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Green Supply Chain Practices in Emerging Markets: Barriers and Enablers

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ABSTRACT: The increasing global emphasis on environmental sustainability has spurred the adoption of Green Supply Chain Management (GSCM) practices across industries. This study explores key barriers and enablers influencing the adoption of GSCM in emerging economies, especially India. Findings highlight structural constraints such as weak regulation, high costs, and limited awareness as key barriers. Enablers include customer demand, policy incentives, and technological advancements. The research emphasizes a need for stakeholder collaboration and stronger institutional frameworks to mainstream sustainable practices.

This study investigates the barriers and enablers of Green Supply Chain Management (GSCM) practices in emerging markets, with a particular focus on India. The research explores how firms navigate environmental sustainability within the constraints of limited resources, infrastructure, and regulatory inconsistency. It begins with a review of environmental pressures, government policies, and global supply chain demands that necessitate green transitions. Through a mix of exploratory research (case studies, experience surveys, and secondary data analysis) and primary data collection using structured surveys, the study identifies key factors influencing GSCM adoption.

The research finds that high implementation costs, lack of technical expertise, and organizational resistance are the primary barriers. Enablers include customer pressure, government incentives, and CSR mandates. The data analysis, based on 51 industry responses, highlights varying degrees of GSCM integration, with SMEs lagging behind large firms due to capital constraints. The study concludes that GSCM implementation requires a combination of institutional support, internal capacity building, and strategic foresight. Recommendations emphasize policy reform, awareness training, technology adoption, and incentive structures to support firms, especially SMEs.

I. INTRODUCTION

i. Background Factors Necessitating the Project

- 1. Situational Analysis: India's industrial growth has led to environmental degradation, including air and water pollution, and increased greenhouse gas emissions. With growing global awareness and policy mandates, Indian firms face pressure to transition toward greener operations.
- 2. Literature Review: Global research (Zhu & Sarkis, 2006; Rao & Holt, 2005) shows that GSCM leads to efficiency and reputation benefits. Indian literature highlights high costs, limited SME readiness, and weak regulatory enforcement as barriers (Mudgal et al., 2010).
- 3. Exploratory Research: Semi-structured interviews, secondary policy analysis, and pilot surveys revealed that while awareness is high, practical implementation is often stalled due to systemic and organizational challenges.

ii. Explanation of Research Topic: Green Supply Chain Management (GSCM) refers to integrating environmental thinking into supply chain activities, from raw material sourcing to product disposal, with minimal ecological harm.

iii. Research Questions and Hypotheses:

- 1. General Research Question: What are the key factors influencing the adoption of GSCM in Indian industries?
- 2. Specific Research Questions (Hypotheses):
 - H1: Lack of resources hinders GSCM adoption.
 - H2: Government policies positively influence GSCM practices.

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- H3: Consumer demand encourages green practices.
- H4: International trade requirements promote adoption.
 - H5: Top management commitment is critical.
- 3. Logic: General question is addressed through five hypotheses linked to strategic, policy, and market dynamics.

iv. Research Objectives:

- 1. Identify barriers to GSCM implementation.
- 2. Examine enablers supporting green adoption.
- 3. Compare GSCM between SMEs and large firms.
- 4. Evaluate regulatory influence.
- 5. Assess international and market pressures.
- 6. Recommend actionable strategies for firms and policymakers.

II. LITERATURE REVIEW

Global studies show that GSCM improves brand value and operational efficiency. Indian literature reveals that SMEs face greater challenges due to financial and technical barriers. The review highlights policy gaps, weak enforcement, and the potential of technology and CSR initiatives.

III. RESEARCH METHODOLOGY

I. Research Design: A mixed-method exploratory design was used, combining qualitative and quantitative data for contextual depth and statistical validity.

ii. Data Collection Method:

- Medium: Online self-administered surveys
- Instrument: Structured questionnaire with Likert scales
- Sequence: From general awareness to implementation and technology adoption
- Scales: Nominal, ordinal, Likert-type scales

iii. Sampling Design and Plan:

- Target population: Indian firms in manufacturing and services
- Sampling frame: Industry contacts and LinkedIn outreach
- Sample unit: Mid- to senior-level supply chain professionals
- Method: Purposive sampling
- Sample size: 51
- Response rate: 85%

iv. Fieldwork: Surveys were conducted online over two weeks. A pretest with 5 participants led to adjustments in terminology for clarity.

v. Data Analysis and Interpretation:

- 1. Preparation: Screening for missing/incomplete responses
- 2. Editing: Inconsistent entries removed
- 3. Methods: Descriptive statistics, frequency distributions, charts
- 4. Reasoning: Focus on identifying patterns and deviations
- 5. Findings:
 - High awareness (Q4)
 - o Common practices: eco-packaging, transport efficiency (Q6)
 - Major barriers: cost, resistance to change (Q7)
 - Enablers: customer demand, government incentives (Q8)
- 6. Tables and charts were used to support analysis (appendix for full data)





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IV. DATA ANALYSIS AND INTERPRETATION

This section presents the key insights derived from the survey responses of 51 industry professionals, focusing on awareness, adoption, and drivers of Green Supply Chain Management (GSCM) in Indian firms.

1. Awareness and Adoption

- A large majority of respondents indicated awareness of GSCM practices, reflecting increasing exposure to sustainability dialogues in India.
- More than 70% of the participants reported that their companies have implemented at least one green supply chain initiative, suggesting a growing inclination toward sustainable operations.

2. Types of Green Practices Adopted

- Most commonly adopted practices include eco-friendly packaging, energy-efficient transportation, and supplier environmental audits.
- Recycling programs and life cycle assessment tools were less commonly implemented, highlighting an opportunity for broader adoption of holistic sustainability measures.

3. Barriers to Implementation

- The most frequently cited barriers were high implementation costs, lack of technical expertise, and organizational resistance to change.
- These issues were particularly pronounced among small and medium enterprises (SMEs), which face financial and knowledge constraints.

4. Enablers Supporting GSCM

- Key enablers included government incentives, customer demand for sustainable products, and corporate sustainability goals.
- Firms with international trade links were more likely to adopt GSCM practices, suggesting compliance with global environmental standards as a motivating factor.

5. Stakeholder Influence

- Customers and government regulators emerged as the most influential stakeholders in shaping GSCM strategies.
- Suppliers and investors also had a notable impact, especially in industries reliant on external certifications or investor-backed sustainability mandates.

6. Impact Measurement

- Nearly half of the respondents reported formally measuring environmental impacts, using metrics such as carbon emissions, energy usage, and waste generation.
- Others relied on informal tracking or lacked measurement protocols entirely, indicating a gap in accountability mechanisms.

7. Future Outlook

- A significant number of respondents expressed interest in expanding GSCM initiatives over the next three years.
- Technologies such as blockchain for transparency, circular economy models, and life cycle analysis tools were noted as areas of high future interest.

8. Summary Tables and Charts

- Frequency distributions and response tallies were used to visualize awareness levels, adoption rates, and perceived barriers/enablers.
- Comprehensive charts and individual survey data are included in the appendix to support transparency and further analysis.





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• Overall, the analysis reveals that while there is a promising shift toward green supply chain practices, success is uneven across firm sizes and sectors. Continued support through policy, education, and investment is essential for scaling GSCM adoption across the broader Indian industrial landscape.

V. LIMITATION

i. Generalizability is limited due to the relatively small sample size (51 respondents) and a geographic focus predominantly within select industrial sectors in India. This reduces the external validity and restricts broader applicability to all emerging market contexts.

ii. Validity was enhanced through careful question design and expert input, ensuring content and construct alignment. However, certain questions may have been interpreted differently by respondents from varying industry backgrounds, leading to potential measurement inconsistencies. Reliability was measured using Cronbach's Alpha, yielding a score of 0.81, which is considered acceptable. Nevertheless, future studies could strengthen both internal and external validity through triangulated data sources and larger, more representative samples.

iii. Several practical challenges were encountered during data collection:

- Low Initial Response Rate: Many potential respondents hesitated to participate, likely due to survey fatigue or lack of interest in sustainability topics.
- **Terminology Confusion**: Terms such as "green logistics" and "GSCM" were not immediately clear to all participants, despite definitions provided.
- Access Limitations: Difficulty in reaching decision-makers at larger firms limited diversity within the sample. To overcome these, the study utilized multiple follow-up communications, clear definitions in survey instruments, and a pretest phase to refine question clarity.

iv. Lessons Learned:

- Future research should aim for a more **stratified sample** that includes a wider variety of firm sizes, sectors, and regions.
- Mixed-method approaches, including interviews and focus groups, should supplement surveys to enrich contextual understanding.
- Greater emphasis should be placed on **respondent education**, perhaps through pre-survey briefings or simpler phrasing, especially when introducing technical terms.
- Longitudinal tracking would help monitor GSCM adoption trends and validate earlier findings.
- Collaborating with industry associations could enhance response rates and data richness by leveraging trust and relevance.

VI. CONCLUSION AND RECOMMENDATIONS

i. Conclusions

The findings of this study offer a comprehensive view of the current landscape of Green Supply Chain Management (GSCM) in emerging markets, with a focused lens on the Indian industrial sector. It is evident that GSCM awareness is relatively high, particularly among larger organizations and firms engaged in international trade. However, the extent of implementation varies significantly, with small and medium enterprises (SMEs) trailing behind due to cost-related constraints, limited technical know-how, and insufficient regulatory pressure.

Government initiatives, rising consumer demand, and corporate social responsibility (CSR) commitments are acting as critical enablers in driving the adoption of sustainable practices. Moreover, the study shows that firms already engaging in GSCM report tangible benefits, including cost reductions, enhanced brand reputation, improved regulatory compliance, and operational efficiency gains.

Despite these positive signals, the absence of uniform regulatory enforcement, lack of green supplier networks, and poor infrastructure continue to be substantial obstacles. The study highlights the need for a more robust, coordinated





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approach between government bodies, industry associations, and academic institutions to facilitate widespread GSCM adoption.

ii. Recommendations

Managerial Recommendations:

- 1. **Develop Formal GSCM Strategies:** Organizations should embed GSCM principles into their strategic planning, with clear sustainability objectives aligned with business goals.
- 2. Invest in Training and Capacity Building: Companies must provide regular training programs to upskill employees and enhance awareness across supply chain functions.
- 3. Leverage Green Technologies: Adoption of technologies like IoT for real-time tracking, blockchain for transparency, and LCA tools should be encouraged.
- 4. **Supplier Engagement:** Strengthen collaboration with suppliers to foster shared environmental goals, and help build green capabilities across the value chain.
- 5. **Performance Monitoring:** Establish environmental KPIs and track them regularly to monitor progress and identify areas for improvement.

Policy Recommendations:

- 1. Strengthen Regulatory Enforcement: Clearer, enforceable environmental regulations are necessary to encourage compliance across industries.
- 2. **Incentivize GSCM Investments:** Tax credits, low-interest green loans, and subsidies can support firms, particularly SMEs, in adopting sustainable practices.
- 3. **Public-Private Partnerships:** Encourage joint initiatives between government, academia, and industry to develop scalable solutions, particularly in under-resourced regions.

Future Research Recommendations:

- 1. Sector-Specific Studies: Detailed studies focused on specific sectors can uncover unique challenges and opportunities.
- 2. Longitudinal Research: Studies tracking GSCM implementation over time will provide insights into progress and effectiveness of interventions.
- 3. **Inclusive Stakeholder Research:** Further research should integrate perspectives from consumers, regulators, NGOs, and supply chain partners to provide a holistic understanding.
- 4. Assessment of Technology Readiness: Evaluate the actual feasibility, return on investment, and adoption hurdles of digital technologies within GSCM.

By addressing these strategic, operational, and policy-driven recommendations, Indian firms and other emerging market players can transition toward more resilient, transparent, and environmentally sustainable supply chains

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