Green Supply Chain Management Practices in Manufacturing Industries

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Abstract- This study examines the adoption of Green Supply Chain Management (GSCM) in manufacturing industries, focusing on eco-friendly practices in procurement, production, and logistics. Data from 40 respondents reveal that while awareness of GSCM is high, challenges like cost and lack of expertise hinder full implementation. However, companies using green practices report benefits such as improved compliance, brand image, and efficiency. The study suggests stronger policy support, training, and collaboration to enhance GSCM adoption.

I. INTRODUCTION

1.1 Background of the Study

In today's global industrial landscape, sustainability and environmental responsibility have become integral to business operations. As industrialization expands, manufacturing industries are facing increasing pressure to reduce environmental degradation and implement sustainable practices. Green Supply Chain Management (GSCM) emerges as a strategic response, integrating environmental considerations into supply chain activities including design, procurement, production, distribution, and reverse logistics.

The concept of GSCM gained momentum as firms began to realize the long-term benefits of aligning business processes with eco-friendly practices. The integration of green practices not only addresses environmental challenges but also improves efficiency, reduces costs, enhances brand reputation, ensures regulatory compliance. and In а manufacturing context, where resource consumption and waste generation are significant, GSCM plays a critical role in minimizing negative environmental impacts.

This study investigates the extent to which manufacturing industries are adopting green supply chain practices, the benefits realized, and the challenges faced. It also aims to provide suggestions for enhancing the implementation of GSCM in India's manufacturing sector.

1.2 Need of the Study

The study of Green Supply Chain Management is increasingly relevant in the context of global warming, resource depletion, and tightening environmental regulations. Manufacturing industries are a major contributor to carbon emissions, waste production, and resource exploitation. There is an urgent need to shift from traditional supply chain practices to sustainable and environmentally responsible systems.

This research becomes necessary to:

Understand the level of awareness and readiness in adopting GSCM.

Evaluate how green practices affect operational and environmental performance.

Identify gaps in implementation and provide actionable recommendations. The study will benefit policymakers, manufacturing firms, supply chain professionals, and academicians by providing insights into practical GSCM strategies.

1.3 Objectives of the Study

1. To explore the awareness and implementation of green supply chain practices in manufacturing industries.

2. To examine the factors motivating and hindering the adoption of GSCM.

3. To evaluate the benefits and impact of GSCM on environmental and operational performance.

4. To suggest measures for effective implementation of GSCM in Indian manufacturing units.

1.4 Scope of the Study

The research is confined to selected manufacturing industries in India, including sectors such as automotive, electronics, FMCG, textiles, and chemicals. The scope covers:

Green practices adopted in procurement, production, packaging, logistics, and waste management.

Perspectives of supply chain managers, procurement officers, and production heads.

Influence of government regulations, market competition, and consumer awareness on GSCM adoption. This study excludes non-manufacturing sectors and does not focus on international case studies.

1.5 Research Methodology

The research is descriptive and empirical in nature. Both primary and secondary data sources have been used to ensure comprehensive coverage.

Primary Data:

Structured questionnaires were administered to supply chain and operations professionals in various manufacturing industries. Face-to-face interviews were also conducted where possible.

Secondary Data:

Books, journals, articles, company websites, and reports by organizations like the United Nations Industrial Development Organization (UNIDO), and the Ministry of Environment and Forests were used to support and validate findings.

Research Instrument:

A structured questionnaire with multiple-choice, Likert scale, and open-ended questions.

1.6 Limitations of the Study

The study is limited to a sample size of 40 respondents, which may not fully represent the entire industry.

Respondents may hesitate to disclose non-compliance or gaps in green practices.

The focus is on Indian industries only; global comparisons are not within the scope.

Time constraints and lack of access to internal company data may limit analysis depth.

II. REVIEW OF LITERATURE

Green Supply Chain Management has been widely studied across various contexts.

Srivastava (2007) defined GSCM as the integration of environmental concerns into supply chain management, covering activities like product design, material sourcing, manufacturing processes, and delivery.

Zhu and Sarkis (2004) explored the relationship between environmental practices and performance among Chinese manufacturers, finding that regulatory pressure and market competition were key drivers.

Diabat and Govindan (2011) proposed a framework identifying barriers and drivers in the adoption of GSCM in emerging economies.

Rao and Holt (2005) argued that GSCM leads to improved environmental and economic performance. These studies collectively suggest that while GSCM offers significant benefits, its adoption is often hindered by high implementation costs, lack of expertise, and resistance to change. This study builds on the existing literature by providing fresh insights into the Indian manufacturing context.

III. RESEARCH DESIGN

3.1 Research Design

This study adopts a descriptive research design. It seeks to collect data that describes the current status

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of GSCM practices, understand respondents' attitudes, and evaluate the outcomes of such practices in the manufacturing sector.

3.2 Sources of Data

Primary Data: Collected through structured questionnaires and interviews.

Secondary Data: Books, journals, company reports, government databases, and online resources.

3.3 Sample Design

Sampling Method: Non-probability convenience sampling.

Sample Size: 40 respondents from various manufacturing units in India.

Target Respondents: Supply chain managers, operations executives, procurement officers, and sustainability consultants.

3.4 Tools for Data CollectionStructured questionnaireGoogle Forms for online responses

3.5 Tools for Data AnalysisPercentage analysisGraphical representations (bar graphs and pie charts)Descriptive statistics (mean, mode, standard deviation)

IV. DATA ANALYSIS AND INTERPRETATION

4.1. Respondents' Profile

Gender	Percentage	No. of Respondents
Male	60%	24
Female	37.5%	15
Prefer n	ot to say	2.5%
Age Distribution:		
18-25: 5	5%	
26–35: 42.5%		
36–45: 3	35%	
46-55: 1	2.5%	
56+: 5%)	

4.2. Implementation of GSCM Practices 80% of respondents confirmed that their company implements green practices.

65% indicated that energy-efficient production methods are a top priority.

55% use eco-friendly packaging materials.

50% have systems in place for reverse logistics and recycling.

4.3. Challenges in Adopting GSCM High implementation cost: 67.5% Lack of awareness: 42.5% Resistance to change: 35% Technology limitations: 30%

4.4 . Motivators for GSCM Implementation
Government regulations - 60%
Customer pressure - 50%
Competitive advantage - 45%
Corporate Social Responsibility - 70%

4.5. Benefits Experienced
Enhanced brand image – 60%
Improved regulatory compliance – 55%
Reduced operational costs – 40%
Increased customer satisfaction – 35%

4.6 . Satisfaction with Current GSCM Practices
Very Satisfied – 25%
Satisfied – 45%
Neutral – 20%
Unsatisfied – 7.5%
Very Unsatisfied – 2.5%

V. FINDINGS, SUGGESTIONS & CONCLUSION

5.1 Major Findings

A significant number of companies are aware and have adopted some form of GSCM.

Energy efficiency and packaging are the most common focus areas.

High cost and limited technical knowledge remain major hurdles.

Companies implementing GSCM have witnessed improvements in brand image and compliance.

Stakeholder pressure is a driving force for green initiatives.

5.2 Suggestions

Government Support: Offer tax benefits and subsidies to industries that adopt GSCM.

Training & Awareness: Organize workshops and seminars for supply chain professionals.

Technology Adoption: Invest in clean technologies and waste management systems.

Collaborative Initiatives: Encourage collaboration among suppliers and distributors for green practices.

Monitoring Systems: Develop KPIs and audit systems to evaluate environmental performance.

5.3 Conclusion

Green Supply Chain Management is not just an ethical obligation but a strategic necessity for manufacturing industries. It ensures long-term sustainability, cost-effectiveness, and competitiveness. While challenges persist, consistent efforts, policy support, and a commitment to innovation can transform traditional supply chains into eco-friendly systems. This study reaffirms that green practices, when embedded into core business functions, lead to significant environmental and economic benefits.

VI. CONCLUSION AND SUGGESTIONS

6.1 Conclusion

The manufacturing sector in India is gradually embracing GSCM. Companies realize that environmental performance is closely linked to economic performance and stakeholder satisfaction. The study concludes that while initial resistance exists, the long-term gains from GSCM are compelling. Firms must integrate sustainability into their operational DNA.

6.2 Suggestions for Future Implementation

Develop green partnerships with eco-certified vendors.

Include green objectives in supply chain strategy.

Encourage digitalization for better traceability and resource efficiency.

Engage employees and customers in sustainability drives.

Conduct periodic environmental audits and publish green reports.

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