

# Role of Green Supply Chain Management Practices in Small Scale Industries Using Linear Regression Analysis (LRA)

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**Abstract:** In India, small scale industries play vital role in economic growth and it has considerable growth rate and the number of these industries are increasing rapidly. Talking about Punjab, it is noteworthy that the small scale industrial sector is suffering from the lack of modernization, which contributes about half of the total industrial production in the state. When we consider the international green initiatives and sustainability, the major issues: detoxification, de-carbonization and dematerialization are mainly focused, which results to the 4R's (redesign, reuse, remanufacture and reduction) in practice. In order to achieve these goals, Green practices have been introduced in the supply chain. Green Supply Chain Management's (GSCM) Objectives in small scale industries are to reduce negative impression on the environment, increase market competition and increase profit to the company.

This study examines the role of green practices in small scale industries in cities of Punjab by finding the connection between GSCM Practices and Corporate Image and also gives the most suitable dimensions for improving corporate image. In this study a questionnaire based survey has been conducted among small scale industries in Ferozepur District and its surroundings and total 58 samples were gathered. Linear Regression Analysis (LRA) has been applied using ANOVA in SPSS software for finding the results. The findings show that Green Supply Chain Practices have signifying beneficial effect on Corporate Image but these practices are not fully implemented due to lack of customer awareness and supplier support. This study can be done on a large scale which provides a better picture of GSCM practices and their effect. Also by applying more statistically and quantitative techniques various relations can be obtained.

**Keywords:** GSCM (Green supply chain management), SCM (Supply Chain Management), SSI (Small Scale Industry), LRA (Linear Regression Analysis).

## Introduction

In the current scenario, by the impact of global economic integration and technological progress, the supply chain in various industries, between different regions, cities, states and countries are getting more and more common [1]. A few of these industries are improving their competitiveness through advancement in their environmental indicators by adhere to following environmental regulations, to properly address the concerns raised by their customers related with environment, and to reduce the environmental effect of their manufacturing and allied service activities [2]. In most of the industries, raw materials are purchased and final items are manufactured/assembled in one or more factories, then shipped to warehouses for intermediate storage, and then shipped to retailers or customers. Consequently, to reduce cost and improve service levels, effective supply chain strategies must take into account the interactions at the various levels in the supply chain. The greening of whole supply chain activities has appeared as a crucial organizational philosophy to minimize environmental risk and to enhance firm's competitive advantages [3].

From last 50 years, the small scale sector has played a significant role in the socio-economic development of our nation. More than 90 percent of the total industrial units in India are of small scale, more than 40 percent of the total industrial production comes from these industry, more than 30 percent of the country's exports,

and more than 2 crore employment provide by these small scale industries. Therefore, this sector turned up as a bosom and dynamic part of the country economy [4].

Supply Chain Management (SCM) has been redefined by researchers using green practices in it. GSCM practices aware mankind to become eco-friendly and to minimize the risks to human being and other species. The idea of Green Supply Chain develops from sustainable development theory and supply chain management. GSCM is a system which consists of the process of material procurement, manufacturing, packaging, storage, transportation, sale, usage and recycling [5].

### **Green supply chain management (GSCM)**

'Green' word can be classified into three type namely government green, customer green and scientific green. The government green deals with effect of population density, geographical location and availableness of energy sources in enhancing the quality of life while the customer green deals with human health and safety, and scientific green deals with emissions from products, processes and systems. [6]. The definition of GSCM is: "the integration of environmental thinking in handling the supply chain, including design of product, selection of raw material, their production, final dispatch to end users and management of the product till the end of its life" [7].

### **Role of GSCM in small scale industry**

Nowadays, the green practices are very much needed in supply chain in all types of industries. Small industry sector has turn up as an extremely thriving and robust sector for the Indian economy. It provides not only more job opportunities at comparatively lower capital expense than big industries but also aid in industrialization of rural and backward areas, thereby, reducing regional imbalances, assuring more equitable distribution of national income and wealth. Small industries are supplementary to large industries as ancillary units and these industries also contributes highly to the socio-economic advancement of the country [8]. Small scale industries account for 40 percent of the total industrial production, 35 percent of the total exports, and employ more than 15 million people in 3.2 million industrial units. They are involved in food processing, cottage, textile, handloom and leather and leather products. All these sectors are having a high export and earning potential. The export share of small industries is accounted to be 60 percent approximately of the total manufactured exports of the country [9]. The objectives of GSCM in small scale industries are to minimize the negative impact on the environment, increase market competition and increase profit of the company.

### **Advantages of GSCM**

The advantages of GSCM are listed below:

- Mitigate business risks
- Lowered Costs/Increased Efficiency
- Improved quality and products
- Sustainability of resources
- Effective management of suppliers
- Increased sale and revenue
- Reduction in waste
- Reduction in pollution
- Increased sales
- Safer and clean work environment
- Reduced safety costs
- Increased organization overall profit
- Reduced procurement costs
- Reduced compliance costs

### **Classification of GSCM practices**

There are some practices to be considered for implementing GSCM. These practices are Internal Environmental Management (IEM), Green Design (GD), Green Procurement (GP), Customer Support (CS) and Asset Recovery (AR).

Internal Environmental Management (IEM) is the method of developing environmental sustainability as vital organizational through commitment and support from managers and higher authority [10]. An industry's internal environment is comprised of the elements within the industry, including present workforce, managers, higher authority and especially corporate culture, which describe behavior of the employees. The actual industry's environmental performance cannot be verified by externally [11].

Green product design consists of Life-Cycle Assessment/Analysis and Environmentally Conscious Design (ECD) of the goods, green manufacturing process comprise of reducing resource consumption, reduction of waste, and reduction of harmful emissions. Reverse Logistics seals the loop of generic supply chain and includes remanufacturing, recycling and reuse of materials into new materials or other goods with value in the marketplace [12].

Green Procurement accentuate reduction of waste at initial stage and make the course of action to acknowledge this before purchasing of any goods. Green Procurement leads to many quantifiable benefits like cost savings, performance enhancement, and minimize the risks, are feasibly the most common across all kinds of industries; additionally, working along with suppliers expedite innovation, and product development; as we know, the supplier likely knows more than buyers about a particular goods or service as this is the supplier core business [13].

A cooperative supply chain leads to coordinate its partnerships to produce and distribute commodities and services along the chain, for minimum overall costs. This is geared towards satisfying the customers' demands. The cost reduction is the basic or inherent feature of environmental improvement which leads the organizations to be abler to satisfy customer demands for more sustainable environment's products absolute in environmental performance should lead to overall improvement in the both fields; marketing performance and financial performance for the organization [14].

Investment recovery generates significant revenue and creates impressive cost savings for corporations. By strengthening bonds between investment recovery and other departments responsible for the supply chain, corporations will realize less waste and idle assets while increasing revenue. Investment recovery provides corporations with a structured program to identify, reuse, sell, or otherwise dispose of surplus or idle assets. Properly redeployed, these assets can create a cost savings for buying additional equipment or other assets. Key steps for a successful investment recovery program: Identify surplus, determine opportunities to redeploy surplus assets elsewhere in the company, assess value of assets, identify markets, finalize legal transactions, Manage risk and Report program status [15].

### **Corporate image**

A corporate image is based on the feelings consumer and business have about the overall organization and its individual brands. Image is connected to a company's strength and weaknesses. A strong image is built when an opportunity is discovered in an external environment to create a strategic advantage for the firm. Corporate image is not only associated with large corporations, but small business corporation also work on building their image [16]. Corporate identity of a firm is, firm's representation by visually and physically with factors like; special vehicles, air vehicles, color selection, uniforms, announcement board, exhibitions, flags and cutlery. Addition to this corporate identity includes corporate design, corporate communication, corporate behavior and corporate philosophy. It is possible to order the targets that corporate image reaches functional as follows:

- It guides and strengthens the company to achieve wider and much known targets.
- It provides to balance the needs between the company and the target audience which sometimes conflict.
- It evaluates the difference of the employees and a qualified team work.
- Knowledge and skills have the opportunity of continuously improve in the environment it created.

- It increases the value of the brand, products and the service of the company.
- It creates an environment in which it is not afraid of the change [17].

### **Motivation of the study**

In today scenario, small scale industries have considerable growth rate and the number of these industries are increasing rapidly. Some industries initially followed green practices due to fear of law. By knowing the direct and indirect effect of different green practices in their corporate image they became eco-friendly and increased their performance. This study is an attempt to find the most suitable dimensions for improving corporate image through such green practices in their supply chain.

### **Literature review**

In this study, literature related to role of GSCM practices, its implementation, effect and advantages have been reviewed. Adarsha and Prathap in 2003 [18] presented a research with a 59 item measurement scale for evaluating the different facets of their green supply chain practices implementation. The pressures or drives to implement GSCM practices and the relationship between GSCM practices as well as environmental performance were also studied.

Nidhi Shah in 2005 [19] concluded that Green purchasing is responsible purchasing going beyond price and volume. The most uniformly successful way to promote, improved environmental performance is through the supply chain. Qinghua Zhu in 2006 [10] studied Green Supply Chain Management: pressures, practices and performance within the Chinese automobile industry in which they observed that increasing pressures from a variety of directions have caused the Chinese automobile supply chain managers to consider and initiate implementation of GSCM practices to improve both their economic and environmental performance.

In another study Mustafa Karadeniz in 2009 [17] studied that corporate identity and corporate image are very important on creating positive significance at view of consumers in marketing management. The corporations must keep their brands strong, create significance and have a strong corporate identity and corporate image in the globalizing world of today in order to get over their rival firms and to be one step forward.

Yan Li in 2011 [3] research on the Performance Measurement of Green Supply Chain Management in China. Chinese enterprises have recognized its importance, but have lagged in the implementation of these principles into practice. His work is one of the few efforts to investigate GSCM practices in China. B.L.Lakshmimeera and Dr. Palanisamy in 2013 [20] concluded that the subject launches a number of challenges for managers, academics and researchers. GSCM involves a paradigm shift in which the issue of sustainability is no longer seen as a source of costs, representing a potential source of competitive advantage for companies. Manufactures today are under pressure to adopt these strategies to create an environmental stance that is a driver for reduced costs and risks, increased revenues, and improved brand image.

Catherine Njoki Gatari, Dr. Susan Were in 2014 [21] conclude that effective implementation of green procurement in manufacturing sector can be enhanced. Given the backdrop that the implementation of green procurement in manufacturing sector is poor, the findings indicated that currently there is lack of structural and organizational change to support implementation of green procurement, poor legal and regulatory framework, cost of green procurement is relatively high and the resources required to implement green procurement are limited in manufacturing sector.

Ugras Demirci in 2014 [22] studied which concentrated on three aspects, GSCM practice, performance and pressures, each of which includes several subcomponents. It is seen that case companies were very successful in implementing and working with some of these subcomponents, while they failed to utilize the other subcomponents. For instance, all companies have obtained ISO 14001 certification and EMS. On the other hand, it seems that cooperation with customers, green purchasing and green design a still a new concept for Turkish companies and they have not implement the related systems yet. This study is based on a questionnaire survey filled by appropriate authorities representing five Turkish automotive manufacturers. Based on the findings of this study, it is observed that these Turkish automotive manufacturers have not completely implemented the GSCM.

From the accessible literature as reviewed above it is observed that the GSCM practices has proved them as an effective way for the organization to increase their performance and to become environment friendly. It is also observed that there is a need to study it in context to various regions. So, this study intends to focus on Punjab.

### **Research methodology**

GSCM has emerged as an important new approach for enterprises to achieve profit and market share objectives by reducing environmental risk and impact. With environmental problems such as global warming, ozone depletion, solid waste disposal and air pollution on the ascendency, small scale industries are considered to be the source of most of the environmental problems. The industries are experiencing an increased pressure to reduce cost, improve quality and reduced time of delivery to sustain in the present market, so they are narrowed on focusing to the factors of their sustainability and other influencing factors to the environment are ignored. In this study role of green supply chain management practices on corporate image of small scale industries was determined.

### **Objectives:**

The aim of this research work is to study the role of ‘Green Supply Chain Management Practices’ in small scale industries in Punjab and this is accomplished by fulfilling the following objectives:

1. To find the relationship between Green Supply Chain Management and Corporate Image in small scale industries.
2. To find out the most important Green Supply Chain Practices those build the Corporate Image.

When accomplished, these objectives may help the managers to find the most important practices to improve Corporate Image and also enabling them to provide better environmental friendly product to the customers.

In this study independent and dependent variables are considered as follows:

Independent variables

- Internal Environmental Management
- Green Design
- Green Procurement
- Customer Support
- Asset Recovery

Dependent variable

- Corporate Image

### **Data collection and analysis**

For this research, a survey was conducted among small scale industries in the area of Ferozepur District and its surroundings. Primary method of data collection has been used. Survey method was found to be appropriate to achieve the objectives of this research. Questionnaire was filled from various small scale industries in the area of Ferozepur District and its surroundings area. The study targeted middle and top level management employees. Questionnaire was distributed to total 58 participants by personally visiting 12 industries. The collected data was analyzed using SPSS (Statistical Package for the Social Science) software. The linear regression analysis method was used and ANOVA table indicates the result of linear regression model. In the regressions models each dimension were averaged from their underlying measurement item to form a single indicator.

### **Results, findings and discussions**

The reliability of collected data is tested by Cronbach’s Alpha value and basically it is designed to check consistency. The Cronbach’s Alpha value is measured separately for each dimension for set of questions. All the values are above 0.7 therefore measurement scale is reliable.

The ANOVA table of Regression between Green Supply Chain Practices and Corporate Image

Model		Sum of Squares	Df	Mean Square	F	Signif. F
1	Regression	4.407	5	0.881	8.703	.000 <sup>a</sup>
	Residual	5.226	52	0.101		
	Total	9.673	57			

a. Dependent Variable: Corporate Image

b. Predictors: Internal Environmental Management, Green Design, Green Procurement, Customer Support, Asset Recovery

In ANOVA table value of significance 0.000 less than 0.005 indicates that overall relationship between two variables is statistically significant. The developed model can predict the value of outcome significantly. Sum of square is a standard measure of variability. Degree of freedom for regression is equal to number of independent variable (5) and for Residual it is sample size (58) minus number of independent variables (5) minus one. Mean square value is sum of squared divided by degree of freedom. F value is mean square regression divided by mean square residual.

The table shows coefficient of regression between Corporate Image and each dimension of Green Supply Chain Practices including Internal Environmental Management (IEM), Green Design (GD), Green Procurement (GP), Customer Support (CS) and Asset Recovery (AR).

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig. of t
		B	Std. Error	B		
1.	IEM	0.628	0.161	0.462	3.898	0.000
2.	GD	0.419	0.106	0.465	3.933	0.000
3.	GP	0.721	0.124	0.615	5.836	0.000
4.	CS	0.568	0.150	0.451	3.778	0.000
5.	AR	0.372	0.124	0.373	3.007	0.004

From above table it shows that IEM, GD, GP, CS and AR exert positive and significant impact on Corporate Image. Higher the value of B coefficient more impact on Corporate Image. IEM, GP and CS are strongly associated with Corporate Image as compared to GD and AR.

The table shows the overall modal summary of result of regression analysis between GSCM practices and Corporate Image.

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	0.644 <sup>a</sup>	0.414	0.404	0.31812

a. Predictors: GSCM Practices

As shown in above table (Modal Summary) R value shows multiple correlation between dependent and independent variables. High R value (0.644) indicating strong relationship between corporate image and green supply chain practices. R Square value of 0.414 indicates that 41.4% of the variance in corporate image is accounted for by green supply chain practices. Std. error of estimates is measure of sampling error of distribution.

The table shows overall ANOVA table of regression between Green Supply Chain Practices and Corporate Image.

Model		Sum of Squares	Df	Mean Square	F	Signif. F
1	Regression	4.006	1	4.006	39.589	.000 <sup>a</sup>
	Residual	5.667	56	0.101		
	Total	9.673	57			

In ANOVA table value of significance 0.000 less than 0.005 indicates that overall relationship between two variables is statistically significant. The developed model can predict the value of outcome significantly. Sum of square is a standard measure of variability. Degree of freedom for regression is equal to number of independent variable (1) and for Residual it is sample size (58) minus number of independent variables (1) minus one. Mean square value is sum of squared divided by degree of freedom. F value is mean square regression divided by mean square residual.

The table shows overall coefficient of regression between Corporate Image and Green Supply Chain Practices.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig. of t
		B	Std. Error	B		
1.	(Constant)	-0.613	0.372		-1.646	0.105
	GSCM Practices	0.980	0.156	0.644	6.292	0.000

The result shown in above table clears that the value of B is 0.980, so GSCM Practices are positively associated to corporate image. The significance level of 0.000 indicates this regression coefficient is statistically significant. The level of corporate image increases by increasing the level of GSCM Practices. The hypothesis 1 is accepted.

### Conclusions

From the study it is confirmed that GSCM practices play a vital role in building the Corporate Image in the small scale industries. IEM, GP and CS are strongly associated with CI as compared to GD and AR. Though the results of this study shows that GSCM practices posed a significant impact on CI but these practices are not fully implemented due to lack of customer awareness and supplier support. In small scale industries the authorities and managers are aware about these practices but there is lack of awareness among workers and customers. This study can be done on a large scale which provides a better picture of GSCM practices and their effect.

### References

- [1] Christopher, M. (2005). Logistics and supply chain management [M], Pearson Education.
- [2] Rao, Purba, Holt, Diane, Do green supply chains lead to competitiveness and economic performance? International Journal of Operations and Production Management, Vol. 25, No. 9, 2005.
- [3] Yan Li, Research on the Performance Measurement of Green Supply Chain Management in China, Journal of Sustainable Development, Vol. 4, No. 3; June 2011.
- [4] Nitya, Marketing strategies of small scale industries in Punjab.
- [5] Bacallan, J.J. (2000). Green the supply chain, business and environment, 6: pp.11-12.
- [6] Essay on "Increasing awareness of the green supply chain commerce".
- [7] Srivastava, S.K (2007). Green Supply Chain Management: A State-of-the-Art Literature Review. International Journal of Management Reviews, v.9 No 1.

- [8] Hsiao-Fan Wang, Surendra M. Gupta A Textbook on “Green Supply Chain Management: Product Life Cycle Approach”
- [9] Dr. Anil Agarwal “Small-Scale Industries Drive India’s Economy but Pollute Heavily: What Can Be Done?”
- [10] Zhu, Q., and Sarkis, J. (2007). Green supply chain management: pressures, practices and performance within the Chinese automobile industry. *Journal of Cleaner Production*, 15(2).
- [11] Rondinelli DA, Vastag G. 2000. Panacea, common sense or just a label? The value of ISO 14001 environmental management systems. *European Management Journal* 18.
- [12] M. Ghobakhloo, S. H. Tang, N. Zulkifli, and M. K. A. Ariffin “An Integrated Framework of Green Supply Chain Management Implementation” *IJIMT* Vol. 4, No. 1, February 2013.
- [13] Stuart Emmett, Vivek Sood A Textbook on “Green Supply Chains: An Action Manifesto”
- [14] B Suleiman A. Al Khattab, As ad H. Abu-Rumman, Ma’n Mustafa Massad, “The Impact of the Green Supply Chain Management on Environmental-Based Marketing Performance” *Journal of Service Science and Management*, 2015, 8.
- [15] Dennis Knutz, “Investment Recovery’s Role in the Supply Chain”.
- [16] Ajayi, Y (1997) Corporate Image Management in the Private Sector, *Image Maker*, 1(1).
- [17] Mustafa Karadeniz, “The Importance Of Creating A Successful Corporate Identity And Corporate Image For Enterprises In Marketing Management” *Journal of Naval Science and Engineering* 2009, Vol. 5, No.3.
- [18] Adarsha and Prathap, “Green Supply Chain Management Practices: A Case Study from Indian Manufacturing Industry” *Asia Pacific Journal of Research* October 2013, Volume: III, Special Issue: X
- [19] Nidhi Shah-2005, Green purchasing: The issue of responsible supply chain management for improving the environmental Performance-Press article.
- [20] B.L. Lakshmimeera and Dr. Chitramani Palanisamy, "Conceptual Framework on Green Supply Chain Management Practices", Coimbatore, India Vol.3, No.10, (2013).
- [21] Catherine Njoki Gatari, Dr. Susan Were, “Challenges Facing Implimentation Of Green Procurement In Manufacturing Sector Inkenya: A Case Study Of Unga Limited Kenya” *European Journal of Business Management* Vol.2, Issue 1, 2014.
- [22] Ugras Demirci, “Green Supply Chain Management Case: Turkish Automotive Industry by practices, pressures and performance”. 2014, University of Gavle.