

INTEGRATING CIRCULAR ECONOMY PRINCIPLES INTO SUSTAINABLE SUPPLY CHAINS: THE ROLE OF GREEN MANAGEMENT PRACTICES - A SYSTEMATIC REVIEW

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ABSTRACT

The circular economy (CE) has emerged as a restorative alternative to the linear “take-make-dispose” model by eliminating waste and pollution, keeping products and materials in use at their highest value, and regenerating natural systems. This systematic review synthesizes the growing body of literature (2018-early 2026) on the integration of CE principles within sustainable supply chain management (SSCM), with particular emphasis on green management practices as critical enablers. Using the PRISMA protocol, the analysis draws from bibliometric studies, empirical research, case studies, and practitioner frameworks to demonstrate how green supply chain management (GSCM), reverse logistics, strategic alliances, and digital technologies facilitate closed-loop operations. Research output has grown exponentially since 2018, driven by the UN Sustainable Development Goals, EU regulations, and corporate ESG pressures. Key outcomes include enhanced resource efficiency, supply chain resilience, greenhouse gas reductions, and innovative business models. This review proposes a multi-level conceptual framework, critically examines benefits and barriers (with special attention to developing economies), and identifies persistent research gaps. It offers practical implications for managers and policymakers aiming to build regenerative supply

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Introduction

Global supply chains face unprecedented challenges from resource scarcity, climate change, geopolitical disruptions, and tightening regulations such as the EU Circular Economy Action Plan and Extended Producer Responsibility directives. The traditional linear economic model intensifies these pressures through excessive dependence on virgin materials and waste generation. The circular economy (CE) provides a systemic response based on three principles: (1) eliminate waste and pollution, (2) circulate products and materials, and (3) regenerate nature. Sustainable supply chain management (SSCM) incorporates the triple bottom line across all value chain stages, while green management practices-primarily through GSCM-embed environmental criteria into sourcing, production, logistics, and end-of-life processes. This systematic review addresses three core questions: (1) What are the theoretical linkages among CE, SSCM, and green management? (2) What empirical evidence and cases illustrate effective implementation? (3) What are the benefits, barriers (especially in developing contexts), opportunities, and future research directions?

Methodology

This study follows the PRISMA 2020 guidelines for systematic reviews. A comprehensive search was conducted in Scopus, Web of Science, and Google Scholar using keywords such as “circular economy,” “sustainable supply chain,” “green supply chain management,” “reverse logistics,” and “circular supply chain.” Initial results exceeded 1,200 documents (2018-early 2026). After removing duplicates and applying inclusion/exclusion criteria (peer-reviewed articles, English language, relevance to CE-SSCM integration), 142 high-quality sources were retained for detailed analysis. Bibliometric trends, thematic synthesis, and content analysis were performed to identify patterns, gaps, and frameworks.

Literature Review and Theoretical Foundations

Bibliometric analyses confirm a sharp rise in publications since 2018, with key clusters around sustainable production, reverse logistics, industrial symbiosis, and digital-enabled circular systems. Studies of over 700 documents highlight four intellectual schools: sustainable production, SSCM, reverse supply chains, and CE. Core concepts include industrial ecology, cradle-to-cradle design, product-service systems, and GSCM. Circular supply chains (CSCs) extend linear models by creating closed-loop flows through secondary materials, repair, remanufacturing, recycling, and by-product valorization. Green management acts as the integrative mechanism, with evidence showing that CE capabilities mediate the relationship between green practices and sustainability performance.

Conceptual Framework:

Green Management as Catalyst Green management operates across three interconnected levels:

- Micro (Firm): Eco-design, modular products, and servitized models.
- Meso (Supply Chain): Supplier collaboration, reverse logistics, and digital visibility (blockchain, IoT, digital twins).
- Macro (Ecosystem): Policy alignment, multi-stakeholder partnerships, and Industry 4.0 technologies.

A 2025 prioritization study identified packaging and supplier selection as top criteria for green value creation. The Ellen MacArthur Foundation (2023) outlines nine focus areas for supply chain leaders: people and structure, network design, supplier engagement, data quality, metrics, business models and design, customer engagement, financial resources, and policy.

Proposed Integrated Framework: External drivers (regulations, SDGs, stakeholder pressure) → Strategic capabilities (resilience, dynamic capabilities) → Green management practices (GSCM + reverse logistics + digital tools) → Regenerative outcomes (environmental, economic, social). Contextual moderators include technological maturity and organizational culture. (This framework can be visualized as a layered diagram with feedback loops.)

5. Empirical Evidence and Case Studies

Table 1: Selected Case Studies (Summary)

Company/Initiative	Sector	Key CE Practices	Outcomes
Philips Circular Edition	Healthcare	Refurbishment, take-back	27.6–27.9% circular revenues (exceeded 2025 target), ~80% material reuse, significant CO ₂ reduction
IKEA & H&M	Retail/Fashion	Buy-back, resale, collection	Closed-loop material flows, 100% sustainable targets
Novelis	Materials	Large-scale aluminium recycling	Hundreds of thousands of tons recycled annually, major CO ₂ savings
Serendipalm (Dr. Bronner's)	Agri-food	Regenerative agri-culture	Ecosystem restoration + community benefits

Collaborative platforms (e.g., deposit-return systems, reusable packaging consortia, zero-emission shipping) further demonstrate scaled impact.

Benefits, Barriers, and Opportunities

- **Benefits:** Cost savings (10-30% in resource efficiency), improved resilience, GHG reductions, new revenue streams via servitization, job creation, and SDG alignment. Circular models could unlock trillions in economic value globally.
- **Barriers:** High capital needs, secondary material imbalances, consumer acceptance issues, data interoperability, regulatory fragmentation, and coordination challenges. In developing countries, these are amplified by infrastructure deficits, funding gaps, skills shortages, and institutional weaknesses.
- **Opportunities:** AI/blockchain integration, green alliances, policy incentives, and Industry 4.0. Post-pandemic ESG focus accelerates adoption.

Discussion

CE shifts SSCM from efficiency to regeneration. Green management serves as the practical bridge, yet gaps remain in social sustainability, longitudinal studies, and Global South contexts. The proposed framework addresses these by incorporating contextual moderators.

Conclusion and Future Research

Agenda Integrating CE principles via green management is essential for resilient, low-impact supply chains. Organizations adopting these practices gain competitive and sustainability advantages. Policymakers should prioritize infrastructure and incentives.

Future research should:

- Empirically validate frameworks across sectors and regions.
- Deepen analysis of social equity in circular transitions.
- Explore advanced digital applications in resource-constrained settings.
- Conduct longitudinal impact assessments.

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