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Comparative Analysis of Green Supply Chain Management (GSCM) Practices in India and the United Kingdom

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Abstract: The study presents comparative study of India's and the United Kingdom's Green Supply Chain Management (GSCM) practices and its implementations in the leather manufacturing industry. The research evaluates how GSCM plans influence the environment, economic and social performance outcomes in both countries. The study also highlighted the factors influencing GSCM implementation in India and UK Leather industry. Secondary data received from published academic journals and databases in the form of reports are processed through quantitative methods to examine the environmental, economic and social effects of GSCM practices. Environment, economic and social performance outcomes variables were further analyzed by descriptive analytics, correlation and Chi Square Test. Factor Analysis identify the key factors influencing implementation of GSCM practices in India. The finding of suggests that there is significant variation in the execution and impacts of GSCM in India and UK and it is influenced by regulatory uncertainties, technology readiness and culture. UK performs better in environment performance than India due to strict regulatory norms; still India has shown enhancement in environment performances but lacks on strict regulation and compliances. UK companies show better economic performance outcomes in comparison to India. In India, the application of GSCM is expensive and less cost saving. It may provide results in long run, but at short run it lacks in finances. On the other hand, UK use GSCM as its critical operation and has developed competitive edge over the market. The social performance was found weak in India in comparison to UK as there is a lack of law enforcement for GSCM practices. The study reveals that Policy and regulations, financial resources and technology are significant drives of GSCM implementation in India. However in UK, supplier and customer collaboration (Exogenous factor) is a dominant factor of GSCM practices. The cross-sectional research concludes that both nations have progressed similarly in the GSCM implementation; however India requires more regulation, finances and technological development than the UK, which has an integrated model of economic benefit with sustainability.

Keywords: Sustainability, Supply Chain Management, Green Supply Chain Management, Sustainable practices, Comparative economies studies

I. INTRODUCTION

Today, the global environment is under rigorous pressure, reshaping business operations. The growing pressure of climate change and pollution are preparing firms to change their global supply chain management strategies. Green Supply Chain Management (GSCM) has come out strongly into the spotlight to supplement traditional supply chain management by considering ecological and environmental factors. In theoretical concept, GSCM integrates various practices such as green procurement, eco-design, sustainable logistics, and even reverse supply chain management within a firm (Meager et al., 2020). GSCM practices are used and implemented for waste and emissions reductions and resource improvement. Successful implementation of GSCM practices leads to establishment of efficient, effective and sustainable business model. GSCM practices implementation also differs across countries, as it depends on numerous factors, such as the nature of the regulation system, economic structure, culture, and the state of the industries. It supports the need for comparative research to determine the influence of the national setting on the execution and performance of GSCM practices in India and the United Kingdom (UK) (Badi & Murtagh, 2019). While both countries have demonstrated their efforts toward sustainable supply chain management, they did it in contrasting economic, legal, and cultural contexts. India is a comparatively a young industrializing country with a vast array of industries. Therefore, concerns about the relationship between economic development and the state of the environment are quite relevant. At the same time, the UK has been considered to understand how supply chain management can be sustainable even in countries of the developed world with environmental protection standards.

India comprises large multinationals, many small and medium enterprises, and a significant proportion of the informal sector bonded by a legal framework. We can found an increasing numbers of policies and measures for environmental protection, including the National Action Plan on Climate Change (NAPCC) and Corporate Social Responsibility (CSR) provision under the Companies Act. However, implementing GSCM practice in India faces challenges such as poor infrastructure, high cost of green technology, and low awareness among small firms (Tseng et al., 2019). In addition, the country is socio-economically diverse

which creates a big gap in development and maturity. It makes factors such as law enforcement and consumer awareness more risky.

On the contrary, the UK has a rich experience in sustainable practices and initiatives, particularly after establishing environmental regulatory bodies that fully endorse GSCM practices. The Climate Change Act of the UK was passed in 2008 and provides legal frameworks that ensure that greenhouse gas emissions are controlled and the Green Finance strategy that supports the development of sustainable businesses (Carvalho et al., 2020). The manufacturing and retail industries in the UK have been the pioneers of GSCM adoption due to the increased demands on sustainability from regulators and customers. Marks & Spencer and Unilever have led the trend by developing GSCM integrated and overall strategic sustainability processes.. However, the UK also has issues, such as problems with global supply chain and management, cost, and environmental concerns. This study compares the GSCM practices between India and the UK. It is synchronized with the existing literature while significantly investigating the external influences in the context of sustainable supply chain management (Cousins et al., 2019). Thus, this research seeks to explore the drivers and challenges of GSCM practices in the respective environments of the two countries, as well as the resultant outcomes of GSCM practices. Several aspects of GSCM: legal requirements of GSCM, the level of GSCM implementation in industries, performance indicators and challenges linked to the implementation of GSCM will be discussed in the study.

The Indian government also making efforts to integrate GSCM with industrial and economic policies, and hence, the regulatory framework is still in its nascent stage. For instance, the NAPCC aims to achieve sustainable development in different fields such as agriculture, water, and energy. It face challenges ranging from the fragmentation of the regulatory framework, enforcement and compliance costs which reduces the impact of these initiatives, especially in small and medium firms. (Pattnaik & Pattnaik, 2019). The need for effective waste disposal, recycling, and green supply chain logistics makes GSCM implementation difficult in India. However, several Indian manufacturing companies, particularly the automotive manufacturing industries, have made good progress in implementing GSCM practices. It has been observed that Tata Steel and Mahindra & Mahindra have ensured the application of green measures in their operations, including energy conservation, waste minimization, and eco-friendly procurements (Reche et al., 2020).

Comprehensive laws and policies are available in the United Kingdom to implement the GSCM and to embrace environmental sustainability. UK Climate Change Act of 2008, which has laid down emission reduction targets in the country, forms the major part of GSCM. The UK also remains privileged with a robust tradition of corporate sustainability, where most organizations practice GSCM during CSR initiatives (Bhatia & Gangwani, 2021). UK's retail sector has been at the forefront of GSCM, where firms like Tesco and Marks& Spencer have undertaken sustainable sourcing, waste reduction, and carbon footprint. Nonetheless, the UK faces some obstacles due to the country's integration with global supply networks with substantially full-spectrum tiers of distribution. In addition, the high price of sustainable innovations and the difficulty in maintaining compliance with more than one regulation can increase challenges towards GSCM implementation in the UK.

This exploratory research will focus on case studies in India and the UK. It will cover the main GSCM practices based on industry reports and surveys. The research will speculate on the nature, extent, and characteristics of how two different structures regulating the two countries' legal systems impact the implementation and measurement of the GSCM practices and the challenges encountered. Thus, this research aims to understand the reasons for adopting or not adopting GSCM in the context of two nations, India and the United Kingdom. This research aims to compare the GSCM practices in two different countries, India and the United Kingdom, to understand better how different countries settle over the issue of integration of sustainability into SCM.

2. LITERATURE REVIEW

2.1 Conceptual Framework of Green Supply Chain Management

Supply chain environmental management is a major shift in ‘paradigm’ largely because the environmental factor is incorporated in the four tiers of the supply chain (Pervaiz et al. (2011)). Green Supply Chain Management (GSCM), on the other hand, covers sub-processes including green purchasing, sustainable production, green products development and reverse logistics. The rise of GSCM has addressed environmental consciousness, as the prior conventional supply chain management systems had excluded environmental factors in product manufacturing and distribution (Elbaz & Iddik (2020)). GSCM is about managing material while evaluating its environmental effect. It aims to reduce waste, emissions, energy consumption, recycling, and using environmentally friendly products, as Saini et al. (2023) outlined. Thus, the concept of GSCM embodies not only green suppliers but also green customers. It could develop a business model inclusive of environmental considerations for the entire production supply chain (Kumar et al., 2019). Current adoption of GSCM practices are gradually moving from simple compliance; to larger investments in sophisticated GSCM practices like EMS, eco-labelling, and adopting LCA in products’ design for assessing environmental impacts. (Asif et al., (2020)). The final strategic aspect modelled by GSCM is information and communication management, which is concerned with improving the level of control, visibility, and accountability in the supply chain through ICT.

2.2 Regulatory and Institutional Drivers of GSCM in India and the UK

The most notable effect of the regulatory environment in the assessment and practice of GSCM activities exist in developing a GSCM. In India, environment legislation evolved during the past few decades with rapid industrialization in line with environment prevention. The NAPCC setup in 2008 is India's long-term policy framework for sustainable development across industrial, agricultural, and energy sectors (Choudhary & Sangwan, (2022)). Likewise, many organizations' adoption and integration of the environmental management system have been enhanced by the availability of CSR under the Companies Act of 2013 (Tumpa et al., (2019)). However, in the case of India, several of these regulation-enhanced measures may lack strength due to poor implementation policies, dual regulation, and high regulation costs for companies, particularly that small-to-medium in size (Esfahbodi & Zhang, (2020)). Other research has found that stronger infrastructure for waste disposal, recycling, and green logistics affects the implementation of GSCM practices among organizations (Zhang & Zhao, 2022). However, in recent years, India's manufacturing and automobile industries initiating the GSCM practices due to the demands of regulation acts and cumbersome search for competitive advantage.

However, the UK has good legal enforcement on environmental issues and a sound institutional support structure for implementing GSCM practices. Similarly, the Climate Change Act of 2008 in the United Kingdom guarantees the inhabitants that emission reductions will be planned and achievable and engineering targets will be set and approved to promote sustainability and good practices in respective sectors (Rahman et al., (2020)). The UK government has also implemented several initiatives that support business sustainability. One is the Green Finance Strategy, which seeks to support green innovations (Shetty & Bhat, (2022)). The UK has a favourable legal framework backed by a good culture of corporate sustainability whereby many organizations embrace the GSCM practices in their discourses on CSR (Alexandrou et al., (2022)). According to Khan et al. (2021), the UK's retail sector companies are way ahead in the GSCM context. For instance, Marks & Spencer and Tesco have developed fundamental sustainability programs that engage GSCM as a strategic organizational business model. However, integrating UK society into the global economy poses operational challenges. To implement sustainability principles requires program and practice coordination across the extended supply chain network.

2.3 Industry Adoption and Implementation of GSCM Practices

It has also been noted that the level of GSCM practice adoption and implementation varies from one industry to the other in India and the UK, depending on the type of industry, the extent of the market competition, and the level of awareness of the environment. The industries that have fully adopted the GSCM in India are the manufacturing and automotive industries since it is mandatory to adhere to these norms and the practice of dealing with global environment norms. (Zhu, 2022). Tata Steel and Mahindra & Mahindra are some Indian organizations implemented fully mature GSCM activities relating to energy conservation as well as the management of waste and green purchasing (Panigrahi et al., (2019)). However, the practice of GSCM in India decreased mainly due to country's small and medium enterprises (SMEs), which form a higher proportion of the country's industrial sector (Abdellatif & Graham, (2019)). SMEs need to bring the necessary financial muscle and specialized skills to undertake GSCM practices. SMEs are more vulnerable to the high costs of green technology adoption (Ghadge et al., (2022)). Further, the structures of the Indian supply chain are severely fragmented with a significantly large involvement of informal system and practices and, therefore, the prospect of implementing the GSCM practices becomes even difficult.

GSCM practices in UK are more developed as the companies are increasingly integrating green factors into their SCM activities. Yildiz Çankaya & Sezen (2019) noted that all industries in the United Kingdom, namely the manufacturing, retail, and logistics industries, have implemented GSCM either as a result of regulation or forced by the market factor/forces/ drivers such as green consumerism. For example, the food and beverages sector's operation in the UK has registered considerable improvements towards environment management as it is embodied in their sustainable sourcing, reduction of animal content, and carbon footprint (Abdel-Baset et al., (2019)). The other reason for the implementation of GSCM practices pertains to the length and the nature of the company's relationships with their life cycle partners, where supply chain relationships are viewed as cooperative and where both firms and their supply chain counterparts are working towards the achievement of the objectives of the GSCM. The third factor that emerged in the research process is that managing the global supply chains and costs of sustainable innovations are still challenging for UK firms. Nevertheless, the need to use different regulations in various countries is a great challenge to the general use of GSCM practices.

2.4 Performance Metrics and Outcomes of GSCM Practices

The extent to which GSCM practices deliver environmental and economic improvements is predominantly assessed using different performance measures. They comprise environmental parameters, such as emissions, energy, and wastes, and the economic parameters, such as cost, efficiency, and competitiveness (Badi & Murtagh, (2019)). Thus, the choice of performance measures depend on the type of host industry, the specific GSCM practices being implemented, and overall organization strategies (Carvalho et al., (2020)). It has been found that the concept of GSCM performance evaluation in India is even in its infancy. Mainly, it was done by comparing GSCM on some aspects, such as regulation concerns and cost control (Pattnaik & Pattnaik, (2019)). For instance, performance indicators implemented by Indian manufacturing firms in GSCM are reduction in energy rates, eradication of wastes, and conformity to stands set by the environment (Reche et al., (2020)). However, challenges such as the absence of sound indices for assessment and challenges of data acquisition and processing always work against the Indian firms to assess the strength of their GSCM initiatives effectively.

This implies that UK companies have a more advanced look at performance measurement anxieties from the perspective of the impacts of the GSCM practice (Bhatia & Gangwani, (2021)). The economic/financial and the social/environmental factors are typically used by the UK-based firms in evaluating the effectiveness of the expanded GSCM, in addition to the traditional environmental KPIs. For example, retail organizations in the UK might appraise GSCM regarding customer satisfaction, brand reputation, and supply chain (Saini et al., (2023)). These results also support the assertion that the impact of GSCM practices could vary according to the level of participation and penalties given by companies. Some of the benefits that several studies have identified include lower costs, organization efficiencies, and competitiveness in the UK market of organizations that have immensely invested in GSCM practice. However, in India, in many cases, companies are not able to reap the benefits of GSCM because of barriers to implement such actions and the lack of green technologies.

2.5 Barriers to the Implementation of GSCM Practices

Although more and more companies in India and the UK pay attention to GSCM, various factors hinder companies from practicing sustainable supply chain management. . In India, one of the major constraints is the high costs of green technologies and the unavailability of funds for new companies (Kumar et al., (2019)). Another problem with the Indian supply chain is it's highly disintegrated, with numerous supply chain participants in the informal economy (Asif et al., (2020)). Insufficient facilities for waste, recycling, and green logistics add to the challenges of GSCM implementation in India (Rahman et al., (2020)). The cultural and organizational factors hinder the implementation of GSCM practices in India. Most Indian organizations, especially SMEs, have, despite appreciable development in organizations' essentials of sustainable development, still been trapped by short-term

monetary return (Shetty & Bhat, (2022)). Managers and employees need more awareness and understanding of GSCM for implementing sustainable practices (Zhu, (2022)). Further, the need for more training and capacity-building programs on GSCM can challenge the company to find the right expertise to practice these measures.

Concerning the UK, the main challenges are the number of GSCM implementations, the difficulty in managing the global supply chain, and the sustainability cost of innovations (Meager et al., (2020)). The requirement to comply with various regulation systems in numerous countries might be a source of problems for British businesses, especially industries with extensive and discontinuous supply networks. However, the methods of managing GSCM and the absence of a specific guideline on the best practice complicate the process to achieve a consistent implementation (Tseng et al., 2019). Another major impediment in the UK, is established clash of interests between the environment and the economy. Many UK firms support the long-term advantages of GSCM, but short-term costs discourage firms, especially low-margin industries (Reche et al., (2020)). Furthermore, the low consumer awareness and demand for green products in some industries can constrain GSCM implementation. (El Baz & Iddik, (2022)). The need for integration and communication among various supply chain partners emerges as one of the major concerns regarding the effective implementation of GSCM practices in the UK supply chains.

3. RATIONAL AND RESEARCH OBJECTIVES

With increasing global attention on environmental sustainability, industries are being compelled to re-examine their supply chain operations. In this context, Green Supply Chain Management (GSCM) has emerged as a strategic approach that seeks to balance environmental, economic, and social performance goals (Zhu et al., 2022). GSCM involves the integration of environmental thinking into all stages of the supply chain, including product design, material procurement, manufacturing processes, logistics, and end-of-life management (Yadav et al., 2023).

The leather industry, especially within small and medium-sized enterprises (SMEs), presents unique challenges and opportunities for GSCM implementation. Known for its high water usage, chemical-intensive processes, and significant environmental footprint, the sector is under increasing scrutiny for its sustainability practices (Jain & Ghosh, 2023). While GSCM principles have gained momentum globally, their implementation remains inconsistent, particularly between developing and developed economies. In Northern India, the leather industry plays a crucial role in the economy, contributing significantly to exports and employment. However, it continues to struggle with issues such as non-compliance with environmental standards, obsolete production technologies, financial limitations, and inadequate policy enforcement (Tiwari & Singh, 2024; Kumar et al., 2022). The lack of awareness, limited stakeholder collaboration, and infrastructural gaps further deteriorate the situation, making GSCM adoption a complex task for Indian SMEs.

In contrast, SMEs in the United Kingdom operate within a more structured regulatory framework, with heightened consumer environmental awareness and proactive government support. The UK has demonstrated greater maturity in GSCM adoption, enabled by policy incentives, technological innovation, and stakeholder collaboration (Pattnaik & Pattnaik, 2019; Andrews et al., 2023). As a result, UK-based leather SMEs tend to show stronger environmental accountability and supply chain transparency. Despite the importance of GSCM, there is a noticeable lack of comparative research that examines how these practices are implemented in different geopolitical and socio-economic contexts, particularly within the leather SME sector. A comparative study between Northern India and the UK is essential to identify key drivers, barriers, and performance differentials, enabling targeted strategies that reflect local realities and challenges (Ali & Sahu, 2023).

This research also aligns with the Triple Bottom Line (TBL) sustainability framework by assessing the environmental, economic, and social impacts of GSCM practices. By providing an in-depth comparative perspective, the study contributes not only to academic knowledge but also offers practical implications for policymakers, industry practitioners, and sustainability advocates seeking to enhance GSCM adoption among SMEs across diverse regions.

Research Objectives

- To understand the GSCM practices in Indian and UK Leather manufacturing industry.
- To analyze the impact of GSCM practices on environment performance outcomes in Indian and UK Leather manufacturing industry.
- To analyze the impact of GSCM practices on economic performance outcomes in Indian and UK Leather manufacturing industry.
- To analyze the impact of GSCM practices on social performance outcomes in Indian and UK Leather manufacturing industry.
- To identify the factors affecting implementation of GSCM practices in Indian and UK Leather manufacturing industry.

4. RESEARCH METHODOLOGY

The research conducted an empirical analysis using secondary quantitative data. An empirical analysis is one in which data in numerical form is gathered and processed to draw conclusions that also apply to other areas. The research design adopted in this study is descriptive and explanatory, providing a guide to exploring the GSCM practices in India and the UK. A descriptive design provides a clear account of the sample or subjects under study and what constitutes them (Chen et al., (2022)). The study will assist in categorizing the GSCM practices in the two countries. Quantitative research is conducted to analyze the impact of environment, economic and social variables on GSCM practices and key factors affecting GSCM implementation. Secondary data has been collected from a large resource base of reports and articles. It enables the identification of a wider number of factors applicable to any industry or sector in both countries. The choice of the second type of data is also rational, as it will allow the use of secondary sources that have already been quantitatively analyzed, improving the study's reliability and credibility.

Data Collection

In this study, the secondary quantitative data has been collected from reports and articles. An attempt was made to gather the most relevant data of GSCM practices in India and the UK. Only reports published in journals and periodicals of academics, government, industries, and international organizations were considered for internal and external data accuracy. These reports presents variables i.e. environmental performance measures, economic performance measures, social performance measures, GSCM policies, regulatory issues, and internal and external variables of sustainable supply chains of United Kingdom leather industry (Costa et al., (2022)). Due to the use of secondary data, the study is in a position to give an account of GSCM practices in the two nations and across the different industries. The integration of such an approach allowed the comparison and understanding to build conclusions on the similarities and differences between India and the UK.

Data Analysis

Quantitative analysis has been done to understand trends, patterns, and relationships in GSCM practices between India and the United Kingdom based on the extracted secondary data. The key control variables were explained and quantified descriptively; the outcome displayed the state of environmental, social and economic performance indicators and GSCM strategies in both nations (Watari et al., (2022)). To analyse the relationships between variables and impact of GSCM on environment, economic and social performance indicators and to identify the factors affecting GSCM practices, this study relied on inferential statistics such as descriptive statistics, correlation, Chi square test and factor analysis. Tables were used to represent data to interpret the findings. The research findings showed some degree of variance in factors such as policy stringency and the state of the economic system affecting the usage of GSCM. Therefore, they provided a key aspect of the determinants of sustainable supply chain management practices. The results obtained were compared with the works of other authors to check for coherence and to establish novelties in knowledge.

5. DATA ANALYSIS AND INTERPRETATION

This section covers the data analysis and findings of the research work on implementing GSCM practices in Northern India and UK SME leather industries. The analysis focuses on three key performance dimensions, environmental, economic, and social perspectives, to obtain a reference for learning how these regions employ and harness GSCM. Explicating by descriptive statistics, factor analysis, and model fit indices; the chapter explores the level of GSCM implementation and its efficiency on these performance dimensions. The discovery thus reveals a substantial variation in how both the regions implement GSCM, and more to the point, the results of these implementations are influenced by factors such as regulation, technology, and culture. This research seeks to bring out the issues and prospects for boosting established and developmental GSCM practices with a special focus on India, which still has much room for improvement.

Table 5.1: Environmental Performance Outcome (Indian Leather Industry)

S. No.	Standard	Mean	Std. Deviation
1	Air emission reduction	2.77	1.08
2	Water Pollution reduction	3.04	0.43
3	Reduction of solid waste	3.28	0.64
4	Reduction of accidents	3.39	0.76
5	Recycling of Materials	3.43	0.88

Source: (Tiwari & Singh, 2024)

Table 5.1 articulates the environmentally adjusted performance of Green Supply Chain Management (GSCM) in SME leather industries of Northern India. The mean scores and standard deviations indicate varying levels of focus on different environmental aspects. The mean scores suggest that the industries show moderate to high interest in reducing water pollution (mean = 3.04) and solid waste (mean = 3.28) and in recycling materials (mean = 3.43). The reduction of accidents (mean = 3.39) and air emissions (mean = 2.77) have slightly lower scores but still reflect some level of commitment. The results suggest a broad shift in the discussed enterprises' approach to environmental issues, with less emphasis on conservation and more on waste minimization and recycling.

Table 5.2: Economic Performance (Indian Leather Industry)

S. No.	Standard	Mean	Std. Deviation
1	Cost reduction for energy use	2.75	1.58
2	Cost savings when buying materials	3.09	1.22
3	Reduced charge for offal treatment	3.08	1.05
4	Environmental conditions have improved overall.	3.48	0.98

Source: (Tiwari & Singh, 2024)

Table 5.2 features the economic performance by using Green Supply Chain Management (GSCM) practices in SMEs of Northern India involved in the leather sector. By analyzing the mean scores and standard deviations, one can distinguish the level of impact on economic performance. The lowest mean score is given to cost reduction in energy use (2.75), meaning there is moderate interest in energy cost. Higher scores are observed for cost savings when purchasing materials (3.09) and reduced charges

for offal treatment (3.08), suggesting a more pronounced economic benefit in these areas. The highest mean score is for overall improvement in environmental conditions (3.48), implying that while benefits exist, and the strongest economic gains are linked to broader environmental improvements rather than specific cost reductions.

Table 5.3: Social Performance (Indian Leather Industry)

S. No.	Standard	Mean	Std. Deviation
1	Professional Conduct	3.96	0.76
2	Participation in Social Work	3.92	0.68
3	Providing employment possibilities	3.74	1.09
4	Obeys governmental law	2.03	1.58

Source: (Tiwari & Singh, 2024)

Table 5.3 presents the social performance results of Green Supply Chain Management (GSCM) in Northern India's SMEs within the leather industry. The mean scores and standard deviations reflect varying levels of social impact. The highest mean score is for professional conduct (3.96), indicating a strong emphasis on maintaining standards of professional behaviour. Participation in social work (3.92) and providing employment opportunities (3.74) also show significant social contributions. However, adherence to governmental laws (2.03) has the lowest mean score, suggesting that compliance with legal regulations should be more emphasized. While there is notable progress in professional and social engagement, legal compliance needs to be prioritized in the social performance of these industries.

Table 4.5: KMO and Bartlett's Test (Indian Leather Industry)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.811
Bartlett's Test of Sphericity	Approx. Chi-Square	4191.255
	df	253
	Sig.	.000

Source: (Beloor et al., 2023)

Table 5.4 provides key insights into the suitability of the data for factor analysis within the context of Indian manufacturing sectors. The KMO value of 0.811 indicates a high level of sampling adequacy, suggesting that the data is appropriate for conducting factor analysis. A KMO value above 0.8 is generally considered very good, implying that the dataset's variables are sufficiently correlated for meaningful factor extraction. Bartlett's Test of Sphericity further supports the appropriateness of factor analysis, with a highly significant result ($p < 0.001$), as indicated by the approximate Chi-Square value of 4191.255 and degrees of freedom (df) of 253. This significant result suggests that the correlation matrix is not an identity matrix, meaning substantial relationships exist among the variables in the Indian manufacturing sector data. These findings collectively validate the factor analysis approach for identifying underlying factors influencing Green Supply Chain Management practices in the Indian manufacturing sector.

Table 5.5: Total Variance Explained (India Leather Industry)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.520	23.999	23.999	5.520	23.999	23.999	3.501	15.221	15.221
2	3.883	16.883	40.882	3.883	16.883	40.882	3.370	14.650	29.871
3	2.547	11.074	51.956	2.547	11.074	51.956	2.706	11.767	41.638
4	1.658	7.208	59.164	1.658	7.208	59.164	2.444	10.625	52.263
5	1.525	6.632	65.796	1.525	6.632	65.796	2.412	10.488	62.751
6	1.405	6.108	71.904	1.405	6.108	71.904	2.105	9.153	71.904
7	.845	3.673	75.577						
8	.637	2.768	78.345						
9	.609	2.650	80.995						
10	.550	2.390	83.385						
11	.511	2.221	85.606						
12	.443	1.928	87.533						
13	.392	1.703	89.236						
14	.376	1.636	90.872						
15	.350	1.522	92.394						
16	.309	1.345	93.740						
17	.267	1.160	94.900						
18	.249	1.081	95.980						
19	.210	.912	96.893						
20	.194	.843	97.736						
21	.187	.814	98.550						
22	.172	.747	99.297						
23	.162	.703	100.00						

Source: (Beloor et al., 2023)

Table 5.5 presents the results of the factor analysis, "Initial Eigenvalues" section; the first component “Policy and Regulation” explains 23.999% of the variance, followed by the second component “Financial Resource” with 16.883%, and the third component “Technology” with 11.074%. Together, the first six components account for 71.904% of the total variance, which is significant in the context of the Indian manufacturing sector's Green Supply Chain Management (GSCM) practices. These six components likely represent the most critical factors influencing GSCM practices. The "Extraction Sums of Squared Loadings" section mirrors the initial eigenvalues, indicating that these components remain significant after extraction. The "Rotation Sums of Squared Loadings" section, which reflects the results after applying Varimax rotation, shows a more even distribution of variance across the first six components, with the first component now explaining 15.221% and the sixth component 9.153%. The cumulative variance these six components explain is still 71.904%, suggesting that the rotated factors provide a balanced and interpretable solution for understanding the key drivers of GSCM practices in the Indian manufacturing sector. This indicates that the factors identified are both significant and distinct, clearly representing the underlying structure within the data.

Table 5.6: Chi-Square Model fit summary (India Leather Industry)

Model tested	χ2/Cmin	GFI	AGFI	CFI	TLI	RMSEA
Performance of model	2.317	.907	.952	.932	.918	.064
Criterion for Goodness of Fit	≤ 3	≥0.90	≥0.90	≥0.90	≥0.90	≤ 0.08

Source: (Beloor et al., 2023)

Table 5.6 presents the model fit summary; the χ2/Cmin ratio of 2.317 is below the threshold of ⩽ 3, indicating a good fit of the model to the data. The Goodness-of-Fit Index (GFI) and Adjusted Goodness-of-Fit Index (AGFI) are both reported as 0.907 and 0.952, respectively, surpassing the recommended minimum of ⩾ 0.90. This means there is a promising fit of the model, and the model has factored quite a large proportion of the variance of the data. Speaking of the goodness of fit, it is high as well, for the CFI is 0932 and Tucker-Lewis Index (TLI) of 0.918, both of which are above the permissible level of ⩾ 0.90, which indicates that there is a fairly reasonable level of the comparative fit of the model with the null model. There is another index, the Root Mean Square Error of Approximation (RMSEA), which is equal to 0.064; it hence recorded a Triple Bottom Line score of ⩽ 0.08, which was quite acceptable for the model approximation and, therefore, a level of 10 percent error. These fit indices confirm that the Chi-square test and other parameters related to GSCM practices depict a fairly good match of the model to the observed data in the given dataset.

Table 5.7: Discriminant Analysis (UK Leather Industry)

Correlated Constructs	Squared Correlation Values	Discriminant validity test
SCP <—> EP	$(.485)^2 = 0.235$	0.235 < AVE EP (0.511) < AVE SCP (0.59)
SCP <—> EDP	$(.274)^2 = 0.075$	0.075 < AVE SCP (0.59) <AVE EDP (0.508)
SCP <—> SCC	$(.418)^2 = 0.174$	0.174 < AVE SCP (0.59) <AVE SCC (0.626)
EP <—> EDP	$(.708)^2 = 0.501$	0.501< AVE EP (0.511) <AVE EDP (0.508)
EP <—> SCC	$(.633)^2 = 0.400$	0.400 < AVE EP (0.511) < AVE SCC (0.626)
EDP <—> SCC	$(.695)^2 = 0.483$	0.423<AVE EDP (0.508) <AVE SCC (0.626)

Table 5.7 presents a discriminant validity test of exogenous variables in the context of GSCM in the UK. In the case of Supplier and Customer Pressure (SCP), the results show that its squared correlation and Environmental Purchasing (EP) have been found null. The correlation values were 0.235, lower than AVE's for the EP and SCP at 0.511 and 0.590, respectively. This contributes to the evidence that SCP and EP are two different entities and discriminant validity could be confirmed. Equally, the relationship between the extent of SCP and the extent of MSCP is squared to that of Eco Design and Production (EDP). The mean value of COR is lower than the AVE values of SCP and EDP 0.075, compared to SCP, 0.590, and EDP, 0.508; they are cross-validated. Indeed, Supplier and Customer Collaboration (SCC) affection correlates almost perfectly with Supplier and Customer Pressure with Pearson coefficient at 0.174, which is a lower value than AVE of SCP = 0.590 and AVE of SCC have a squared correlation. Even though the values 0.501 exceed the AVE for Environmental Purchasing (EP) (0.511) and are below the AVE for EDP (0.508), this shows relatively low discriminant validity but a high level of overlap in acceptable levels. Therefore, they are more different from each other than L&M is from each other. EDP and SCC, level by speaking, have a squared correlation of Average Variance Extracted (AVE) for all the constructs as follows: EDP = 0.508, SCC= 0.626, and PT= 0.483 of which are below that of EDP and SCC, thereby indicating that they are different. In general, these results agree with previous research that has pointed to the fact that there are indeed mean differences present in the UK GSCM measured constructs, as discussed.

Table 5.8: Reliability Analysis of Exogenous Variables (UK Leather Industry)

Exogenous variables	No of items	Cronbach's α	Composite Reliability (CR)	AVE
SCP	5	0.884	0.876	0.590
EP	6	0.860	0.860	0.511
EDP	5	0.829	0.828	0.508
SCC	5	0.898	0.892	0.626

Table 5.8 provides the findings on the reliability and the pre-test of the convergent validity of exogenous variables of GSCM in the context of the UK. Supplier and Customer Pressure (SCP), including five items, has a high internal consistency measured through Cronbach's α of 0.884; concerning the Internal consistency, the reliability coefficients of all the subscales ranged, which is good reliability. Its Composite Reliability (CR) was known to have a Total Information Coefficient of 0.876 and an Average Variance Extracted (AVE) of 0.590, providing evidence for stable reliability and convergent validity so that the SCP measures are reliable and have equivalent meaning. There is a resultant Cronbach's α of 0.860 for six items in the Environmental Purchasing (EP) factor and a CR of 0.860. The AVE of 0.511 suggests that as to construct, EP measures hit the target. Eco Design and Production (EDP) with five items has Cronbach's α of 0.829, and The Clinic's CR was at 0.828. The AVE of 0.508 has good convergent validity for affirmation of the reliability of EDP measures. Supplier and Customer Collaboration consist of 5 items, of which Cronbach's α is 0.898 and a CR of 0.892, with an AVE of 0.626, confirming their excellent convergent validity and presenting the measures of the SCC's reliability. The findings of this research imply that the measurement model fairly well represents GSCM practices in the UK and that the constructs developed are reliable and valid for undertaking the analysis.

Table 5.9: Chi-Square Model fit indices (UK) - Exogenous Variables

Relative chi-square	CFI	TLI	RMSEA
1.607	0.928	0.917	0.069

Table 5.9 gives the findings of the measurement model of the exogenous variables for GSCM in the UK setting. The relative chi-square of 1.607 also represents acceptable fitness levels, indicating that the model appropriately fits the data on the GSCM practices. The degree of translation adequacy was also determined using TLI, which takes the value of 0.917 and a cut-off point of CFI is 0.928, both above 0.90 levels, to establish whether the model appropriately fits the estimated GSCM variables and the outcomes. The RMSEA of 0.069 reflects below the standard value of 0.08, which further subscribes to the good fit of a UK GSCM model with a very low level of approximation error, as shown.

Table 5.10: Reliability and convergent of endogenous variables (UK Leather Industry)

Endogenous variables	No of items	Cronbach's α	Composite Reliability (CR)	AVE
EnvPerf	4	0.835	0.841	.572
SocPerf	5	0.866	0.866	.567
EcoPerf	4	0.886	0.888	.666
OperPerf	3	0.845	0.853	.661

Source: (Pattnaik & Pattnaik, 2019)

Table 5.10 shows the reliability and convergent validity of the endogenous variables in the context of the present study of GSCM in the UK. For Environmental Performance (EnvPerf), which has four items, Cronbach's α is 0.835, and the Composite Reliability (CR) is 0.841. The study's results yielded participants, and the entire construct's Average Variance Extracted (AVE) was greater than 0.572. The former reveals high internal reliability and reasonable construct validity, primarily because the highest AVE exceeds 0.50. In the same way, the scale of Social Performance (SocPerf) has five items and has a Cronbach's α = 0.866 and a clinical recovery rate, CR of 0.866 with an AVE of 0.567. The estimates ranged fairly around the mean, with the measurements being reliable and valid. Economic Performance (EcoPerf) with four items recorded a high inter-item reliability of Cronbach's α of 0.886 and had a clinical response rate of 0.888 and AVE of 0.666 with coefficients of reliability and convergent validity that are off the chart. Three items assessing Operational Performance (OperPerf) display a reasonable internal consistency, estimating that Cronbach's α was 0.635 and had a mortality rate. In total, it has 0.853 coefficients with an average variance extracted value. It had a Cronbach alpha coefficient of 0.666, proving the test is reliable and valid. On balance, these findings support that this study's measures for endogenous variables in GSCM are valid and, as postulated, capture the intended construct.

Table 5.11: Chi-Square Model fit indices of endogenous variables (UK Leather Industry)

Relative Chi-Square	CFI	TLI	RMSEA
1.712	0.940	0.927	0.074

Table 5.11 presents the model fit indices of the measurement model of the endogenous variables on GSCM in the UK environment. The value of the relative chi-square was 1.712, which is considered acceptable as it is well below the DFF cut-off point. The comparative Fit Index (CFI) was 0.940, and the Tucker-Lewis Index (TLI) was 0.927, both over the 0.90 benchmark, proving the good fit of the model and data on the outcomes of GSCM. The Root Mean Square Error of Approximation (RMSEA) of 0.074, just a bit underneath the threshold of 0. 08, is indicative of an acceptable model fit with the least measure of error and was an assurance of the correctness in depicting the impact of the GSCM model for these practices in the conceptual model of UK.

Table 5.12: Core Influencers of Green Supply Chain Management Practices in UK

Influencing Factor	Type	Role
Supplier & Customer Pressure	External	Pushes firms to adopt green practices
Environmental Purchasing	Practice	Encourages green procurement
Eco Design & Production	Practice	Drives innovation in sustainable products
Supplier & Customer Collaboration	Practice	Enables shared sustainability goals
Environmental Performance	Outcome	Measures ecological gains from GSCM
Social Performance	Outcome	Reflects ethical/social impacts
Economic Performance	Outcome	Financial gains from sustainability
Operational Performance	Outcome	Efficiency and productivity improvements

6. **DISCUSSION**

6.1 Environmental Performance

The cross-sectional survey results present that the studied Northern India SME leather industry has a moderate to deep concern for environmental factors such as reduction in water pollution, solid waste reduction, and recycling, etc. The above normative characters align with the existing research that has significant changes among calibrating industries of developing economies regarding environmental issues. However, implementing response may be lower than in developed economies (Kumar et al., 2019). The overall perceived mean was 3.04 for water pollution and 3.28 for solid waste, indicating a fairly poor commitment response.. In contrast, the response of 3.43 indicates the stringency of waste reduction goals for these industries. A lower mean value was again observed for air emissions, which implies that fewer measures have been put in place to address such emissions (mean = 2.77) and for accident reduction (mean = 3.39). Subsequently, writing for the World Bank Group, Singh et al. (2022) found that developing countries have few environmental regulations, although they are relatively less stringent and less strictly enforced; thus, the environmental performance gap is irregular. Such a shift between the environmental dimensions means there has also been a transition to more concern in addressing the local environmental issues at the expense of more global issues such as air pollution. However, in the UK's SME leather industry, the GSCM practices had more compliance due to regulatory pressures and better environmental awareness in the industry (Pattnaik & Pattnaik, 2019). The model fit indices prove a good match between the effectiveness of GSCM and the improvement of environmental performance. These scores coincide with earlier works that note that the UK has adopted high environmental standards and the encouragement provided to SMEs to go green.

Table 6.1: Comparative analysis of GSCM implication on environment performance outcome

Area	India	UK
Focus Areas	Moderate emphasis on recycling and waste reduction (e.g., solid waste: 3.28, recycling: 3.43)	High construct reliability (AVE > 0.57), indicating consistent practices across firms
Weak Areas	Low on air emissions (2.77)	Not explicitly weak, but less itemized detail
Interpretation	Indian SMEs are environmentally active but still developing strategies systematically	UK SMEs demonstrate higher structural consistency and more integrated approaches

6.2 Economic Performance

After examining the economic performance outcomes of numerous SMEs in Northern India, it is confirm that GSCM has led to certain cost savings, preferably in materials and waste treatment as illustrated in the figure disclosed by Tiwari and Singh (2024). For instance, the mean scores of energy cost reduction are 2.75; pointing to the fact that energy efficiency still needs to be improved as desired. This aligns with the study done by Govindan et al. (2014), which states that even though cascading benefits accrue to the adoption of GSCM practices energy, energy-efficient technologies cannot be implemented by SMEs operating in developing nations due to many factors, including inadequate capital and dearth of technical expertise. Therefore, the slightly higher mean scores in other aspects, such as overall environmental improvement (3.48), reveal concrete evidence of improved environment in Northern India by GSCM and other environmental benefits, which have been realized but are not cost savings. This aligns with the finding by Zhu et al. (2008), who noted that GSCM practices bring significant economic benefits to firms in the long run through environmental returns and valuable reputation capital instead of cost savings. However, the assessment of economic performance results is consistent with the distinct difference between GSCM practices and economic outcomes. It demonstrates a relative trade-off between environmental sustainability and profitability in terms of model fit indices in the UK as highlighted Pattnaik and Pattnaik (2019) in their study. The study finds that the UK leather industry has adopted GSCM as one of

the critical operations of the industry which support the preposition developed by Carter and Rogers' (2008 that sustainable supply chain management practices could be a competitive advantage using efficiency, cost, and brand image.

Table 6.2: Comparative analysis of GSCM implication on economic performance outcome

Aspect	India	UK
Focus Areas	Moderate cost savings in material purchasing (3.09) and offal treatment (3.08)	High economic construct reliability (Cronbach's α = 0.886, AVE = 0.666), shows confidence in outcomes
Weak Areas	Low emphasis on energy cost reduction (2.75)	None evident in reported data
Interpretation	Indian SMEs see indirect economic benefits; cost savings aren't the primary focus	UK firms have well-defined metrics with greater economic alignment to GSCM practices

6.3 Social Performance

The mean scores for managerial professionalism and social responsibility, as well as social performance indices in Northern India's SME leather industry, summed up to 3.96 and 3.92, respectively, as observed by Tiwari and Singh (2024). Nevertheless, the respect for governmental laws obtained a measly 2.03, pointing toward the fact that there are some shortcomings in the government regulations. . Similar to the conclusions made by Geng et al. (2017), while SMEs from developing countries perform community activities and are socially responsible, they need more compliance with regulations as enforcement is weak and resources are scarce. Concerning professionalism and social work, the interviewees were influenced by the rising appreciation of corporate social responsibility (CSR) in Northern India's leather industry, as discussed in Chaudhary and Biswas' (2020). However, the lower score in legal compliance means that laws only force a few social initiatives. Regarding social performance, metrics like adherence to laws and regulations related to labour and environment are relatively better in the UK. However, they are more rational, with the legal structure being much stronger and with better enforcement of laws than most other countries. This reaffirms the conclusions made by other authors that regulation plays an important role in determining social performance results and that this is especially valid in developed countries (Carter & Rogers, 2008). The about mean of 3.67 implies that UK SMEs are more likely to engage in partnerships that will improve the social and environmental performance of the firm. The scores for supplier and customer collaboration (Cronbach's α = 0.898) confirm that the GSCM practices are more integrated into the business system in the UK.

Table 6.3: Comparative analysis of GSCM implication on social performance outcome

Aspect	India	UK
Strengths	High professional conduct (3.96), community participation (3.92)	High reliability for social constructs (α = 0.866, AVE = 0.567)
Weaknesses	Very low legal compliance (2.03)	None explicitly noted
Interpretation	Indian firms are socially active but struggle with legal compliance	UK firms demonstrate holistic social responsibility with better structural integration

6.4 Factor Analysis and Model Fit

The factor analysis results indicate that the GSCM practices in Northern India are affected by five components i.e. Policy and Regulation, Financial Resource, Technology, Organization culture and leadership commitment, of which the first six components cumulatively account for 71.904%. It reflects that Policy and Regulation followed by financial resources and technology usage have a huge impact on implementation of GSCM in India. This concords with the study by Beloor et al. (2023), who stated that various factors are essential drivers of GSCM practices in developing economies. These factors claim that the implementation of GSCM is not a simple task, and several factors are coming into the picture while looking at the Indian manufacturing environment and the factors that are influencing the same, such as regulation, technology, and culture. KMO value of 0.811 and Bartlett's test of sphericity ($p < 0.001$), it is clear that factor analysis is apt; prior research also uses similar methods to analyze GSCM practices (Govindan et al., 2014). These results indicate that the identified factors are reliable and valid for studying the SMEs in the Leather Industry of Northern India and offer a robust foundation for explaining the antecedents of GSCM practices among the target businesses. In the UK, therefore, the model fit indices also endorse the effectiveness of GSCM practices for enhancing the performance results. The relative chi-square (1.607) and RMSEA 0.069 signifies a good fit for the data analysis of GSCM practices regarding the performance of the firms. The results are in consonant with the study by Carter and Rogers (2008), which concluded that GSCM practices influencing performance output are more aligned in developed economies because of the favourable regulatory environment and improved technological implementation.

The reliability and validity analysis for the UK context demonstrates that various dimensions of GSCM practices have strong internal consistency; in terms of Cronbach's α values, these range from 0.829 to 0.898. This is in line with the research findings of

past authors that claimed reliability and validity as core determinants of GSCM outcomes (Pattnaik & Pattnaik, 2019). The high composite reliability (CR) and average variance extracted (AVE) values also assure the reliability of the constructs used to measure the GSCM practices. The reliability of the constructs was found to be equally high in Northern India, and factor analysis was also found to be valid based on KMO and Bartlett's test values. Nevertheless, scoring a lower magnitude of compliance in social performance underlines that the constructs' reliability and the GSCM practices' effectiveness vary significantly across the used dimensions. This has been supported by earlier studies that reveal that financial and regulatory barriers constrain the extent of GSCM implementation among SMEs in developing countries (Geng et al., 2017).

Table 6.4: Factors Affecting GSCM practices in India and UK, Model Fit and Validity

Aspect	India	UK
Major Factors	Regulation (23.9%), Financial resources (16.8%), Technology (11%)	Supplier & Customer Collaboration (α = 0.898), Eco Design, Environmental Purchasing—all valid and reliable
Analysis Method	Factor analysis (KMO = 0.811, 6 components explain 71.9% variance)	Discriminant validity and reliability analysis show strong construct distinctions
Interpretation	India's GSCM is heavily dependent on external factors (policy, finance), indicating systemic challenges	UK shows more internal maturity in GSCM systems, particularly supplier/customer dynamics and eco-design integration
Model Fit	Good fit (CFI = 0.932, TLI = 0.918, RMSEA = 0.064)	Also strong (CFI = 0.940, TLI = 0.927, RMSEA = 0.074)
Reliability & Validity	Acceptable across constructs	High across both exogenous and endogenous variables
Interpretation	Both models are statistically sound, but UK constructs are more tightly validated and interlinked	

6.5 Implications for Practice

This study's findings have several managerial implications concerning GSCM practices in India and the UK. Therefore, suggestions for SMEs in Northern India is to work on enhancing compliance with the legislation and to extend the usage of environmental management tools, especially regarding air pollution and energy usage. This could be done through more government reassurance, extending the availability of funds that help promote sustainable technologies, and enhancing policy for environmental compliance. The future research question in the UK is how the GSCM practice can be integrated deeper into the organization and how sustainability and economic practices can be balanced. The focus on the relations between suppliers and customers indicates that UK SMEs have the potential to improve networking and know-how transfer in order to improve the results of GSCM.

7. CONCLUSION AND RECOMMENDATION

The objectives of the present study were to examine the extent of GSCM practice in the leather industry SMEs in Northern India and the UK and to understand the risks and benefits of implementing GSCM practice in these SMEs. The research has established the following implications of GSCM regarding reducing adverse environmental impacts and enhancing operational capacities, competitiveness, and market positions. This research ascertained that as much as the SMEs in these two regions appreciate the fact that GSCM is important to implement, they would be able to do it with some external and internal barriers such as financial resources, regulatory mandates, access to technologies, and organizational culture. The study presents one of the major research results that show that policies and regulations affect GSCM implementation. However, in the UK, the top management's awareness of environmental standards and political stimulus has fostered a better commitment to sustainability. However, the leather industries operating in Northern India face issues such as weak enforcement of laws on the environment, issues of finance, and the need for adequate technological backup. Hence, Indian SMEs are more or less in a reactive stage, and they follow GSCM practices only when buyer counterparties exert pressure. That difference between the developed and the developing world means that the governments of nations in the developing world must first ensure that they put the right type of regulation in place to facilitate sustainable development and the right economic inducements to encourage the active practice of sustainable development.

In assessing the perceived factors for GSCM adoption, the study also found that 'financial resources' were another important factor to influence GSCM adoption. Financially constrained SME's of developing economies put less effort on adopting green technology and process investment. It is due to absence of sufficient financial backing, as SMEs are more focused towards short-

term approach for sustainability strategies. The barrier indicates that governments and financial institutions should provide special financial incentives through subsidies or grants and low-cost credits for green investments. The former measures would promote cleaner production and technologies and enhance resource usage even in case of SMEs' financial obligations. The technological factors that may constrain the ability of industries to adapt GSCM was another factor which receive attention; it was in addition to the factor of financial stringencies held to hold out for the industries of Northern India that are engaged in the business of making leather goods. The study identify that UK businesses enjoy supply chain openness, improvisation and efficacy as well as access to new tools, the Indian businesses adopt outdated practices. The technological deficiency inhibits the correct execution of the GSCM strategies in SMEs, resulting poor environmental performance. Optimum technology together with capacity building will enhance the practice of GSCM in a developing economy. Moreover, exchanging information between SME businesses, large companies, and governments might improve technology advancements and the deployment of sustainable supply chain management practices. Out of the two important internal factors correlated with GSCM adoption, organizational culture, and leadership commitment were considered. The research findings indicates: Organizations with a high commitment towards sustainability will incorporate GSCM practices when the leadership perspective and organizational values are considered. In UK, the concept of sustainable development is quite well practiced, and the SMEs revealed a higher level of GSCM implementation than the manufacturing SMEs of India. Regardless, all the Indian SMEs with leaders on board with sustainability issues and concerns could also tackle the abovementioned barriers and adopt green practices. This study implies that, while implementing GSCM, it is important to focus on issues such as training, awareness, and leadership development within the SMEs.

Concerning frailty in environmental management, more effort should be placed into enhancing environmental legislation and enforcement among the world's governments, especially in developing states like Northern India. Standardization practices must be established and consequences of non-attainment of targets will encourage SME's to become more sustainable.. While implementing GSCM practices in developing economies, financial constraint is one of the evident and critical challenges.. Subsidies, grants, and low-cost loans have to be extended by governments and financial institutions to encourage long-term investment in port technology improvement and waste management/cutting energy usage. It is relevant to focus on the technologies that drive increased efficiency of supply chains and, therefore, enhance sustainability. The local sectorial associations and government organizations must cooperate to make green technologies cheaper and available for SMEs in developing countries. Training on digital tools such as blockchain and IoT should also be encouraged to enhance supply chain vulnerability. Cross-industry and cross-company cooperative relationships between SMEs and large companies and between companies and universities advance the innovation and diffusion of knowledge in GSCM.

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