IOSR Journal of Business and Management (IOSR-JBM)
e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 22, Issue 10. Ser. III (October 2020), PP 60-67
www.iosrjournals.org

Investigation of Constraints for the Implementation of Green Supply Chain Management Practices

Tusher Sarder[1*], MahabuburRahman Khan[2]
[1*]*University of Dhaka, Institute of Leather Engineering and Technology, Bangladesh*
[2] *University of Dhaka, Institute of Leather Engineering and Technology, Bangladesh*

Abstract:
Green Supply Chain Management is getting importance in many industries all over the world not only for its competitive or economic advantages but also for the government regulations and the consciousness of the customers for the environment. To focus mainly on environmental issues manufacturing industries started adopting the green concept in their supply chain management. Nowadays for the manufacturers green supply chain management is a very cardinal issue. But its implementation is not easy due to its constraints. This work focuses on identifying constraints to the implementations of a green supply chain management.Total eleven constraints have been identified under three main categories. It has been done by taking questionnaire-based survey from different industries and through detailed literature and discussion with industrial experts. The main constraints have been identified by recourse to the analytical hierarchy process. In essence, 'Financial constraints' is ranked as first priority category among three other main constraint categories. Capital unavailability (C11) received the first priority among the full list of sub-constraints.
Key Word:*Green Supply Chain;AHP; Sustainability; Corporate responsibility.*

Date of Submission: 25-09-2020 Date of Acceptance: 08-10-2020

I. Introduction

At present time environmental management framework is quite different than before. In early times operating managers involved only at arm's length. For ensuring environmental excellence separate organizational units were responsible. They were responsible for the process design, product development, operations, logistics etc. Today, this has changed. As in the quality revolution of the 1980s and supply chain revolution of the 1990s, it has become clear that the best practices call for integration of environmental management with ongoing operations. Green supply chain management (GSCM) is gaining interest among researchers and practitioners of operations and supply chain management. The growing importance of GSCM is driven mainly by the escalating deterioration of environment, e.g. diminishing raw material resources, overflowing waste sites and increasing level of pollution. However, it is not just about being environment friendly; it is about good business sense and higher profit.

Due to the production in business, resulting in scarcity of natural resources, and generation of large amount of wastes by polluting the environment and unsustainable consumptions there are a number of serious environmental, economic, and social issues are arising which are highly interlinked and have been faced many challenges during the past one or two decades. Now a days, getting pressured from the government most of the industries are focusing on GSCM to improve their images as a green practitioner. It has gained importance in the academia too.

Beamon (1999) has defined green supply chain as "The expansion of traditional supply chain to include activities to reduce waste of resources and negative environmental effects of a product throughout its entire life cycle, from extraction of raw materials to final utilization and disposal (Eltayeb, Zailani, & Ramayah, 2011). GSCM is an integration of natural environmental worries into supply chain management by implementing various green practices like life cycle analysis (LCA), green design, green purchasing, 3Rs (recycling, reuse and remanufacturing), environmental technologies, green logistics, and collaborative practices with suppliers, distributors and customers (P Ahi & Searcy, 2013; Sarkis, Zhu, & Lai, 2011).

This paper takes an integrated and fresh look into the area of GSCM and its constraints in implementing it in Bangladesh. Using the rich body of available literature, including earlier reviews that had relatively limited perspectives, the literature on GSCM is classified on the basis of the problem context in supply chain's major influential areas. It is also classified on the basis of methodology and approach adopted. Various mathematical tools/techniques used in literature vis-à-vis the contexts of GSCM are mapped. Finally, the findings and interpretations are summarized, and the main research issues and opportunities are highlighted.

The first goal of this work is to identify the constraints to the adoption of GSCM practices in Bangladesh. While certain constraints can be identified through the literature or experts' opinions, there remains the fact that different organizations may have different views regarding constraints in adopting GSCM practices. In view of this, the same GSCM adoption constraints may differently impact a certain industry and therefore hold a specific importance for that industry. Thus, a feasible barrier needs to be proposed and evaluated to manage the adoption of GSCM practice in various business organizations like leather goods industry. This is the reason for which the second objective of the present research is to evaluate the GSCM constraints. In light of this, an AHP approach is used for determining the relative importance of the constraints to adopt GSCM practice.

II. Literature Review

Green Supply Chain Management (GSCM)

In 20th century innovation goal of the green supply chain management (GSCM) was to reduce wastes due to economic reasons rather than environmental. But in 21st century the target has changed. Now industries are eager to adopt GSCM for getting competitive advantages by protecting environmental issues. In Bangladesh, leather goods industries are not serious about environmental issues. Most of them have to develop a supply chain strategy based on an environmental sustainability point of view by modifying traditional SCM to GSCM through the initiations of green procurement strategies (Mudgal, Shankar, Talib, & Raj, 2010).

GSCM can be achieved through various kinds of practices like as green purchasing, green design etc. For instance, purchasing recycled or recyclable materials affect the GSCM. Green design is another important issue which reduces negative environmental effects by integrating environmental issues in product design, development cycle is as 80% of product environmental impacts are specified in the design phase (Baykasoğlu, Kaplanoglu, Durmuşoglu, & Şahin, 2013; Büyüközkan & Ifi, 2012).

Transition from an old system to a new system sometimes creates some problems. These problems are known as constraints. In Bangladesh, these problems are more intensive than other developed countries. So, leather goods industries must focus to remove these constraints. In the initial stage of the adoption of GSCM they should identify essential constraints from all and should take necessary steps to remove them.

Research papers which consider relationships between GSCM practice and performances are generally limited, it emphasizes the need for future research which examines the GSCM constraints and develops the relationship of GSCM practices, economic and environmental performances. Here the main objective of this research is to find the best green practice to overcome the main supply chain management constraints for an industry's economic and environmental performance. Over the last decades, there have been pressures on the leather goods industries to take action to enhance their supply chain management to improve environmental performance and to reduce the hazardous effects on the environment. For this GSCM practices must be implemented in each industry.

GSCM integrates various environmental issues like life cycle analysis, green design, green purchasing, 3Rs (recycling, reuse and remanufacturing), green logistics, and collaborative practices with suppliers, distributors and customers (Payman Ahi & Searcy, 2013; Sarkis et al., 2011)with all activities of SCM. GSCM has ranged from green purchasing to integrated green supply chains starting from supplier to manufacturer to customer, and even RL (Zhu & Sarkis, 2004).

In this paper, GSCM is defined as 'integrating environmental thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life'. Green design has been used extensively in the literature to denote designing products with certain environmental considerations. It is the systematic consideration of design issues associated with environmental safety and health over the full product life cycle during new production and process development (Fiksel, 1997).

Product manufacture or remanufacture, usage, handling, logistics and waste management are related with green operations. Green manufacturing aims to reduce the ecological burden by using appropriate materials and technologies. On the other hand, remanufacturing relates with an industrial process in which worn-out products are restored to like-new condition (Lund, 1984), (Rogers & Tibben-Lembke, 1998) define RL as 'the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal', while (Eng Ann, Zailani, & Abd Wahid, 2006) defines waste minimization as 'the reduction of hazardous waste which is generated (during production and operations) or subsequently treated, stored or disposed'.

Constraints of Green Supply Chain Management (GSCM)

The GSCM and sustainability issues are becoming more relevant over the world because most of the world's manufacturing will be carried out in Asia continent within next twenty years and will create a lot of

opportunities in this continent, but in implementing GSCM practices it will bring about considerable environmental and social constraints. The main constraints in the perspective of leather goods industries in Bangladesh are categorized below:
The summary of literature on GSCM constraints is shown in Table 1.

Table 1: List of Constraints of Green Supply Chain Management

Main Category of Constraints	Sub-Constraints	Supporting literature
A. Financial constraints (C1)	1. Capital unavailability (C11)	(Abdulrahman, Gunasekaran, & Subramanian, 2014)
	2. Involvement of high investment (C12)	(Lorek & Spangenberg, 2014)
	3. Unavailability of financial loan (C13)	(Perron, 2005)
	4. High investment cost for environmental management (C14)	(van Asselt, van der Grijp, & Oosterhuis, 2006; Vazifehdoust, Taleghani, Esmaeilpour, Nazari, & Khadang, 2013)
B. Technological constraints (C2)	1. Absence of technical expertise Lack of latest technology, materials and processes (C21)	(Perron, 2005)
	2. Absence of technology upgradation (C22)	(Srivastava, 2007; Ying & Li-jun, 2012)
	3. Uninterest to adopt new technology (C23)	(Revell & Rutherfoord, 2003)
C. Information and knowledge contrarians (C3)	1. Lack of information related to green practices (C31)	(Reisch, 1998)
	2. Lack of interest on green products (C32)	(Revell & Rutherfoord, 2003)
	3. Lack of training program and seminar (C33)	(Zhu, Sarkis, & Lai, 2008)
	4. Lack of environmental knowledge (C34)	(Abraham, 2011)

III. Methodology

On the basis of literature reviews and discussions with the industrial experts, a detailed questionnaire was framed and circulated to various industries in Bangladesh. Later, the returned questionnaires were examined and the most common constraints were identified which was accepted by various industries. From these identified common constraints, the essential key constraints were selectedand ranked using an AHP approach. An overview of AHP method is given below,

Overview of AHP

In this work, Analytic Hierarchy Process (AHP) is used as the solution methodology. AHP is a multi-criteria decision making (MCDM) method that was initially proposed by Prof. Thomas L. Saaty. It is an MCDM approach which assists in analyzing, organizing and evaluating a complex multi criteria problem. It converts the problem attempted into a hierarchical structure comprising of different definite levels, like goal, criteria and sub-criteria (Dey & Cheffi, 2013; Govindan, Kaliyan, Kannan, & Haq, 2014; Luthra, Mangla, Xu, & Diabat, 2015; Madaan & Mangla, 2015; Saaty, 1980). In short, it is a technique to get proportion scales from paired comparisons. The input of the process can be picked from real estimation, for example, length, intensity etc., or from subjective assessment such as satisfaction, review, interview and preference. AHP may hold some small inconsistency in judgment since human perceptions are not always consistent. The ratio scales and consistency index are derived consecutively from the principal Eigen vectors and from the principal Eigen values. There are numerous additional methods, like ELECTRE and TOPSIS that have been presented to solve the multi-criteria decision making problem. However, AHP is suggested as a better tool in comparison to others due to its wide applicability and ease in use (Topçu, Harputlugil, Prins, & Gültekin, 2011). Therefore, we implement an AHP method to evaluate green supply chain risks and drivers with respect to the scenario of Bangladesh.

Steps in AHP analysis

The steps (Schoenherr, Rao Tummala, & Harrison, 2008) involved in the AHP are given as:

I. **Formulation of the aim of work**: Evaluating the constraints in order to identify their relative importance in the green supply chain implementation is defined as the aim of this work.

II. **Formation of the pairwise comparisons:** Pairwise comparison is formulated by means of data collection from assigned leather goods company with the help of five expert opinion, the pairwise comparisons among the green supply chain implementation constraints are attained through a nine point Saaty's scale as shown in **Table 2.**

Table 2: Saaty's Scale Values for Random Consistency Index

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

First, a set of pairwise comparison matrices for each level of the hierarchy are formulated and then all the pairwise comparisons are calculated. The pairwise comparison matrix is A and element a_{ij} of the matrix is the relative importance of i^{th}constraint with respect to j^{th} constraint. The representation is done like the following:

$A = [a_{ij}]$

where the entry in row *i* and column *j* of A (a_{ij}) indicates how much important constraint *i* is than constraint *j*. Each entry in matrix A is positive ($a_{ij}> 0$) and reciprocal (($a_{ij}= 1/a_{ji}$) for all *i, j= 1,2, 3,…n*) (Jaberidoost et al., 2015).

The pairwise comparisons are performed in terms of which element dominates or influences the order. AHP can aggregate many aspects of the decision situation into a single objective function. Its goal is to choose the best alternative that can optimize the objective function making pairwise comparisons of the criteria using Saaty's nine-point scale. The nine-point scale seeks to know the dependence criteria, which one will impact on the common criteria more and if that, how much more. According to Saaty, a value of 1 between two criteria denotes that both criteria equally influence the focused point, where a value of 9 indicates that the effect of one criterion is extremely more important than the other.

III. Computation of the Eigen values and Eigen vectors and relative importance weights:

The framed pairwise comparisons matrices were operated to determine the Eigen values and Eigen vectors, which are further analyzed to calculate the relative importance weights of the factors.

VI. Evaluation of the consistency ratio:

The consistency ratio (CR) is computed to ensure the consistency of pairwise comparisons. The used mathematical expression for finding the CR is given as, CR = CI/RI, where the consistency index is denoted by

$$CI= \frac{Maximum\ \ Eigen\ value - n}{n-1}$$

and the value of the random consistency index (RI) depends upon value of (n).The value of CR should be less than 0.10 to have better level of consistency (Madaan & Mangla, 2015).

IV. Applications of proposed method

To examine the case company, a decision team of eight professional is formed. The professionals selected are highly skilled in their domains and are proficient in decision- making. These experts were interviewed personally for collecting the necessary qualitative and quantitative data needed for present study.

Questionnaires were designed to facilitate data collection. Our data collection's two phases are discussed in the following,

Phase 1: Initial literature survey to identify common constraints

For literature we identified 11 constraints under three groups and presented in Table 1.

Phase 2: Determination of essential constraints.

In this section, the determination of essential constraints for GSCM implementation was done using the AHP approach.

First, pairwise comparisons are derived for both the criteria and the sub-criteria of constraints using experts inputs through a Saaty's scale. This way a pairwise comparison matrix for the main categories of constraints is framed and their relative weights and ranks are found out.

Table 3: Pairwise assessment matrix for main categories of constraints

Main Constraints	C1	C3	C3	Relative Weight	Rank
C1	1	4	3	0.630	1
C2	1/4	1	2	0.218	2
C3	1/3	1/2	1	0.151	3

Maximum Eigen Value =3.10785**; C.I.** =0.0539237

Likewise, the pairwise comparison matrices for sub-constraints under each category and their corresponding relative weights are shown in **Table 4** – **Table 6.**

Table 4: Pairwise assessment matrix for Financial constraints (C1)

Sub-Constraints	C11	C12	C13	C14	Relative Weight	Rank
C11	1	3	4	2	0.482	1
C12	1/3	1	2	2	0.234	2
C13	1/4	1/2	1	2	0.154	3
C14	1/2	1/2	1/2	1	0.130	4

Maximum Eigen Value =4.2377**; C.I.** =0.0792344

Table 5: Pairwise assessment matrix for Technological constraints (C2)

Sub-Constraints	C21	C22	C23	Relative Weight	Rank
C21	1	1	2	0.387	2
C22	1	1	3	0.443	1
C23	1/2	1/3	1	0.169	3

Maximum Eigen Value =3.01829; C.I. = 0.0091474

Table 6: Pairwise assessment matrix for Information and knowledge contrarians (C3)

Sub-Constraints	C31	C32	C33	C34	Relative Weight	Rank
C31	1	2	2	3	0.413	1
C32	1/2	1	1	2	0.222	3
C33	1/2	1	1	4	0.264	2
C34	1/3	1/2	1/4	1	0.100	4

Maximum Eigen Value =4.0902; C.I. = 0.030066

The pairwise comparison matrices are operated to determine the relative importance of weights are assigned corresponding to each category of constraints as given in **Table 7**

Table 7: Global ranking of green supply chain constraints

Constraints	Relative Weights	Sub-constraints	Relative Weights	Relative Rank	Global Weights	Global Rank
A. Financial constraints (C1)	0.630	C11	0.482		0.304	1
		C12	0.234	2	0.148	2
		C13	0.154	3	0.097	3
		C14	0.130	4	0.082	6
B. Technological constraints (C2)	0.218	C21	0.387	2	0.085	5
		C22	0.443	1	0.097	4
		C23	0.169	3	0.037	9
C. Information and knowledge contrarians (C3)	0.151	C31	0.413	1	0.063	7
		C32	0.222	3	0.034	10
		C33	0.264	2	0.040	8
		C34	0.100	4	0.015	11

Table 8: Final Result of constraints

Main-Constraints	**Rank**	**Sub-Constraints**	**Rank**
A. Financial constraints (C1)	1	Capital unavailability (C11)	1
		Involvement of high investment (C12)	2
		Unavailability of financial loan (C13)	3
		High investment cost for environmental management (C14)	6
B. Technological constraints (C2)	2	Absence of technical expertise Lack of latest technology, materials and processes (C21)	5
		Absence of technology upgradation (C22)	4

		Uninterest to adopt new technology (C23)	9
C. Information and knowledge contrarians (C3)	3	Lack of information related to green practices (C31)	7
		Lack of interest on green products (C32)	10
		Lack of training program and seminar (C33)	8
		Lack of environmental knowledge (C34)	11

V. Results Discussion

We see from the Table 8 that the 'financial constraints' is the first priority among the constraints categories. Therefore, it shows that industries commonly need more finance to extend their environmental management systems. Technological constraints receive the second in the rank. The 'Information and knowledge contrarians' ranks third, has found that there is a lack of knowledge in measuring environmental performance in supply chain management.

Constraints ranking for GSCM implementation

The ranking of specific constraints is shown in the Table 8 revealing that overall ranking is based on the global weight values of the AHP approach. Global weights are obtained by multiplying the relative weight of the constraint category values of with the relative weights of specific constraint. The result of each constraint, based on constraint categories, is discussed in the following sections.

Financial constraints

In GSCM implementation, the lack of financial support is usually considered as the most important constraint to environmental actions (Zhang, Bi, & Liu, 2009). In this constraint category, Capital unavailability (C11) is a dominant constraint. It reveals that industries in our country fear to invest for green supply chain management due to risk of loss or low profit. Involvement of high investment (C12) acts next to (C11) constraint based on its weight. Unavailability of financial loan (C13) ranks third in this category. It is also a significant financial constraint. Finally, High investment cost for environmental management (C14) received the last position in this category.

Technological constraints

Absence of technology upgradation (C22) is identified as first constraint in this category. Underdevelopment of latest technologies, non-availability of appropriate technology/process within industry to adopt green supply chain and lack of eco-friendly materials causes this constraint as first one. Absence of technical expertise (C21) is considered as second constraint. There is a lack of skilled technical experts and they failed to find an alternative to design a pollution free product to fulfill environmental requirements. Uninterest to adopt new technology (C23) is considered as last one in this category.

Information and knowledge contrarians

The Information and knowledge contrarian is comprised of four constraints. Lack of information related to green practices (C31) comes first. Lack of training program and seminar (C33) receive second position. Lack of interest on green products (C32) received third position. Customers are still unaware about green product and their usefulness and benefits of environment friendly products. Lack of environmental knowledge (C34) comes next which shows that there is lack of preparedness owing to the low level of uptake of environmental management systems due to ignorance which in turn becomes a significant contrarian.

VI. Conclusion

Regarding the results obtained from data analysis, we present the following conclusions. GSCM implementation in manufacturing industries is crucial and requires coordination from all level of the workforce, from bottom-line employee to top management. Identification of essential constraints for GSCM implementation is tricky due to its numerous characteristics. This paper has attempted to present a benchmarking framework to ease these complicated elements and to trim down constraint identification difficulties to make managers efforts towards environmental improvements a little easier.

A literature review reveals the existence of more studies identifying constraints for GSCM adoption within industries. In our explorative research, we were able to determine the constraints to be eradicated and those which are essential for GSCM adoption. Eleven initial constraints, under three main categories, from literature and industrial discussion were examined. The proposed AHP approach is used to give rank (priorities) to these eleven constraints based upon judgments of industrial experts. The AHP results clearly show that the Financial constraints (C1) is the leading constraint category. Capital unavailability (C11) is the most important obstacle during GSCM adoption. Technological constraints, and Information and knowledge constraints categories are the next priorities.

This paper has provided industries with extensive solutions for identification of essential constraints, and it provides a benchmark that may assist them during their GSCM implementation. The study revealed that industries in Bangladesh still struggle to prioritize environmental performance improvements over economic performance. Similarly, most industries struggle for financial support for new environmental adoptions.

References

[1]. Abdulrahman, M. D., Gunasekaran, A., & Subramanian, N. (2014). Critical barriers in implementing reverse logistics in the Chinese manufacturing sectors. *International Journal of Production Economics*, *147*(PART B), 460–471. https://doi.org/10.1016/j.ijpe.2012.08.003

[2]. Abraham, N. (2011). The apparel aftermarket in India – a case study focusing on reverse logistics. *Journal of Fashion Marketing and Management*, *15*(2), 211–227. https://doi.org/10.1108/13612021111132645

[3]. Ahi, P., & Searcy, C. (2013). A comparative literature analysis of definitions for green and sustainable supply chain management. *Journal of Cleaner Production*, *52*, 329–341. https://doi.org/10.1016/j.jclepro.2013.02.018

[4]. Ahi, P., & Searcy, C. (2013). A comparative literature analysis of definitions for green and sustainable supply chain management. *Journal of Cleaner Production*, *52*, 329–341. https://doi.org/10.1016/j.jclepro.2013.02.018

[5]. Baykasoğlu, A., Kaplanoglu, V., Durmuşoglu, Z. D. U., & Şahin, C. (2013). Integrating fuzzy DEMATEL and fuzzy hierarchical TOPSIS methods for truck selection. In *Expert Systems with Applications* (Vol. 40, pp. 899–907). https://doi.org/10.1016/j.eswa.2012.05.046

[6]. Büyüközkan, G., & Ifi, G. (2012). A novel hybrid MCDM approach based on fuzzy DEMATEL, fuzzy ANP and fuzzy TOPSIS to evaluate green suppliers. *Expert Systems with Applications*, *39*(3), 3000–3011. https://doi.org/10.1016/j.eswa.2011.08.162

[7]. Dey, P. K., & Cheffi, W. (2013). Green supply chain performance measurement using the analytic hierarchy process: a comparative analysis of manufacturing organisations. *Production Planning & Control*, *24*(8–9), 702–720. https://doi.org/10.1080/09537287.2012.666859

[8]. Eltayeb, T. K., Zailani, S., & Ramayah, T. (2011). Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes. *Resources, Conservation and Recycling*, *55*(5), 495–506. https://doi.org/10.1016/j.resconrec.2010.09.003

[9]. Eng Ann, G., Zailani, S., & Abd Wahid, N. (2006). A study on the impact of environmental management system (EMS) certification towards firms' performance in Malaysia. *Management of Environmental Quality: An International Journal*, *17*(1), 73–93. https://doi.org/10.1108/14777830610639459

[10]. Fiksel, J. (1997). *Design for Environment: Creating Eco-Efficient Products and Processes (Book).Journal of Product Innovation Management* (Vol. 14). https://doi.org/10.1162/jiec.1997.1.1.141

[11]. Govindan, K., Kaliyan, M., Kannan, D., & Haq, A. N. (2014). Barriers analysis for green supply chain management implementation in Indian industries using analytic hierarchy process. *International Journal of Production Economics*, *147*(PART B), 555–568. https://doi.org/10.1016/j.ijpe.2013.08.018

[12]. Jaberidoost, M., Olfat, L., Hosseini, A., Kebriaeezadeh, A., Abdollahi, M., Alaeddini, M., & Dinarvand, R. (2015). Pharmaceutical supply chain risk assessment in Iran using analytic hierarchy process (AHP) and simple additive weighting (SAW) methods. *[GS],Journal of Pharmaceutical Policy and Practice*, *8*(9), 1–10. https://doi.org/10.1186/s40545-015-0029-3

[13]. Lorek, S., & Spangenberg, J. H. (2014). Sustainable consumption within a sustainable economy - Beyond green growth and green economies. *Journal of Cleaner Production*, *63*, 33–44. https://doi.org/10.1016/j.jclepro.2013.08.045

[14]. Lund, R. T. (1984). Remanufacturing. *Technology Review*, 18–22, 28–29.

[15]. Luthra, S., Mangla, S. K., Xu, L., & Diabat, A. (2015). Using AHP to evaluate barriers in adopting sustainable consumption and production initiatives in a supply chain. *International Journal of Production Economics*. https://doi.org/10.1016/j.ijpe.2016.04.001

[16]. Madaan, J., & Mangla, S. (2015). Decision Modeling Approach for Eco-Driven Flexible Green Supply Chain (pp. 343–364). Springer India. https://doi.org/10.1007/978-81-322-2151-7_21

[17]. Mudgal, R. K., Shankar, R., Talib, P., & Raj, T. (2010). Modelling the barriers of green supply chain practices: an Indian perspective. *International Journal of Logistics Systems and Management*, *7*(1), 81. https://doi.org/10.1504/IJLSM.2010.033891

[18]. Perron, G. M. (2005). Barriers to Environmental Performance Improvements in Canadian SMEs. *… , Canada*, (JANUARY 2005).

[19]. Reisch, L. A. (1998). A definition of " sustainable food consumption ." *Corpus*, (2005), 1–6.

[20]. Revell, A., & Rutherfoord, R. (2003). UK environmental policy and the small firm: Broadening the focus. *Business Strategy and the Environment*, *12*(1), 26–35. https://doi.org/10.1002/bse.347

[21]. Rogers, D. S., & Tibben-Lembke, R. S. (1998). Going Backwards : Reverse Logistics Trends and Practices Going Backwards : Reverse Logistics Trends and Practices. *Logistics Management*, *2*, 275. https://doi.org/10.1006/jema.2001.0488

[22]. Saaty, T. L. (1980). *The analytic hierarchy process : planning, priority setting, resource allocation*. McGraw-Hill International Book Co.

[23]. Sarkis, J., Zhu, Q., & Lai, K. H. (2011). An organizational theoretic review of green supply chain management literature. *International Journal of Production Economics*, *130*(1), 1–15. https://doi.org/10.1016/j.ijpe.2010.11.010

[24]. Schoenherr, T., Rao Tummala, V. M., & Harrison, T. P. (2008). Assessing supply chain risks with the analytic hierarchy process: Providing decision support for the offshoring decision by a US manufacturing company. *Journal of Purchasing and Supply Management*, *14*(2), 100–111. https://doi.org/10.1016/j.pursup.2008.01.008

[25]. Srivastava, S. K. (2007). Green supply-chain management: A state-of-the-art literature review. *International Journal of Management Reviews*. https://doi.org/10.1111/j.1468-2370.2007.00202.x

[26]. Topçu, Y. I., Harputlugil, T., Prins, M., & Gültekin, A. T. (2011). Conceptual framework for potential implementations of multi criteria decision making (MCDM) methods for design quality assessment.

[27]. van Asselt, H., van der Grijp, N., & Oosterhuis, F. (2006). Greener public purchasing: Opportunities for climate-friendly government procurement under WTO and EU rules. *Climate Policy*, *6*(2), 217–229. https://doi.org/10.1080/14693062.2006.9685596

[28]. Vazifehdoust, H., Taleghani, M., Esmaeilpour, F., Nazari, K., & Khadang, M. (2013). Purchasing green to become greener: Factors influence consumers' green purchasing behavior. *Management Science Letters*, 2489–2500. https://doi.org/10.5267/j.msl.2013.08.013

[29]. Ying, J., & Li-jun, Z. (2012). Study on Green Supply Chain Management Based on Circular Economy. *Physics Procedia*, *25*, 1682–1688. https://doi.org/10.1016/j.phpro.2012.03.295

[30]. Zhang, B., Bi, J., & Liu, B. (2009). Drivers and barriers to engage enterprises in environmental management initiatives in Suzhou Industrial Park, China. *Frontiers of Environmental Science and Engineering in China*, *3*(2), 210–220.

https://doi.org/10.1007/s11783-009-0014-7

[31]. Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management*, *22*(3), 265–289. https://doi.org/10.1016/j.jom.2004.01.005

[32]. Zhu, Q., Sarkis, J., & Lai, K. (2008). Green supply chain management implications for "closing the loop." *Transportation Research Part E*, *44*(1), 1–18. https://doi.org/10.1016/j.tre.2006.06.003

Tusher Sarder, et. al. "Investigation of Constraints for the Implementation of Green Supply Chain Management Practices." *IOSR Journal of Business and Management (IOSR-JBM)*, 22(10), 2020, pp. 60-67.