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Green Supply Chain Logistics Management at Sarvam Logistics

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ABSTRACT

In the evolving landscape of logistics and supply chain management, sustainability has emerged as a critical factor for operational resilience and environmental stewardship. This study explores the concept of Green Supply Chain Logistics Management (GSCLM), focusing on the integration of eco-friendly practices in logistics operations in India. Through a mixed-methods approach combining structured surveys and statistical tools such as SPSS and NVivo, the study investigates how companies incorporate green technologies, sustainable sourcing, energy-efficient warehousing, and reverse logistics. Key challenges such as high implementation costs, regulatory barriers, and resistance to change are examined. The paper presents actionable insights for policymakers, industry leaders, and supply chain managers to foster sustainable growth while minimizing environmental impact.

INTRODUCTION

The logistics sector plays a pivotal role in the global economy by facilitating the movement of goods and services. Traditionally centered around efficiency and cost minimization, logistics operations are now increasingly scrutinized for their environmental impact. Rising carbon emissions, excessive resource consumption, and non-biodegradable packaging are just some of the environmental consequences associated with conventional supply chain activities.

In response, the concept of Green Supply Chain Logistics (GSCL) has gained prominence. GSCL focuses on embedding sustainable practices throughout the supply chain—from procurement and transportation to warehousing and reverse logistics. This shift not only contributes to environmental conservation but also enhances brand image, reduces costs in the long run, and ensures regulatory compliance.

India's logistics sector, contributing over 14% to the national GDP, is undergoing a transformative phase driven by policy initiatives such as the National Logistics Policy, Make in India, and Digital India. However, the adoption of green logistics remains uneven, with many organizations still navigating infrastructural, financial, and technological challenges.

This research investigates the strategies, benefits, and barriers related to the adoption of green supply chain practices in Indian logistics, aiming to provide a roadmap for sustainable transformation.

OBJECTIVES OF THE STUDY

1. To assess the environmental and economic impact of traditional logistics systems.
2. To identify green logistics strategies adopted by Indian organizations.
3. To examine technological innovations facilitating green supply chain transformation.
4. To evaluate organizational readiness for adopting GSCLM practices.
5. To propose practical solutions for overcoming barriers to green logistics implementation.

LITERATURE REVIEW

The integration of sustainable practices into logistics operations has been the focus of numerous academic studies, reflecting a growing consensus on the need for environmentally conscious supply chain management. This literature review highlights key theoretical frameworks and research findings relevant to Green Supply Chain Logistics Management (GSCLM).

Green Supply Chain Concepts

Seuring and Müller (2017) propose a triple-bottom-line framework that emphasizes environmental, social, and economic performance in supply chains. Their work identifies supplier collaboration and regulatory alignment as key enablers of sustainable logistics. Similarly, Govindan and Chaabane (2018) highlight the role of stakeholder involvement and government incentives in facilitating green logistics transitions.

Technological Innovations

Kannan and Haider (2020) investigate how innovations such as AI, IoT, and blockchain influence green logistics adoption. AI enables route optimization, while IoT provides real-time monitoring of energy consumption in warehouses. These technologies enhance visibility and efficiency, making sustainable practices more attainable.

Reverse Logistics and Waste Management

Azevedo and Carvalho (2019) emphasize the importance of reverse logistics in closing the loop within supply chains. Recycling, reusing, and refurbishing goods not only minimize waste but also contribute to a circular economy.

Challenges in Implementation

Luthra and Mangla (2021) identify critical barriers to GSCLM, including high costs, lack of awareness, and insufficient infrastructure. Similar findings by Zhu and Geng (2020) in the Chinese context underscore the global relevance of these obstacles, particularly in developing economies.

Corporate Social Responsibility (CSR) and Ethics

Sarkis and Zhu (2020) explore the intersection of CSR and logistics, suggesting that ethical sourcing and environmental accountability are increasingly influencing consumer preferences and regulatory standards.

RESEARCH METHODOLOGY

Research Design

A descriptive research design was adopted to understand the current state of green logistics practices in India. The study utilized a structured questionnaire distributed to logistics professionals across various sectors.

Sampling Method

Purposive sampling was used to target respondents actively involved in logistics and supply chain decision-making. The final sample comprised 100 professionals, including operations managers, quality controllers, and supply chain executives.

Data Collection Tools

Quantitative data were collected using a structured questionnaire, while qualitative insights were gathered through open-ended responses and informal interviews. The study also used:

- SPSS for statistical analysis (descriptive stats, Chi-Square, regression)
- NVivo for thematic analysis of qualitative data
- SWOT Analysis for identifying strategic implications

Data Analysis Techniques

- Descriptive statistics helped summarize demographic and operational characteristics.
- Chi-Square and correlation tests explored associations between green practices and organizational outcomes.
- Thematic analysis identified recurring patterns and themes in qualitative responses.
- Regression analysis assessed predictors of successful GSCLM adoption.

DATA ANALYSIS AND FINDINGS

This section presents the analysis of data collected from 100 logistics professionals across various departments such as operations, supply chain, and quality control. The objective was to understand the prevalence, effectiveness, and perception of green logistics practices in Indian organizations.

Demographic Insights

- Gender Distribution: 60% male, 40% female.
- Age Range: Majority (33%) between 25–35 years.
- Experience: 30% had more than 7 years of logistics experience.

Green Practices Adoption

- Eco-Packaging: 33% reported frequent use, while 21% stated always using it.
- Fuel-Efficient Transport: 52% use it often or always.
- Green Audits: 51% of organizations conduct audits annually.
- Technology Use: A positive correlation ($r = 0.485$, $p < 0.01$) was found between technology adoption and the effectiveness of green logistics.

Challenges Identified

- Resistance to Change: Reported by 39% of respondents.
- Lack of Awareness: Cited by 31%.
- High Costs: 38% linked green logistics barriers to implementation costs.
- Limited Government Support: Noted by 21%.

Key Risk Areas

- Training Needs: 44% reported a need for employee training.
- Workforce Gaps: 38% cited a lack of skilled personnel.
- Regulatory Costs: 36% noted increased compliance expenses.

Alternative Energy Adoption

- 39% are planning to implement it.
- 15% are already using it extensively.

Chi-Square Test

- Tested association between renewable energy usage and carbon reduction strategies.
- $p = 0.159$, Pearson Chi-Square value = 13.087.
- No statistically significant association; however, trend suggests positive inclination.

Correlation Test

- Spearman's rho: A significant correlation ($r = 0.485$, $p < 0.01$) between technology integration and the perceived effectiveness of green logistics strategies.

DISCUSSION

The study affirms that Indian logistics companies are increasingly aware of sustainability imperatives, though full-scale implementation of green logistics remains a work in progress. Key insights include:

- Technology as a Catalyst: The positive correlation between green technologies (AI, IoT) and strategy effectiveness indicates a growing reliance on automation to drive sustainability.
- Training Gaps: Despite rising interest, a lack of skilled workforce and resistance to change remain major internal barriers.
- Cost-Effectiveness Perception: While green logistics is often perceived as expensive initially, respondents acknowledged long-term cost-saving potential through fuel efficiency and waste reduction.
- Policy Maturity: Limited government support and fragmented policies were cited as external barriers, despite the existence of the National Logistics Policy and "Green Freight" programs.

These findings echo previous literature (e.g., Govindan & Chaabane, 2018) which emphasizes the need for integrated policy frameworks and technological support.

RECOMMENDATIONS

1. Government Intervention:

- Introduce tax credits and subsidies for organizations adopting sustainable logistics.

- Standardize national green logistics certification schemes.

2. Skill Development:

- Launch industry-led training programs on eco-logistics and green technologies.
- Encourage academic-industry collaboration for capacity-building.

3. Technology Integration:

- Promote adoption of electric and hydrogen-powered vehicles.
- Incentivize the use of blockchain for supply chain transparency.

4. Infrastructure Investment:

- Expand multimodal transport options (rail + water).
- Develop more green-certified warehouses with solar-powered operations.

5. Stakeholder Engagement:

- Foster collaboration with suppliers, third-party logistics (3PL) firms, and government bodies to standardize sustainable practices.

CONCLUSION

Green Supply Chain Logistics Management is more than a corporate trend—it is a strategic necessity in an environmentally conscious and competitive business environment. This study highlighted the current adoption levels, key challenges, and technological drivers influencing green logistics in India. While the sector shows promising intent, infrastructural, financial, and skill-related barriers hinder large-scale implementation.

The study concludes that sustainable transformation is possible through a collaborative approach involving government incentives, industry participation, and academic research. Businesses that proactively embrace green logistics will not only contribute to environmental protection but also enjoy improved brand value, cost savings, and compliance benefits in the long term.

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