IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, December 2025
Impact Factor: 7.67

Sustainable Supply Chain Management and Green Logistics: Strategies, Challenges, and Future Directions

Devkar Vikas Gorakh, Dr. Gunjal Sandeep Jagannath, Prof. Kandare Priyanka Vinod
Adsul's Technical Campus, Chas, Ahilyanagar
devkarvikas2001@gmail.com, sandeepgunjal16@gmail.com, kandarepv001@gmail.com

Abstract: *Sustainability has emerged as a strategic priority for organizations due to increasing environmental concerns, stricter regulations, and rising consumer expectations. Supply chains, traditionally focused on efficiency and cost minimization, are now required to incorporate environmental and social responsibility. Sustainable Supply Chain Management (SSCM) and Green Logistics have thus become essential frameworks for integrating eco-friendly operations across procurement, production, transportation, packaging, and distribution. This research paper examines the principles, practices, drivers, and challenges of SSCM. It also analyses how organizations can implement green logistics strategies such as green transportation, waste reduction, reverse logistics, and circular supply chain systems. The paper concludes with recommendations and future directions for building sustainable, resilient, and competitive supply chains.*

Keywords: Sustainable Supply Chain Management, Green Logistics, Reverse Logistics, Circular Economy, Carbon Footprint, Eco-Efficiency, Sustainable Procurement, Green Transportation, Environmental Performance, Green Manufacturing, Waste Reduction, Triple Bottom Line, Green Supply Chain Strategies, Sustainability Challenges, Lean and Green

I. INTRODUCTION

The global shift toward environmental awareness and responsible business practices has significantly impacted operations and supply chain management. Climate change, resource scarcity, pollution, and waste generation have forced organizations to rethink traditional supply chain models. Governments and regulatory authorities worldwide are now enforcing environmental compliance, while consumers increasingly prefer eco-friendly brands.

Sustainable Supply Chain Management (SSCM) integrates environmental, social, and economic considerations known as the **Triple Bottom Line** into supply chain operations. Green logistics, a key element of SSCM, focuses on reducing environmental impact through eco-friendly practices in transportation, warehousing, packaging, and distribution.

This paper explores how SSCM and green logistics are reshaping supply chain strategies, why sustainability is now essential, and what organizations must do to create sustainable and socially responsible supply chain networks.

II. LITERATURE REVIEW

Evolution of Sustainable Supply Chain Management (SSCM)

Initially, supply chains focused on operational efficiency and cost reduction. Sustainability was regarded as an added cost rather than a strategic imperative. Over time, environmental challenges and increasing regulatory pressures led to the rise of SSCM. Academic literature emphasizes that sustainability in supply chains enhances resilience, reputation, and long-term competitiveness.

Emergence of Green Logistics

Green logistics emerged as a response to the environmental impact of transportation, warehousing, emissions, and waste. Research shows that transportation contributes nearly 14% of global greenhouse gas emissions, making it a critical area for green intervention.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, December 2025 Impact Factor: 7.67

Triple Bottom Line Approach

The Triple Bottom Line (TBL) framework—People, Planet, Profit—forms the foundation of sustainable supply chains. Authors like Elkington (1999) have highlighted that organizational success must be measured beyond financial performance, incorporating environmental and social value.

Circular Economy in Supply Chains

Modern literature highlights the transition toward circular economy models, where waste is minimized through recycling, refurbishing, and reusing materials. Companies like IKEA and H&M use circular strategies to recover products and reduce waste.

Research Objectives

This research aims to:

1. Explore the concept and importance of Sustainable Supply Chain Management.
2. Examine green logistics strategies and their impact on environmental performance.
3. Study drivers that encourage companies to adopt sustainability practices.
4. Analyse challenges in implementing SSCM and green logistics.
5. Suggest strategies for building sustainable and circular supply chains.
6. Highlight future trends and directions in SSCM for global competitiveness.

III. RESEARCH METHODOLOGY

Research Design

This study is qualitative and exploratory, based on extensive secondary data analysis.

Data Collection

Data was collected from:

- Journals (Elsevier, Taylor & Francis, Springer)
- Industry reports (EY, Deloitte, World Economic Forum)
- Case studies of companies like Patagonia, Tesla, Unilever
- Government websites and environmental bodies

Data Analysis

A **thematic analysis** approach was used to identify major themes such as environmental compliance, green logistics strategies, circular systems, and sustainability challenges.

Meaning and Scope of Sustainable Supply Chain Management

SSCM integrates eco-friendly and socially responsible practices into supply chain decision-making. It ensures that materials, processes, and operations minimize environmental impact and contribute positively to society.

Scope of SSCM includes:

- Sustainable sourcing and procurement
- Green manufacturing
- Eco-friendly warehousing
- Energy-efficient transportation
- Reverse logistics and recycling
- Waste minimization
- Sustainable packaging solutions
- Carbon footprint reduction
- Supplier sustainability audits

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, December 2025 Impact Factor: 7.67

SSCM is not limited to environmental protection it also ensures ethical labour practices, fair trade, and social compliance.

Strategies for Sustainable Supply Chain Management

Sustainable Procurement

Sourcing eco-friendly materials, engaging ethical suppliers, and enforcing sustainability standards across the supply base.

Green Manufacturing Practices

- Use of renewable energy
- Lean and green production systems
- Reducing emissions and waste
- Recyclable material usage

Eco-Friendly Warehousing

- Solar-powered warehouses
- Energy-efficient lighting
- Smart storage systems to reduce power consumption

Sustainable Packaging

- Biodegradable packaging materials
- Minimalistic designs to reduce waste
- Reusable packaging for logistics

Green Marketing and Consumer Awareness

Communicating environmental benefits to customers builds brand reputation and loyalty.

Green Logistics: Meaning and Key Components

Green logistics focuses on minimizing the ecological impact of logistics operations while maintaining cost-effectiveness and efficiency.

Green Transportation

- Fuel-efficient vehicles
- Electric delivery fleets
- Route optimization
- Load consolidation to reduce emissions

Green Warehousing

- Renewable energy facilities
- Smart temperature control
- Waste management practices

Green Distribution

Utilizing eco-friendly packaging, reducing return rates, and optimizing last-mile delivery.

Reverse Logistics

Reverse logistics involves the return of used products for recycling, remanufacturing, or reuse.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, December 2025 Impact Factor: 7.67

Examples:

- E-waste recycling programs
- Returnable packaging systems
- Refurbished electronics market

Drivers of Sustainable Supply Chain Adoption

Regulatory Pressures

Governments worldwide enforce carbon emission standards, waste management rules, and green manufacturing policies.

Consumer Demand for Eco-Friendly Products

Modern consumers prefer brands that prioritize sustainability.

Cost Savings and Operational Efficiency

Green practices reduce energy, fuel, waste, and material costs.

Corporate Social Responsibility (CSR)

Organizations adopt sustainability to align with CSR policies.

Competitive Advantage

Sustainable brands enjoy stronger market positions and customer loyalty.

Challenges in Implementing SSCM and Green Logistics

1. **High Initial Investment** – Switching to eco-friendly infrastructure requires significant cost.
2. **Technological Barriers** – Lack of advanced tools and expertise.
3. **Supplier Resistance** – Small suppliers may resist new sustainability standards.
4. **Limited Awareness** among stakeholders.
5. **Complex Reverse Logistics Systems** – Difficulties in collection, sorting, and recycling.
6. **Lack of Government Incentives** in developing countries.
7. **Balancing Cost and Sustainability** during supply chain decisions.

Case Studies of Sustainable Supply Chains

Unilever

Reduced CO_2 emissions by 65% through renewable energy and sustainable sourcing.

Patagonia

Uses recycled materials and promote product repair programs to reduce waste.

Tesla

Uses green manufacturing and circular battery recycling systems.

DHL

Adopted electric vehicles, green warehouses, and optimized routes.

Recommendations for Building Sustainable Supply Chains

1. **Invest in Renewable Energy Across Operations**
2. **Adopt Circular Economy Models**
3. **Collaborate with Eco-Friendly Suppliers**
4. **Use Technology for Sustainability**
    - IoT for energy monitoring
    - AI for waste reduction
    - Block chain for transparency
5. **Incentivize Green Procurement**
6. **Train Employees in Sustainability Practices**
7. **Implement Clear Sustainability KPIs**
8. **Develop Robust Reverse Logistics Networks**

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 2, December 2025 Impact Factor: 7.67

Future Trends in SSCM and Green Logistics

- Carbon-neutral supply chains
- AI and analytics for sustainability planning
- Hydrogen-powered logistics fleets
- Drone-based green last-mile delivery
- Greater circular economy adoption
- Zero-waste manufacturing models
- Mandatory sustainability audits

II. CONCLUSION

Sustainable Supply Chain Management and Green Logistics are essential components of modern supply chain strategies. Organizations that integrate environmental and social responsibility benefit from cost savings, brand recognition, regulatory compliance, and competitive advantage. Despite the challenges, adopting circular economy models, green procurement, renewable energy, and eco-efficient logistics systems leads to long-term value creation. As global sustainability pressure increases, the future belongs to supply chains that are resilient, environmentally responsible, and socially conscious.

REFERENCES

[1]. Elkington, J. (1999). Cannibals with Forks: The Triple Bottom Line of 21st Century Business.
[2]. Srivastava, S. (2007). Green supply-chain management: A review.
[3]. Sarkis, J. (2012). A boundaries and flows perspective of green supply chain management.
[4]. WEF, Deloitte, EY sustainability reports.
[5]. Case studies from Unilever, Patagonia, Tesla, DHL.