

Green Supply Chain Management: A Necessity for Sustainable Development

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Deteriorating environmental quality is harming the planet, people and profit, which are the key elements of triple bottom line. Today, business organizations have understood the necessity of Green Supply Chain Management (GSCM) for environmental protection and have started practicing it. Integration of Supply Chain Management (SCM) with environment through green procurement, green manufacturing, green design and information system, green packaging, green logistics and distribution and reverse logistics results in the generation of innovation towards sustainability. It also minimizes and eliminates wastage like solid waste, carbon emissions, hazardous chemicals, thus ensuring maximized consumer satisfaction and healthy profits. In this study, an extensive review of literature on GSCM and its relationship with sustainable development has been done and a conceptual model has been proposed among the various components of GSCM and sustainable development. The study would be beneficial not only for companies to achieve sustainable performance but also for the end users to understand the seriousness of their role in implementing recycle, reduce and reuse by increased use of environment-friendly products and supporting those firms that are implementing it religiously.

Introduction

Supply chain is a system consisting of parties like suppliers, manufacturers, retailers to finally the customers. It constitutes both upstream and downstream chain where flow of information, finances and physical distribution of goods and services takes place directly or indirectly (Mentzer, 2001; and Chopra and Meindl, 2010).

To address the relationship and the influence between Supply Chain Management (SCM) and natural environment, a green component has been added to SCM (Hassini *et al.*, 2012; and Meythi, 2013), which is a green initiative and technique to improve and rectify product or process performance based on prerequisite in environment regulations (Hu and Hsu, 2010).

The SCM gained momentum in 1950 as many firms were finding ways to minimize the cost of production through mass production (Huque and Islam, 2007). From 1990, the firms started to act in a more ethical and socially responsible manner due to increased awareness of green practices and intensified competition in their supply chain practices (Diabat and Govindan, 2011). Also supply chain has turned out to be an important issue for greener industrial development (Srivastava, 2007; and Rehman *et al.*, 2011).

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It has become essential for organizations to go green. 'Green', the color of nature symbolizes hope, fertility, freshness and positivity. The world is nourished by nature which makes the environment beautiful and prosperous, but misuse of natural resources by human beings due to industrialization has led to many problems like reduction in ozone layer, reduction in the forest cover, global warming, melting of ice mountains and glaciers, etc. In order to save our planet Earth from future disasters the companies should start a green movement to protect the environment.

'Going green' means to chase the practices that promote more environmental-friendly and ecologically-responsible lifestyles and decisions, assist in environment protection and maintain the natural resources for present and future generations.

According to Brown and Ratledge (2011), when firms indulge in green output or production, it is termed as green business which has a right mix of commitment towards humanity, environmental sustainability and profitability (Makower and Pyke, 2008). Further, green business uses renewable resources for environmental sustainability (Slovik, 2013). Green Supply Chain Management (GSCM) is a multi-dimensional concept highlighted in the past literatures by many authors (Zhu and Sarkis, 2004; Holt and Ghobadian, 2009; Ninlawan *et al.*, 2010; Green *et al.*, 2012; Lee *et al.*, 2012; Laosirihongthong *et al.*, 2013; Thoo *et al.*, 2014; and Fahimnia *et al.*, 2015).

Companies are adopting contemporary GSCM practices for the improvement of environmental performance and have competitive advantages (Testa and Iraldo, 2010). As per Zhu and Sarkis (2004), GSCM is practiced in varied ways. It is integrated not only into inbound supply chain and outbound supply chain but finally completes with reverse logistics and reaching the end user through recycling and reuse. According to Srivastava (2007), the major dimensions of GSCM are green manufacturing, purchasing, logistics and distribution for the enhancement of sustainability.

Rao (2006) further added that many South East Asian firms have started using eco-friendly raw materials, emphasizing on pollution reduction and wastage in logistic activities with eco-friendly disposal of waste and waste water treatment plant. A study of GSCM conducted by Shang *et al.* (2010) pinpointed that green manufacturing, green packaging, eco-design, green marketing, environmental participation and supplier interaction are all part of it. Thus to conclude, GSCM has become an integral organizational philosophy to attain profits and increase market share by mitigating the environmental risks and its impact and increasing the sustainability efficacy in the organizations and their partners (Van and Erasmus, 2000).

Sustainability was defined by World Commission on Environment and Development (WCED) in 1987 as a headway in order to meet the needs of the present, and the resources should be utilized in such a way that future generations do not have to compromise and their needs are also met.

Shrivastava (1995) defined sustainability with reference to WCED definition as the parameter to reduce long-term risks in alliance with fluctuations in energy costs, pollution and waste management and resource depletion.

Starik and Rands (1995) defined sustainability as “the ability of one or more entities either collectively or individually to improve their activities in the long run without losing sight of the next generation.”

GSCM is not a very old concept, in fact it is a recent innovation in the SCM field which has added value and enhanced its capabilities. As it is a known fact that environment is affected by business activities, so GSCM in manufacturing concerns has become an essential part for sustainability in organizations.

The aim of this paper is to identify and analyze the need, importance and significance of GSCM, and its role and prospects in organizations for attaining sustainability. It is a conceptual study based on secondary data interpreting the relation of GSCM with sustainability. A model has also been proposed in this regard.

Literature Review

‘Green’ – Meaning and Concept

Yaranella *et al.* (1999) defined ‘Green’ thus: “Green induces small improvements in modern technology, social practices, and human habitats, and on the other hand sustainability indicates a transformation in organizing our personal and collective lives and occupying the planet”.

Many companies are focusing on green innovation as an onus to protect the environment and for sustainable development to produce eco-friendly products and services. Energy Star Label, a government-backed symbol for energy efficiency is used by many consumer durable companies as a marketing strategy for their products, which means their usage will reduce the energy consumption, thus enabling the consumers to save money and energy.

NDTV, a famous media group, has started its campaign ‘Greenathon’ to promote green values (<http://green.ndtv.com/milind.aspx>). Godrej consumer products offer additional incentives to buyers for exchanging their old products with environment-friendly and modern green products, i.e., promoting recycling and reuse.

Companies like Tanishq, Titan, etc. deliver goods in carry bags made of recycled paper. Kansai Nerolac has worked on removing hazardous metals from their paints in order to go green and is promoting lead-free paints in India.

‘Go Green with Dell’ strategy has been adopted by Dell and it is producing green IT products with eco-friendly packaging. McDonald replaced ‘Clam shell’ packaging with waxed paper for consumers, following concerns pertaining to ozone depletion and polystyrene production. To satisfy the firm’s demand for less environmentally harmful products, Xerox introduced high quality recycled photocopier. Coca-Cola modified their packaging and invested a large sum of money in various recycling activities to minimize

its environmental impact. Walt Disney World introduced a waste management program in support of environment sustainability.

From the above-quoted examples, it can be inferred that substantial amount of awareness is created on sustainable practices, and companies are involved in sustainable development as a goal in general.

GSCM Practices

GSCM practices are divided into three parts, i.e., upstream components, internal components and downstream components.

Upstream Components of GSCM

Kahannali *et al.* (2015) proposed that to have environmental, social, economic and intangible benefits, an upstream element of GSCM, i.e., Green procurement should be conducted and its effectiveness depends on whether the firm is decentralized or centralized (Birett, 1998). In a survey among purchasing managers, the impact of environmental regulations on activities like purchasing is listed as the second most important for future concern (Monczka and Trent, 1995).

According to Srivastava (2007), Chaturvedi (2010) and Luthra *et al.* (2011); GSCM practices reduce wastage and emission of greenhouse gases by making eco-friendly biodegradable packaging, using recycling techniques and best green procurement with hybrid technology for transportation.

In green procurement, suppliers are selected based on their ability to develop environmental-friendly goods (Lamming and Hampson, 1996; and Paulraj, 2011). Green procurement can be defined as an initiative based on environmentally-conscious purchasing whose objective is to make sure that the products and materials are purchased on the basis that they meet the environmental objectives which involves the three R's, i.e., reduce, recycle and reuse, that are set by manufacturing firms (Salam, 2008). GSCM practices have many advantages and it promotes innovation in environment (Bowe *et al.*, 2001; Rao, 2002; and Hall, 2003).

Rao (2006) opined that organizations should help suppliers in managing their own environmental program by collaborating in designing green goods with suppliers and arranging seminars on GSCM practices as an awareness exercise. In order to have long-term sustainable performance, suppliers should be selected cautiously by organizations (Rajan *et al.*, 2010), their environmental performance should be assessed, and it should be seen that suppliers are taking measures to ensure environmental quality of their products (Handfield *et al.*, 2002).

Manufacturers should cooperate with suppliers to increase environmental sustainability (Green *et al.*, 2012). Manufacturers should work with suppliers to develop new source reduction strategies on how to have cleaner production to achieve environmental

objective (Paulraj, 2011). In order to ensure that suppliers are following green practices and processes, supplier audits are very important, which will also ensure that they provide compliance statements (Hu and Hsu, 2010).

Internal Components of GSCM

In the last few years, manufacturers all around the world have strategized and implemented green supply chain to improve their environmental practices (Rao, 2002; and Begum *et al.*, 2009). Companies, by engaging in ISO 14001 certification, are not only improving business growth, acquiring high international recognition, gaining competitive edge but also improving environmental performance, thus achieving sustainable growth (Rao, 2002; and Zhu *et al.*, 2005).

The basic requirement of green manufacturing is that manufacturers should delineate products that have the possibility of recovery of materials and components that could be recycled and reused; mitigate hazardous products usage in the production process and reduce energy and materials consumption (Zhu *et al.*, 2005).

Green manufacturing activities can be pursued by firms by using solar energy, environmental-friendly and biodegradable energy sources and recycling of raw materials in their manufacturing operations (Amemba *et al.*, 2013). In this process, better corporate image will be built by ensuring low pollution (Al-Odeh and Smallwood, 2012). Green design, also called eco-design, is an environmental design with objectives to reduce the environmental impact during product development cycle right from procuring raw materials from suppliers to manufacturing, to using it and then finally disposing the materials left (Johansson, 2002).

Harrison (2011) also highlighted the importance of green design as it reduces the environmental effects of a product produced, distributed and consumed. Green design is also termed Design For Environment (DFE) as it reduces the environmental effects of a product before production, during production, distribution and final usage. Flammer (2013) pinpointed that eco-friendly companies enjoy significantly higher stock price, however eco-harmful firms face decrease in stock price.

The term 'green design' and 'green information' are considered as effective tools and solutions to the various environmental problems, cost reductions and safety objectives. In fact, triple bottom line adoption led firms to achieve cost reduction through green design (packaging reduction), reduce, reuse and recycle. The safety objectives are met through green transportation, neat and tidy warehouses, improved working conditions; reduction of labor cost through effective motivation of employees leading to increased productivity. The reduction of operation cost and lead times improved product quality with ISO 14000 standards implementation and ethical business goals, leading to corporate image enhancement (Carter and Rogers, 2008; Carter and Easton, 2011; and Kumar *et al.*, 2012).

Many authors have talked and interpreted the remarkable importance of Green IT. According to Fuchs (2008), the Information Technology (IT) applications such as in digital media, e-commerce, mobility of virtual goods, smart buildings, and Intelligent Transport Systems (ITS) help in reducing/controlling carbon emissions and environmental pollution. Hence Green IT has integrated itself in accomplishing energy conservation. According to Elliot (2007), Green IT has emerged as an important branch that is catching wide attention from both practitioners and scholars. This is due to its core role in coordinating and monitoring various business activities and optimizing energy conservation. Bose and Luo (2011) also gave credit to Green IT for reduced carbon emissions and power consumption. This improves and enhances operation performance and increases collaboration and interaction.

Green packaging is a very important term and means for sustainability. Today, product designers focus on using renewable materials such as biopolymers, card, paper, etc. for packaging. Many companies like Dell are examining the viability of packing materials like bamboo, wheat straw and mushroom-derived material and Tetra Pak, intending to manufacture high-density polyethylene made from renewable feedstock. These moves not only limit the materials used for packaging, but also help in reducing the cost of raw materials. Reduced packaging also cuts down shipping costs for the companies (Kassaye and Verma, 1992).

According to Kroon and Vrijens (1995), countries now have a program with objectives to minimize the amount of packaging that goes waste to strengthen green packaging efforts. Ninlawan *et al.* (2010) assert that green packaging implies greener materials and downsized packaging like collapsible shipping containers.

Downstream Components of GSCM

According to Nimawat and Namdev (2012), green distribution could be achieved through green packaging, green logistics and transportation. Similarly, Srivastava (2007) stated that through the reuse and recycle programs green distribution can also be achieved.

Diabat and Govindan (2011) discussed the importance of cooperation with vendors to standardize packaging. Luthra *et al.* (2014) encouraged adoption of returnable packaging methods, however, Beamon (1999) proposed minimizing material use and time to unpack.

The basic difference between reverse logistics and green logistics is that the former is viewed as sustainable development, while the latter emphasizes on the forward flow of supply chain (DeBrito 2003) and is often known as ecological logistics (Rogers and Tibben, 1998). In green logistics, goods are not delivered in smaller batches, rather they are ordered together and they are delivered directly to user site using environment-friendly vehicles (Holt and Ghobadian, 2009; and Ninlawan *et al.*, 2010).

According to Sbihi and Eglese (2007), green logistics considers environmental and social factors and produces and distributes products in a sustainable way. To attain sustainable performance, the firms should extend traditional supply chain and include reverse logistics (Beamon, 1999).

GSCM includes both economic development as well as environmental protection (Zhu *et al.*, 2012) and is concerned with forward and reverse flow (Chien *et al.*, 2007). Reverse logistics has an impact on the environment, economic and intangible performance (Laosirihongthong *et al.*, 2013). According to Nimawat and Namdev (2012), reverse logistics implies the logistics in product returns, reuse and recycling of materials, disposal of waste, remanufacturing and repairing. Wu and Dunn (1995) talked about the need for an environment-friendly logistics system. In addition, Chouinard *et al.* (2005) pinpointed the problems in Reinforcement Learning (RL) integration within an organization. Thoo *et al.* (2014) analyzed that reverse logistics is nothing but green logistics which means collection of used packaging and products from customers for recycling, providing to suppliers back for reuse and pressing them to collect their packaging materials.

Eltayed *et al.* (2012) discussed the incorporation of eco-friendly design and raw material for diminished consumption of energy and material, usage of cleaner technology processes for energy, solid and liquid waste minimization, as well as reverse logistics usage to achieve green logistics. Also, Rao (2002) proposed that management of waste in the upstream such as reverse logistics and exchange of waste could lead to enhanced competitiveness and cost savings.

Relationship Between Green Supply Chain Development and Sustainability

The important parameters of sustainable performance are economic performance, social performance and environmental performance (Holt and Ghobadian, 2009; and Paulraj, 2011). In order to respond to the immediate needs of the environment and market challenges, the firms must rethink to develop green innovative practices in their business strategy (Jaworski and Kohli, 1993). The focus of firms now has shifted from creation of wealth through high economic performance to social and environmental concern in order to reach the optimal levels of sustainability (Carter and Rogers, 2008). If an organization has to be competitive in the long run and has to achieve sustainability, it needs convergence of environmental, economic and society superiority (Paulraj, 2011; and Thoo *et al.*, 2014).

Stakeholders who include customers, employees, non-government organizations and the regulatory bodies are continuously demanding that organizations now increase the management of the sustainable issues which could create a dent through their green operations (Linton *et al.*, 2007; Carter and Rogers, 2008; Teuteberg and Wittstruck, 2010; Gupta and Palsule, 2011; Rehman and Shrivastava, 2011; Carter and Liane, 2011; Aboelmaged, 2012; and Kumar *et al.*, 2012).

Bhateja *et al.* (2011) proposed that international organizations and governments should take necessary and corrective action to protect the environment and achieve sustainability for long-term economic development. Hence, with deteriorating environmental conditions, the attention is on the entire supply chain process, i.e., from production to disposition of products rather to only local optimization of environmental

factors (Linton *et al.*, 2007). The term sustainability is the convergence of social, environmental and economic activities (Elkington, 1998) and the integration of all these activities will have economic benefits and competitive advantage which would have positive impact on the organizations and society in the long run (Elkington, 2004).

The manufacturing firms now have to adopt GSCM practices like green procurement/purchasing, green production, green logistics and distribution to achieve enhanced economic growth (Ninlawan *et al.*, 2010; and Paulraj, 2011).

It has become mandatory to consider economic and societal performance as a factor that can lead to achievement of sustainability. Many manufacturing firms have started implementing GSCM to abide by the government rules and regulations regarding environment and customer request for products and services which are environmentally sustainable, (Murray, 2000). The top management should take full responsibility through supply chain for environmental monitoring efforts (Evans and Johnson, 2005). End-of-pipe control, a new approach, should be followed for environmental regulations, which will lead to increasing economic profit, thus reducing ecological impact (Meythi, 2013).

Nowadays, cost reduction in material purchases and energy consumption is one of the main parameters for sustainable future (Green *et al.*, 2012). Green practices lead to a profound relationship between economic and environmental performance (Fortes, 2009). The sustainability of greening process can be achieved when suppliers get/share information through manufacturers about best practices of environmental adherence and eliminate environmental risks during the manufacturing process (Barasa, 2014).

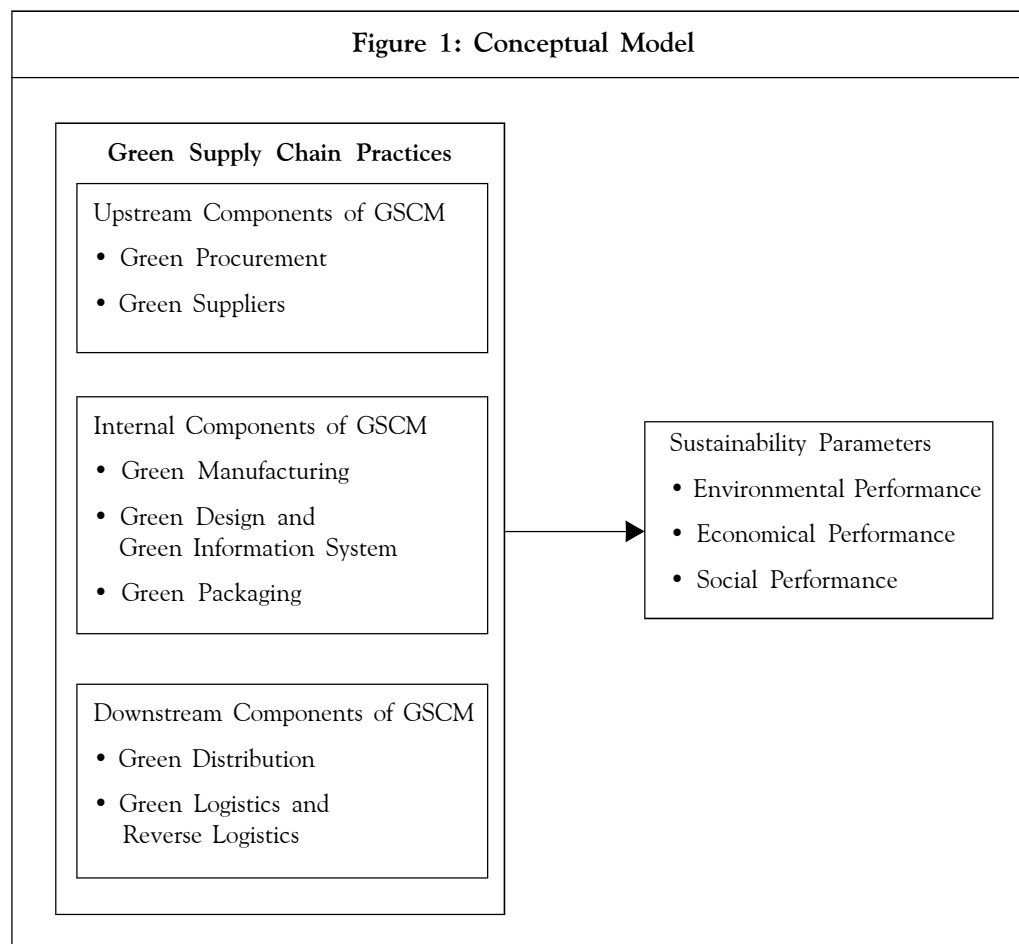
Zhu and Sarkis (2004) talked about a favorable alliance between adoption of GSCM practices through green purchasing, eco-friendly designs, cooperation with customers in order to boost economic and environmental performance (Diabat and Govindan, 2011). Today, organizations have recognized the significance of strategic initiative to compete in the global market for green and sustainable growth due to increased social, economic and regulatory pressures (Melville, 2010; Dao *et al.*, 2011; and Butler, 2011).

Hence it can be concluded that the core elements of GSCM are primarily green procurement/purchasing, green production and design, internal management of environment investment returns and reverse logistics (Carter and Carter, 1998; Hervani *et al.*, 2005; Zhu *et al.*, 2008; Sarkis *et al.*, 2011; and Amemba *et al.*, 2013). The upgradation of supply chain to green supply chain in organizations plays a vital role in attaining environmental awareness. These sustainable practices help in diminishing the adverse effects of climate change, natural calamities, ecological imbalance and other environmental problems (Hervani *et al.*, 2005; and Sarkis *et al.*, 2011).

Conceptual Model and Hypotheses Development

Today, not only organizations are integrating environmental practices into their operations and strategic plans, but researchers and practitioners are showing keen interest

towards environment-friendly business practices (Sarkis, 2001). To achieve more environment-friendly and sustainable green globe, it is pertinent to adhere to GSCM practices which are the sum total of green procurement and purchasing, materials/manufacturing management, total quality management, green design and packaging, marketing/distribution, environment-friendly transportation and reverse logistics and product recycle, reuse practices (Hervani *et al.*, 2005; and Kumar *et al.*, 2012). According to Seuring and Muller (2008), GSCM can be considered as a tool of capital flows, material information along with cooperation among companies aiming towards three dimensions of sustainable development, i.e., social, economic and environmental, thus fulfilling stakeholders' requirements. In order to satisfy the triple objectives of sustainability, organizations should take into consideration the concept of sustainable development right from the beginning of policy making and supply chain management (Ioppolo *et al.*, 2014; and Deutz and Ioppolo, 2015). Based on literature review, Figure 1 proposes the dependency of sustainability performance on GSCM practices.



The following hypothesis has been formulated based on the above arguments and discussions:

H₁: GSCM practices have a positive relation with sustainability performance.

Conclusion

GSCM is a very vast concept where the major components have been summarized in the proposed conceptual model of this paper. However, it is difficult to discuss all the constituents of GSCM practices and sustainability performance in this one study, which is one of the limitations of the study as well.

But now it is crystal clear from the literature review that practicing GSCM will actually lead to sustainable performance and in turn firm's performance (Green *et al.*, 2012; and Lee *et al.*, 2012). Also, significant relationship between GSCM practices and sustainable performance has been identified and confirmed (Zhu *et al.*, 2005; Green *et al.*, 2012; and Thoo *et al.*, 2014).

Today, companies cannot remain untouched by GSCM practices to reduce environmental risks and increase ecological efficiency, thereby achieving environmental sustainability with increased profit and market share (Van and Erasmus, 2000). The important parameters of sustainable performance includes economic, environmental and social performance (Zhu *et al.*, 2005; Holt and Ghobadian, 2009; Paulraj, 2011; and Laosirihongthong *et al.*, 2013).

By adopting GSCM practices, companies can conserve materials and reduce energy and water usage, thus reducing cost and decreasing environmental liability, and most of all achieving better public image (Wisner *et al.*, 2012). The environmental performance of supply chain could be improved by adopting green packaging, green marketing practices and green distribution (Rao, 2002). The companies now facilitate and adopt GSCM as an innovative strategy for higher profits and in turn help society and economy (Srivastava, 2007).

To sustain in this competitive environment, it has become essential for the firms to have balance between environmental and economic performance (Shultz and Holbrook, 1999), and according to Zhu and Sarkis (2004), managers can also improve environmental compliance by addressing environmental issues to customers and thus reducing the environmental impact of goods and services. Having a green supply chain approach to sustainable development can save resources, increase productivity and reduce wastage (Porter *et al.*, 1995; Srivastava, 2007; and Kumar *et al.*, 2012).

The organizations will flourish only if they succeed in their supply chain activities (Chopra and Meindl, 2004). Businesses will only flourish and achieve sustainability if they follow green supply chain practices like purchasing, manufacturing, marketing, logistics, and information systems (Vachon and Klassen, 2007; and Zelbst *et al.*, 2010).

Dheeraj and Vishal (2012), in their study, stated that major components of GSCM practices are green procurement, green manufacturing and materials management, green distribution and marketing and reverse logistics, for they lead to sustainable development. Hasan (2013) found that GSCM practices in firms can minimize cost, increase efficiency, improve service, and increase sales, market share, growth, revenues and reputation. This would ultimately lead to sustainable development.

Scope for Further Research: Beyond doubt, environment concerns are alarming. To save the triple bottom line, i.e., people, planet and profit, the government, organizations and end-users all have to join hands together to achieve sustainability. There are many antecedents to environmental sustainability; most of them are discussed in this study; but innovations are still going on in this area. So it calls for regular studies to evaluate a company's innovative efforts towards sustainability and its impact especially in the context of Indian manufacturing firms. Last but not the least, the role of consumers is also critical in encouraging reverse logistics and using recycled products and services. Thus an empirical study is recommended keeping the objectives of GSCM in mind. ☞

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