensure comprehensive coverage of the study's core themes, a set of carefully selected keywords was applied across two major academic databases: SCOPUS and Web of Science. The search strategy included combinations of terms such as “sustainable supplier selection”, “green supply chain”, “sustainable purchasing”, “sustainable procurement”, and “green supplier selection”, in conjunction with “automotive industry”. This approach aimed to capture relevant publications addressing the intersection of sustainability and supply chain management within the automotive sector.

To ensure the relevance and quality of the selected studies, three exclusion criteria were applied during the screening process: 1) Removal of duplicate records: Articles retrieved from both SCOPUS and Web of Science were cross-checked to eliminate duplicates, ensuring that each publication was considered only once. 2) Journal quality filtering: Only articles published in journals ranked within the first and second quartiles (Q1 and Q2) according to the Scimago Journal Rank (SJR) were retained. This criterion was adopted to guarantee a high standard of academic rigor and impact. 3) Thematic relevance: Publications that lacked clear alignment with the core themes of sustainable supplier selection and green procurement within the automotive industry were excluded. This step involved a manual review of titles, abstracts, and, when necessary, full texts to assess adherence to the research scope. The overall scope and filtering process of the SLR are illustrated in **Appendix A**.

2. The evolution of environmental priorities in Supply Chain Management

When the ISO 14000 series was implemented, in the early 1990s, most companies treated it as a “good to have” premise rather than a mandatory requirement during the homologation of new suppliers (Nunes & Bennett, 2010). However, the evolution of environmental management over recent decades shows a significant shift in this mindset. Beamon (1999) documents how environmental management evolved from basic pollution control and risk management practices in the 1970s, to pollution prevention in the 1980s, followed by the implementation of systematic product and process management approaches – the launch of the ISO 14000 series – and the rise of life cycle and industrial ecology frameworks.

This progression has led to environmental management being recognized not merely as compliance or reputation management, but as a core strategic capability area for companies seeking to remain competitive in the modern global economy (Corbett & Klassen, 2006; Nunes & Bennett, 2010).

Nevertheless, the challenge to many organizations in the implementation and maintenance of sustainability practices, is the fact that environmental protection is strongly recognized as a public good, rather than something necessary to protect business profitability (Orsato, 2006). Over time, however, firms have increasingly recognized the importance of carefully selecting and monitoring their suppliers, thereby mitigating risks associated with supplier practices that could harm the automakers' reputation both in the market and within society (Vanalle et al.; 2014).

“Industry 4.0 technologies can influence the implementation of Green supply chain (GSC) practices within automotive industry, with a likely indirect influence on the supply chain performance.”
(Gadge et al., 2022, p. 2).

Supply chain management (SCM) is a complex process aimed at systematically managing a big set of activities – from customer's order to end-product delivery in a well-organized manner (Yazdani et al.; 2017). This includes managing a lot of risks while also seizing opportunities in the several processes that configure SCM: supplier homologation and selection; product planning and development; storage and handling of raw material and

components; storage and handling of finished goods; inbound and outbound logistics and many others.

Green Supply Chain Management (GSCM) integrates environmental considerations into supply chain activities, including green design, purchasing, manufacturing, and logistics (Srivastava, 2007).

“Adding the “green” component to supply chain management involves addressing the influence and relationships between supply chain management and the natural environment”
(Srivastava, 2007, p. 54).

In the German automotive sector, Thun and Müller (2010) found that pressures from regulations and customers drive GSCM adoption, improving both environmental and operational performance. Similarly, Lopes and Pires (2020) reported that Brazilian automotive firms implement eco-design, green purchasing, and reverse logistics to enhance environmental outcomes, aligning with global trends (Bowen et al., 2001; Sarkis et al., 2011). Institutional theory suggests that coercive, mimetic, and normative pressures compel firms to adopt sustainable practices (DiMaggio & Powell, 1983). And still, such normative pressures come from the market in the form of customers’, suppliers’ and partners’ expectations (Szasz et al., 2021). Vanalle et al. (2017) demonstrated that suppliers in Brazil respond to such pressures by improving green practices, positively impacting environmental, economic, and operational performance. Studies in Europe (Zhu et al., 2013) and China (Zhang & Chen, 2013) confirm that institutional pressures accelerate GSCM adoption across regions. Yazdani et al. (2017) proposed an integrated framework using quality function deployment (QFD) and multi-criteria decision-making (MCDM) for sustainable supplier selection, balancing cost, quality, and environmental criteria. This is supported by Kannan et al. (2013), who emphasize that green supplier selection enhances competitive advantage by reducing risks and improving innovation.

Nunes and Bennett (2010) highlight that innovation, such as green buildings and eco-friendly processes, strengthens ESG outcomes by reducing energy use, emissions, and waste. Moving from traditional to sustainable supply chains requires integrating environmental metrics into SCM processes, supported by digital technologies and advanced analytics (Masoumi et al. 2019).

3. The automotive industry practices

In the automotive industry, green supply chain management (GSCM) activities are increasingly embedded across multiple operational layers, including eco-design, green procurement, manufacturing, logistics, and end-of-life product management. Major automakers such as Volkswagen, Ford, and Toyota have incorporated environmental criteria into supplier selection processes, demanding ISO 14001 certification, promoting eco-friendly materials, and collaborating on cleaner production methods (Nunes & Bennett, 2010; Koplin et al., 2007).

This has not only worked in the reduction environmental impacts but also driven innovation in areas such as lightweight materials, fuel efficiency, and alternative propulsion technologies. The integration of green practices across the value chain enables firms to comply with environmental regulations, such as the EU End-of-Life Vehicles Directive, while enhancing competitive differentiation (Masoumi et al., 2019).

One notable finding across case studies is the importance of institutional pressures – particularly regulatory, customer, and competitor demands – in accelerating GSCM adoption. In Brazil, for instance, Lopes and Pires (2020) and Vanalle et al. (2017) observed that automakers and their suppliers engage in practices such as green purchasing, eco-design, and

investment recovery (e.g., selling scrap and excess materials) to comply with both domestic and international environmental expectations.

While internal environmental management practices, such as establishing dedicated sustainability teams, are foundational, collaboration with upstream and downstream partners is essential for achieving tangible outcomes. Importantly, the Brazilian automotive sector highlights the challenge of balancing cost constraints and environmental goals, with smaller suppliers often struggling to meet green standards without technical or financial support (Drohomeretski et al., 2014).

To ensure a comprehensive and strategic supplier selection process, multicriteria decision-making approach have being adopted by firms, incorporating key evaluation dimensions such as cost, quality, delivery performance, health and safety compliance, sustainable product design, ISO 14001 certification, investment recovery, and green packaging (Çalic, A. 2021; Tronnebati et al.; 2024).

Organizations can reduce environmental hazards and improve their standing as ethical corporations by integrating environmental factors into their supplier selection processes. This proactive strategy promotes long-term sustainability throughout the supply chain in addition to encouraging environmental responsibility. (Tronnebati et al., 2024)

Innovation and digitalization are reshaping how automakers manage environmental impacts across their supply chains. For example, Nunes and Bennett (2010) benchmarked global leaders and found that beyond traditional practices like green manufacturing and reverse logistics, companies are investing in green buildings, advanced materials, and life-cycle assessments to measure and reduce emissions holistically. Yazdani et al. (2017) emphasized the importance of multi-criteria decision-making tools to balance traditional supplier metrics (cost, quality, delivery) with environmental and social criteria, ensuring that sustainability is embedded not only in design but also in procurement and operations. Furthermore, Masoumi et al. (2019) underlined the growing relevance of technologies such as blockchain and IoT for increasing supply chain traceability, enabling more precise monitoring of environmental performance and helping firms meet their ESG commitments.

4. CONCLUSION

Supply chain management plays a pivotal role in advancing the environmental objectives of ESG strategies, particularly in the global automotive sector. The integration of green supply chain management (GSCM) practices - including eco-design, green procurement, reverse logistics, and supplier collaboration - has proven essential not only for meeting regulatory requirements but also for fostering innovation, operational efficiency, and competitive differentiation (Thun & Müller, 2010; Nunes & Bennett, 2010; Masoumi et al., 2019).

Over time, regulatory pressures and stakeholder demands have transformed environmental management from a peripheral obligation into a central element of corporate strategy (Corbett & Klassen, 2006; Srivastava, 2007). The literature shows that GSCM generates concrete ESG benefits: environmental improvements through waste and emission reductions, social gains via supplier development and community engagement, and governance advancements through transparency and certifications (Jabbour & Jabbour, 2009; Nawrocka et al., 2009). Still, organizations -especially small and medium-sized suppliers- face significant barriers to implementing GSCM, such as cost pressures, technological gaps, and limited capabilities. These obstacles underscore the need for institutional support, knowledge transfer, and collaborative governance across supply chain tiers (Drohomeretski et al., 2014; Vanalle et al., 2017). In response, firms are increasingly adopting digital

technologies like blockchain and advanced analytics to enhance traceability, decision-making, and continuous improvement (Masoumi et al., 2019; Yazdani et al., 2017).

Looking ahead, the consolidation of GSCM requires stronger multi-tier collaborations, refined supplier evaluation frameworks that integrate environmental and economic criteria, and sustained investment in eco-innovation. Above all, companies must understand GSCM not as a collection of isolated practices but as a systemic approach that connects all stages of the supply chain, from product design to end-of-life management. As the automotive industry advances, those firms embedding ESG principles holistically into their supply chain strategies will be best positioned to achieve long-term competitiveness, regulatory alignment, and stakeholder trust (Nunes & Bennett, 2010; Lopes & Pires, 2020).

Yet a central question persists: will sustainability initiatives truly occupy a leading role in strategic decision-making, or remain confined to glossy reports and executive speeches? The ultimate challenge lies in reconciling short-term profitability pressures with long-term sustainability imperatives - a balance that demands not only managerial courage but also a transformative vision of corporate responsibility.

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APPENDIX A – Tranfield method application in the process of the systematic literature review. Below figure presents the systematic literature review carried out for this research.

