



# **THE EFFECT OF GREEN SUPPLY CHAIN MANAGEMENT ON ORGANIZATIONAL PERFORMANCE IN MANUFACTURING INDUSTRIES**

**Habib Ullah**

Assistant professor, International Islamic University Chittagong, Bangladesh

habibmu38@iiuc.ac.bd

## **Abstract**

*This research aims to measure how an implementing environmentally friendly supply chain management practice affects organizational performance. For this research, data were obtained from a total of 275 respondents (response rate 91.67 percent) representing supply chain managers from the Bangladeshi manufacturing sector. A purposive sampling technique was applied to select the sample, and data were studied using structural equation modelling (SEM). We measured green supply chain management using four independent factors, including green purchasing, green logistics, interaction with customers, and green procurement. The results show that three determinants of green supply chain management (green purchasing, green logistics, and green procurement) positively influence the performance of an organization. This study will enable organizations to implement green supply chain management practices to enhance their economic and environmental performance.*

*Keywords: Green supply chain management; Environmental performance Organizational performance, Manufacturing organizations; Bangladesh*

## **INTRODUCTION**

The manufacturing industry has quickly embraced green supply chain management (GSCM) as an environmental management model to lessen the negative impact of the sector's operations. The Global Supply Chain Management (GSCM) approach was developed with the intention of incorporating supply chain management in order to encourage environmental

sustainability. This comprises the procedures of product development process, the evaluation and procurement of suppliers, the manufacture of environmentally friendly technology, and distribution for consumers of the end-product, production, and disposal (Endalaye, 2020). To address problems with their organizational performance, businesses have shown a strong interest in using the GSCM supply chain management approach in their processes (Khan, Anwar, & Khattak, 2021). Green supply chain management strategies have been shown to have a good influence on both the organizational performance and the working costs performance of industries (Wibowo et al. 2018). According to the findings of other research, managers have a difficult time completely appreciating the advantages that GSCM techniques provide (Kirchoff et al. 2015). Goyal et al. (2017) verified as well that there is a great deal of possible obstacles in the way of their adoption.

Green supply chain management prioritizes protecting the environment throughout a company's activities and promotes both the company's and the environments integrated environmental growth. According to Luthra, Garg, and Haleem (2016), the main goal of green supply chain management is to minimize the amount of waste and pollution produced, avoid using dangerous materials, and lessen the impact that the supply chain has on the environment. The achievement of a competitive position in the market is accomplished by maximizing the firm's operational performance as a direct consequence of concentrating on a green supply chain management model.

Environmental concerns have risen in importance for corporations as a result of the growing demand from various stakeholders, including management, customers, competitors, non-governmental organizations (NGOs), and employees, for companies to address issues of support both the environment and society in their manufacturing and trading endeavours (Ashraf et al., 2020). The ability of businesses to lessen their impact on the environment is directly proportional to how well they can navigate their intricate connections with their suppliers (Le, 2020). Corporate organizations may lessen their environmental effect in a number of ways. These include planning to manage green supply chains, regulating company operations from raw material suppliers to end customers, and building partnerships that bring participants in the supply chain together..

In the context of supply chain management (SCM), environmental management is an essential problem (Azevedo et al., 2011). The SCM necessitates the integration and coordination of inter-organizational activities in addition to the alignment of strategy across all of the enterprises that are a part of the supply chain (SC) to fulfill the requirements of the end consumer. The terms "sourcing," "manufacturing," "distribution," "marketing," and "information systems" are all part of the organizational operations (Green et al., 2012). To limit the risk of

environmental risks, reduce unwanted publicity due to non-compliance with related government fines, and enhance SC performance, all of these processes should be strategically linked with environmental standards and concerns from government regulators, consumers, and competitors. Because there is rivalry at the SC level (Bai, & Sarkis, 2014) and because the focal firm is often held accountable for the negative ecological consequences of all companies in its SC, it is vital to recognize and apply GSCM strategies that provide competitive benefits. In this particular path, the study on GSCM is drawing an increasing amount of interest in the academic literature (Kirchoff et al., 2016).

Green production, green distribution, and green logistics are essential parts of an efficient green supply chain management plan for the industrial industry to enhance its sustainability performance. According to Green et al. (2012), GSCM procedures should include internal environmental management, green information systems, inexperienced purchasing, customer participation, eco-design, and investment recovery.co-efficient process flows and transformations from input to output are managed internally using environmental operations management methods. Drivers that impact the implementation of green practices come from both the natural and man-made surroundings, and both have a bearing on how much physical and human resources a business needs. One way in which agents, the actions of the environment may be influenced by the amount of time, effort, and resources devoted to carrying out the activity, including supplier management, is by assigning members of these resources to distinct but interdependent responsibilities. Accreditation to an environmental management standard, supplier assessment questionnaires, and waste by-product mapping are all mechanisms, physical or local facilities, in the generation of an output (Chandra & Tunmanyam, 2005).The system's function, mission, aim, or primary concern is to produce the desired result while minimizing adverse effects on the surrounding environment.

To make environmentally responsible purchases, businesses must evaluate their suppliers' environmental performance and insist that they implement procedures to guarantee ecological quality in their production processes. According to the definition of green buying as "environmental strategies for a firm's long-term material, component or system needs," the purchasing department may be able to assess the level of waste being introduced into the company's operations (Zhu & Sarkis, 2007). Forward logistics includes selling surplus stocks, scrap and used commodities, and capital equipment to repay investment. This is because the location analysis needs to ensure that the warehousing and buildings have a safe way of storing, transporting, packaging, and distributing products. The investment recovered some of its losses via the sale of excess inventory and materials as well as through selling waste, discarded materials, and excess capital equipment.

## FRAMEWORK AND RESEARCH HYPOTHESES

Figure 1 is an illustration of the suggested structure for this piece of study. The model illustrates the influence that environmentally responsible business practices have on the overall performance of an organization.

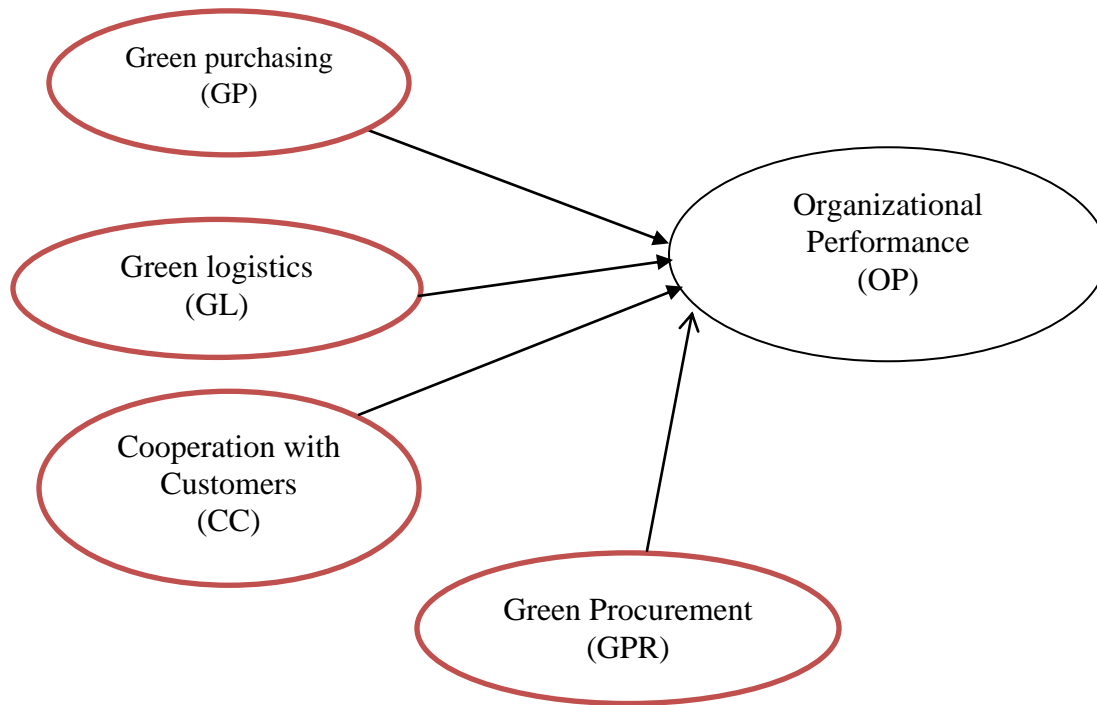


Figure 1. Research framework

The hypotheses of the study are as follows:

H1: Green purchasing significantly affect the organizational performance in the manufacturing sector.

H2: Green logistics significantly affect the organizational performance in the manufacturing sector.

H3: Cooperation with customers has significant association with organizational performance in the Manufacturing sector.

H4: Green procurement significantly affects the organizational performance in the manufacturing sector.

## METHODOLOGY

The empirical research was conducted by using a structured self-administered questionnaire that was filled out by personal interviews, primarily with executive officers of firms in the manufacturing industries of the supply chain department. The interviews were conducted in order to collect as much information as possible. Three hundred manufacturing industries in Dhaka and Chattogram were selected using a purposive random sampling technique. The outcome of this process yielded 275 valid answers to the questionnaires (25 were not considered due to some inconsistency in the questionnaire).

In order to carry out this study, a questionnaire was designed. The information in this survey was collected in two parts. The first part collected information on responder profiles. The second section employs a Likert scale with five levels to evaluate three dimensions of each green purchasing, green logistics, green procurement and cooperation with customers, and three indicators of organizational performance. The Likert scale ranges from 1 (strongly disagree) to 5 (strongly agree), and it begins at 1 (strongly disagree) and ends at 5 (strongly agree) (Udriyah, 2019). The validity and reliability of the questionnaire were evaluated with the use of a battery of tests. The model was validated with the help of Structural Equation Modeling, and the data were analyzed with the assistance of SmartPLS-version 3.

## EMPIRICAL RESULTS

PLS-SEM is a complex statistical procedure, and its use was required in order to analyze and estimate the causal linkages that exist between the variables that were examined. The research model and hypotheses that were proposed were evaluated with the use of this instrument.

For the sake of this investigation, market orientation and innovations were each regarded as independent factors. On the other hand, competitive advantage was thought to play the role of a mediator between the independent variables and the dependent variable. PLS-SEM combines not just one but two different levels of analysis, namely the structural model and the reflected measurement model. These models are respectively known as the structural model and the reflecting measurement model.

### Results of the Reflective Measurement Model

For the purpose of determining the amount of internal consistency, the factor loadings were analyzed. According to Table 1, the vast majority of factor loadings are over the minimum permissible value of 0.7 (Hair, Hult, Ringle & Sarstedt, 2016).

Table 1: Outer loadings of the measurement model

No.	Items of the Constructs	Outer Loadings
<b>GP1</b>	The organization buys items with environmentally friendly labels.	<b>0.921</b>
<b>GP2</b>	The organization works along with its suppliers to reduce the amount of waste generated by packaging and packaging materials.	<b>0.862</b>
<b>GP3</b>	The firm investigates the environmental policies and procedures of its vendors.	<b>0.893</b>
<b>GL1</b>	Selection of the location of the warehouse/distribution center requires environment friendly	<b>0.726</b>
<b>GL2</b>	The business is transitioning its warehouse and distribution facility to run on renewable sources of electricity.	<b>0.890</b>
<b>GL3</b>	The company is now using Optimization of the routes used by vehicles.	<b>0.872</b>
<b>CC1</b>	The company works closely with clients to develop environmentally friendly products.	<b>0.883</b>
<b>CC2</b>	The company collaborates with clients to achieve cleaner manufacturing.	<b>0.873</b>
<b>CC3</b>	The company works together with clients to develop environmentally friendly packaging.	<b>0.645</b>
<b>GPR1</b>	The successful implementation of procurement plans is directly correlated to green procurement.	<b>0.858</b>
<b>GPR2</b>	Sustainable organizational performance can be attributed to environmentally responsible purchasing.	<b>0.815</b>
<b>GPR3</b>	The practice of green procurement guarantees an assessment of the amount of waste that enters into company operations.	<b>0.822</b>
<b>OP1</b>	The costs have been brought down.	<b>0.882</b>
<b>OP2</b>	The overall quality of the products has been improved	<b>0.914</b>
<b>OP3</b>	Our company has increased the value that we provide to our clients.	<b>0.901</b>

Reflecting measurement evaluates convergent and discriminant validity. "Convergent validity" refers to "the degree to which indicators of a specific category converge" (Hair, Hult, Ringle & Sarstedt, 2016). Cronbach's alpha was employed to measure construct dependability. Table 2 shows all alpha values are trustworthy and above 0.7 (DeVellis, 2003). Table 3 shows the internal consistency of the items and assumes the same criteria as Cronbach's alpha (0.7). AVE was employed to test convergent validity. AVEs over 0.50 indicate convergent validity (Tenenhaus, 2005).

Table 2: Reflective Measurement Model assessment

	<b>Cronbach's Alpha</b>	<b>rho_A</b>	<b>Composite Reliability</b>	<b>Average Variance Extracted (AVE)</b>
Green Purchasing	0.874	0.908	0.921	0.796
Green Logistics	0.776	0.795	0.871	0.693
Cooperation with Customers	0.727	0.773	0.847	0.653
Green Procurement	0.778	0.783	0.871	0.692
Organizational Performance	0.881	0.884	0.927	0.808

Fornell and Larcker (1981) say, "the variation that is typically shared between each construct and its measurements ought to be larger than the variance that is often shared between the construct in question and other constructs."

Table 3. Discriminant validity using the Fornell–Larcker criterion

	Green Purchasing	Green Logistics	Cooperation with Customers	Green Procurement	Organizational Performance
Green Purchasing	0.892				
Green Logistics	0.613	0.833			
Cooperation with Customers	0.555	0.684	0.808		
Green Procurement	0.589	0.622	0.719	0.832	
Organizational Performance	0.520	0.678	0.588	0.667	0.899

Off-diagonal regions show correlations, whereas diagonal regions show the square root of the average variance extracted (AVE).

## Hypotheses testing

Hair, Hult, Ringle & Sarstedt (2016) proposed reporting the path coefficient's sign, magnitude, and significance for assessing the structural model and testing hypotheses. To produce the path coefficient values and their accompanying t. values, the Smart PLS software was used with 5000 resamples to bootstrap the whole model. This generated route coefficient values (Hair, Hult, Ringle & Sarstedt, 2016). The data supported most of the hypotheses in this study. Particularly, green purchasing ( $\beta = 0.138$ ,  $t=3.837$ ), green logistics ( $\beta= 0.408$ ,  $t=5.483$ ), and green procurement ( $\beta = 0.380$ ,  $t=6.540$ ) affected organizational performance positively (Table 4). It supported H1, H2, and H4. On the other side, cooperation with customers ( $\beta= 0.015$ ,  $t=0.198$ ) had no effects on organizational performance. It refuted H3.

Table 4: Hypothesis testing for the effect of independent variables

	Path coefficient ( $\beta$ )	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Green Purchasing -> Organizational Performance	0.138	0.036	0.046	3.837	0.038
Green Logistics -> Organizational Performance	0.408	0.406	0.074	5.483	0.000
Cooperation with Customers -> Organizational Performance	0.015	0.022	0.074	0.198	0.843
Green Procurement -> Organizational Performance	0.380	0.378	0.058	6.540	0.000

## DISCUSSION

The study's overarching goal is to ascertain whether or not environmentally responsible supply chain management techniques improve business performance results. The researcher developed the conceptual model and hypothesis by factoring in green supply chain management methods along a number of different aspects. Carter et al. (2000) investigated the influence of green purchasing decisions based on a company's business and green performance. They came to the conclusion that because of the effective implementation of green buying operations, the cost of pollution mitigation was not only much higher than lower, while simultaneously improving the environmental performance and a strong reputation held in the industry. Major corporations adopt more significant number of environmentally conscious shopping behaviours in comparison to businesses of a medium scale. Along with the increased emphasis on environmental protection consciousness, such



execution becomes more important on the on-going trend of the company's progress. However, Zhu and Geng (2005) did an empirical study on Chinese enterprises to examine the link between green buying and firms' financial performance. Despite their expectations, they discovered that green purchasing had a negative influence on the financial performance of Chinese firms. In addition, the Chinese government does not have any particularly stringent eco-friendly rules, but if Chinese enterprises apply green practices owing to the demand of clients and the fear of losing their businesses in the international arena, then this may be a positive development. However, In the long term, environmentally responsible behaviours pay back to the firms in the form of a competitive edge, the attraction of buyers' kindness, the creation of a favourable image and reputation of companies in both local and global marketplaces, and the fact that businesses that are environmentally conscious gain access to a wider worldwide market for the sale of their goods in comparison to firms that do not engage in green practices.

It is necessary to investigate the impact of green purchasing for environmentally conscious policies, which have an influence on the operational efficiency of the businesses that are obligated to comply with them. Several writers have advocated for a collection of ecological techniques that concentrate mainly on logistics from both an organizational management and an operational perspective (Sheu et al., 2005; Zhu and Sarkis, 2004). According to the findings of previous studies, a proactive green approach delivers competitive benefits for companies and organizations since it enables the deployment of rare, unique, and complicated capabilities that can assist organizations in distinguishing themselves from others with competing businesses (Roslender and Hart, 2002). In our modern world, where the service sectors are expanding at high rates, a significant amount of study focus should be directed toward the influence of the interaction between the service sectors and the environment and how it affects the environment. It is often believed that the manufacturing sectors have a more significant influence on the environment than the service sectors. However, the vast majority of service industries, which includes the logistics industry, use a large number and quantity of natural resources and, as a result, produce a significant amount of contaminants. This is a problem that needs to be addressed in order to improve environmental management (Sharma, 2013).

To improve the manufacturing sector's ability to promote environmentally friendly practices, many businesses around the world are adopting green procurement practices and management as one of the most critical aspects of their operations. This trend is especially prevalent in the manufacturing industry (Quyen, 2020). The use of environmentally responsible purchasing practices is connected to a variety of factors, such as support from upper

management, information, and communication technology infrastructure, the selection of suppliers, and compliance regulations established by the authorities in order to safeguard the environment. One of the primary concerns of corporations is total quality management, and many different manufacturing companies are in the process of creating and developing their supply chain methods in order to mild their procurement strategies. This results in increased productivity among workers and boosts their confidence in their ability to fulfil the requirements and preferences of the company's stakeholders (Tan et al., 2019).

## **CONCLUSION AND POLICY IMPLICATIONS**

The report provides an explanation of the green practices approach and how it affects the performance of the organization. The implementation of environmentally responsible purchasing policies is a necessary step in the process of boosting and maintaining sustainable performance. Organizations are operating in a context in which the majority of manufacturing firms offer and maintain green practices, which could influence the attainment of a competitive advantage to satisfy the needs and wants of the mass customers through operation in accordance with the regulations set by the government to protect the environment.

To comply with the principles of eco-design, factories must create goods that decrease the number of raw materials and energy used in production, make it easier to reuse, recycle, and recover materials and components, and limit the number of potentially dangerous chemicals used. In order to achieve the most excellent possible quality in this field, the researchers advocate continuing collaboration across the different administrative levels in order to put into effect the environmentally friendly supply chain and look for the raw materials that are used in the manufacturing sector that are the least harmful to the environment. The government should have implemented legislation and a stricter set of regulations with a heightened focus on the protection of the environment, increased funding for investigation of the green supply chain from a scientific perspective, and continued in Safety environmental design and packaging.

Most studies use large corporations as a sample population to obtain data. True, in the beginning, we must ensure that large enterprises embrace the GSCM first, so that smaller firms may follow. There is an assumption that smaller businesses adhere to the norms of larger corporations. As the concept of GSCM spreads and large corporations adopt GSCM, it is now vital to assess the impact of adoption on small businesses. Smaller businesses must be examined and collaboratively involved in environmental preservation in order to be motivated and contribute to a more sustainable process.

## REFERENCES

- Ashraf, S., Ahmed, T., Saleem, S., & Aslam, Z. (2020). Diverging mysterious in green supply chain management. *Orient. J. Comput. Sci. Technol.*, 13(1), 22-28.
- Azevedo, S.G., Carvalho, H., & Machado, V.C. (2011). The influence of green practices on supply chain performance: A case study approach, *Transp. Res. Part E Logist. Transp. Rev.* 47 (2011) 850–871.
- Bai, C., & Sarkis, J. (2014). Determining and applying sustainable supplier key performance indicators, *Supply Chain Manag. An Int. J.* 19 (2014) 275–291.
- Carter, C.R, Kale, R., & Grimm, C.M. (2000). Environmental purchasing and firm performance: an empirical investigation. *Transp Res E* 36(3): 219–228.
- Chandra, C., & Tumanyan, A. (2005). Supply Chain System Taxonomy: A Framework and Methodology. *Human System Management*, 24(4), 245-258.
- DeVellis, R. F. (2003). *Scale development: Theory and applications* (2nd ed.): Thousand Oaks, CA: Sage Publications, Inc.
- Mandalay, T., Effects of green supply chain management barriers on implementation of green supply chain management: the case of some selected large manufacturing industry in Debrebirhan town (Doctoral dissertation), 2020.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50. <https://doi.org/10.2307/3151312>
- Goyal, S., Kumar, S. and Kailash, A., Systematic literature review of classification and categorisation of benchmarking in supply chain management. "International Journal of Process Management and Benchmarking, vol. 7, no. 2, p. 183, 2017.
- Green Jr, K. W., Zelbst, P. J., Meacham, J., & Bhadauria, V. S. (2012). Green supply chain management practices: impact on performance. *Supply Chain Management: An International Journal*, 17(3), 290-305.
- Hair, J.; Hult, G.T.; Ringle, C. & Sarstedt, M. (2016). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage Publications: Thousand Oaks, CA, USA, 2016; ISBN 9781483377445.
- Kirchoff, J.F., Tate, W.L., & Mollenkopf, D.A. (2016). The impact of strategic organizational orientations on green supply chain management and firm performance, *Int. J. Phys. Distrib. Logist. Manag.* 46 (2016) 269–292.
- Kirchoff, F., Omar, A. and Fugate, S., A behavioral theory of sustainable supply chain management decision making in non-exemplar firms, *Journal of Supply Chain Management*, vol. 52, no. 1, pp. 41-65, 2015
- Khan, U., Answer, M., Li, S. and Khattak, S., Intellectual capital, financial resources, and green supply chain management as predictors of financial and environmental performance." *Environmental Science and Pollution Research*, vol. 28, no. 16, pp. 19755-19767, 2021.
- Le, T. (2020). The effect of green supply chain management practices on sustainability performance in Vietnamese construction materials manufacturing enterprises. *Uncertain Supply Chain Management*, 8(1), 43-54.
- Luthra, S., Garg, D., & Haleem, A. (2016). The impacts of critical success factors for implementing green supply chain management towards sustainability: an empirical investigation of the Indian automobile industry. *Journal of Cleaner Production*, 121, 142-158.
- Quyen, T.H. (2020). The Relationship between Green Procurement Practices and Organizational Performance in the Manufacturing Industry of Vietnam. *Arthatama Journal of Business Management and Accounting*, 4(1), 1-6.
- Roslender, R., & Hart, S. J. (2002). Integrating management accounting and marketing in the pursuit of competitive advantage: The case for strategic management accounting. *Critical Perspectives on Accounting*, 13(2), 255-277.
- Sharma, M. M. (2013). A study on the concept of green supply chain management. *Journal of Supply Chain Management Systems*, 2(1).
- Sheu, J. B., Chou, Y. H., & Hu, C. C. (2005). An integrated logistics operational model for green supply chain management. *Transportation Research Part E: Logistics and Transportation Review*, 41(4), 287-313.
- Tan, C. L., Zailani, S. H. M., Tan, S. C., & Yeo, S. F. (2019). Green supply chain management: impact on environmental performance and firm competitiveness. *International Journal of Sustainable Strategic Management*, 7(1-2), 91-112.
- Tenenhaus, M., Vinzi, V.E., Chatelin, Y-M. & Lauro, C. (2005). PLS Path Modeling", *Computational Statistics & Data Analysis*, 48(1), 159-205.

Udriyah, Tham, J., & Azam, S.M. (2019).The effects of market orientation and innovation on competitive advantage and business performance of textile SMEs. *Management Science Letters*. 9, 1419–1428.

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

Zhu, Q, Sarkis J, & Geng Y (2005) Green supply chain management in China: pressures, practices, and performance. *Int J Oper Prod Manag* 25(5):449–468

Zhu, Q., & Sarkis, J. (2007). Green supply chain management: pressures, practices, and performance within the Chinese automobile industry. *Journal of Cleaner Production*, 15(2), 1041-1052.

Wibowo, A., Handayani, U. and Mustikasari, A., Factors for implementing green supply chain management in the construction industry, *Journal of Industrial Engineering and Management*, vol. 11, no. 4, p. 651, 2018.

**APPENDIX**

**Questionnaire**

	Demographic Information
1	Name:
2	Position:
3	Age:
4	Year of the establishment of your organization:
5	Location of the organization:

Rating level

1	2	3	4	5				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree				
Green purchasing	Items			1	2	3	4	5
1)	The organization buys items with environmentally friendly labels.							
2)	The organization works along with its suppliers to reduce the amount of waste generated by packaging and packaging materials.							
3)	The firm investigates the environmental policies and procedures of its vendors.							
Green Logistics								
1	Selection of the location of the warehouse/distribution center requires environment friendly							
2	The business is transitioning its warehouse and distribution facility to run on renewable sources of electricity.							
3	The company is now using Optimization of the routes used by vehicles.							
Cooperation with Customers								
1	The company works closely with clients to develop environmentally friendly products.							
2	The company collaborates with clients to achieve cleaner manufacturing.							

3	The company works together with clients to develop environmentally friendly packaging.						
Green Procurement							
1	The successful implementation of procurement plans is directly correlated to green procurement.						
2	Sustainable organizational performance can be attributed to environmentally responsible purchasing.						
3	The practice of green procurement guarantees an assessment of the amount of waste that enters into company operations.						
Organizational Performance							
1	The costs have been brought down.						
2	The overall quality of the products has been improved.						
3	Our company has increased the value that we provide to our clients.						