Green Supply Chain Management: A Literature Review

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In India, Green Supply Chain Management (GSCM) as a concept is gaining its pace, and in a broader sense, there have been works in the areas of research opportunities in GSCM, impact of GSCM on economic, social and financial performances, different types of pressure, enablers, drivers, barriers, conflicts and benefits of GSCM practices, designing structural models and testing its implications, comparing green practices among companies within nation and among companies of different nations, finding key words pertaining to GSCM practices, etc. Pragmatically, these concepts have been followed by the corporate and the same has been reflected in their annual sustainability reports. The paper makes an attempt at simplifying the overall factors under the circle of GSCM through a review of literature.

Introduction

Supply Chain Management (SCM) has been perceived as one of the key aspects for organizational long-term sustainability in terms of revenue maximization, profit maximization or increase in the number of end users. In the era of cut-throat competition for market share capitalization, organizations get diluted from their responsibility towards society and environment. Sometimes it happens that the organizations fulfill these roles as obligation in order to convince the governing bodies. It is imperative to align the sourcing, manufacturing, distribution, transportation and remanufacturing/recycling process with the goal of reducing organizations' carbon footprint. Green supply chain integrates environmental thinking into the supply chain, including sourcing, design, manufacturing, logistics and even in the flight management after the product has become obsolete. This further gives scope in identifying the enablers affecting the implementation of the green supply chain and benefits associated through Green SCM (GSCM) practices. Many companies from different sectors have increased consciousness about the world environmental problems that exist such as using toxic substances, increasing global warming and decrease in the earth's resources. Change is inevitable and the sooner the Indian companies realize the importance of adapting eco-friendly business, the better it is to compete in the global markets. Towards this end, industries have been putting forward one or the other form of annual sustainability reports.

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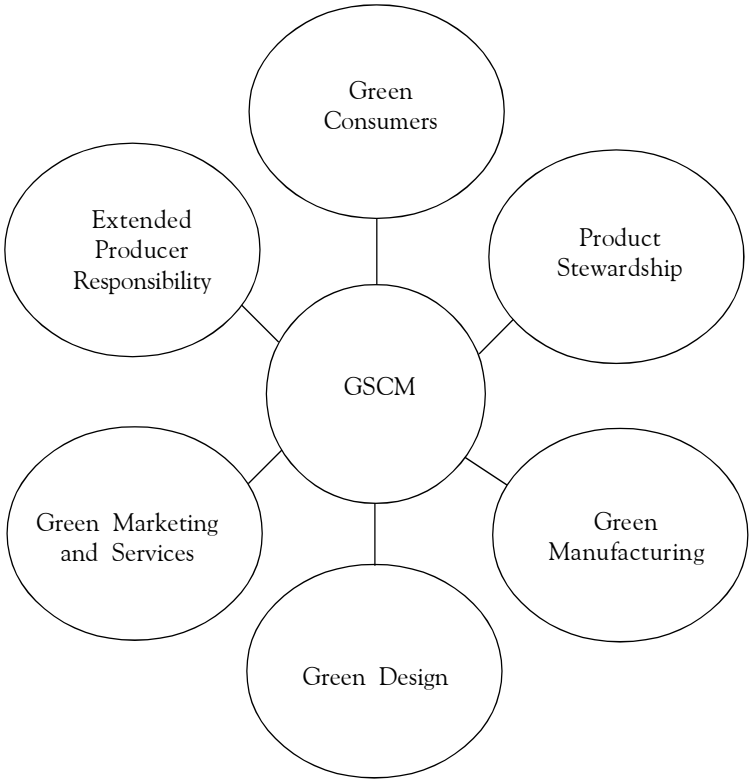
Literature Review

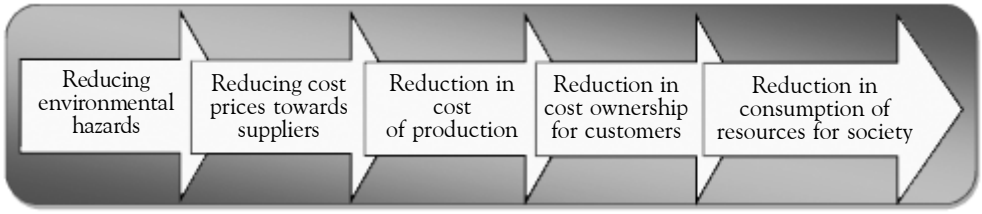
Any energy-saving measure can be termed as a green measure and such energy-saving measure in supply chain can be defined as GSCM. Manufactures are responsible for the entire product life cycle right from its origin to disposal. They have an important role to play in enabling green manufacturing by usage of waste-free and emission-free energy sources through which they can provide products to green consumers who respond to global warming and climate change. The green practices guide organizations in contributing their bit towards corporate social responsibility and building an effective corporate image. The work also reviews the factors affecting the implementation of GSCM for the Indian bottled water industry using Interpretive Structural Modeling (ISM), a multiple criteria decision-making method used for structuring complex decision-making problems. Finally, the authors also emphasize on the role of government and the top management to be predominant in the successful implementation of GSCM practices. There are seven key enablers identified as GSCM, as depicted in a pictorial format in Figure 1 (Anoop, 2013).

Figure 1: Key Enablers For GSCM



In the Indian context, very few studies have been conducted by researchers on GSCM which happens to be a novel concept and as a result the concept is spreading slowly and gradually. GSCM = Green purchasing + Green manufacturing/materials management + Green distribution/marketing + Reverse logistics. There are several benefits of GSCM implementations such as reducing environmental hazards enabling healthy place of living, reducing cost prices towards suppliers, reduction in cost of production, reduction in cost of ownership for customers, and reduction in consumption of resources for society (Figure 2). These benefits also extend towards stakeholder motivation and engagement, consumer delight followed with uplifting of companies' reputation (Sanket, 2013).

Figure 2: Benefits of GSCM



Sudheer and Omkar (2014) stated that the major research in India with regard to sustainable SCM has happened in the area of operation decisions, product design, production planning (scheduling/controlling), inventory management and reverse logistics. The authors also stated the role of Government in sustainability in manufacturing sector has increased over a period of time and they have certifications for manufacturing industries, such as 'Certified Emissions Reduction' and 'Renewable Energy Certificates'. The authors have developed an integrative framework summarizing the existing literature under four broad categories: (1) strategic considerations; (2) decisions at functional interfaces; (3) regulation and government policies; and (4) integrative models and decision support tools (Sudheer and Omkar, 2014).

General motors reduced their annual cost by $12 mn by establishing a reusable container program for their suppliers. In FMCG sector investigation on two major areas, i.e., on sector-wise green initiatives and product category-wise green initiatives, reveals that green initiatives were found to be highest in production, followed by packaging and then by retailers, suppliers and finally by transporters. Green initiative for category related to FMCG sector was as follows—home care, food packaging, sugar, beverages, cosmetics, dairy, tobacco, snacks, food manufacturing and lastly confectionaries. Environmental awareness among different divisions was low as there were no environmental experts in the team. There were no tools to measure environmental sustainability and the companies' focus was towards maximizing profits. Challenges and initiatives have been classified in categories of energy, recycling, green framework and transport (Craggs, 2012).

GSCM addresses the relationship between SCM and environment. GSCMs are lean supply chains with minimal or zero waste. GSCM with focus on performance improvement, barriers, drivers and solid waste management have been investigated in the paper and the comparison of GSCM practices among Japan, China and India reveals that Japanese and Indian companies are considered to be better than Chinese. Indian companies need to focus on financial performance. Recycling wastes discharged by other companies, recycling wastes discharged by own company and waste reduction are considered as part of GSCM practices. The reasons for taking up GSCM practices are termed as corporate social responsibility, corporate image and cost benefits. (Manisha, 2015).

GSCM practices involve parameters like commitment of senior management to GSCM, inter-functional cooperation for environmental improvement, compliance with legal environmental requirements and auditing programs, ISO 14001 certification, selection of suppliers including environmental criteria, working with suppliers to meet environmental goals, evaluations of the internal environmental management of suppliers, evaluation of the environmental management of 2nd-tier suppliers, working with clients for eco-design, working with clients to make production cleaner, working with clients to use environment-friendly packaging, acquisition of the cleanest technologies by the company, product designs that reduce, reuse, recycle, or reclaim materials, components, or energy, product designs that avoid or reduce toxic or hazardous material use, sale of excess stock or materials, sale of scrap and used materials and sale of used equipment (after buying new equipment). The study conducted on Brazilian electronic companies examines the relation between company size, experience with Environmental Management System (EMS), hazardous substances in product inputs and the bargaining power in supply chain vis-a-vis the GSCM practices, of which the bargaining power correlation with GSCM practices not to be likely. Of the above-mentioned GSCM practices, it has been highlighted that compliance with legal environment requirements and inspection programs, sale of scraps and used materials and sale of used equipments are most frequently adopted practices by Brazilian electronics companies (Ana, 2013).

Thirty key words are listed pertaining to GSCM practices: alternative fuels, carbon footprint, certified suppliers, clean engine, clean truck, corporate social responsibility, design for disassembly, design for environment, energy efficiency, environmental stewardship, fuel efficient, fuel saving, green logistics, green manufacturing, green procurement, green supply chain, greenhouse gas emission, ISO 14000, product life cycle analysis, recycling materials, reduced packaging, smart way, supplier audits, supplier certification, supply chain, sustainability scorecard, sustainable supply chain, sustainable transportation, triple bottom line, vehicle routing and their practices among Fortune 500 companies have been assessed. The major focus has been towards cost reduction and pollution prevention. Two-thirds of these companies produce some type of sustainability

report and a few of them reflect key words like supplier audit and green procurement. Third-party audit on GSCM practices would be much effective followed by education and training on the same by Key Performance Indicators (KPI) specifications (John, 2012).

A study pertaining to GSCM practices by industry and power sector companies at Chhattisgarh puts forward the GSCM initiatives as environmental improvement of packaging, optimization of processes to reduce solid wastes, optimization of processes to reduce water use, taking environment criteria into consideration, design considerations, change for more environment-friendly transportation, substitution of environmentally questionable materials, optimization of processes to reduce noise pollution, use of cleaner technology processes to make savings (energy, water, wastes), use of waste of other companies, providing customers with information on environment-friendly products, optimization of processes to reduce air emissions, environment-friendly raw materials, using/pressing suppliers to take environmental actions, recycling of materials internal to the company, recovery of the company's end of life products, eco-labeling, choice of suppliers by environmental criteria, use of alternative sources of energy, helping suppliers to develop their own environment management system and taking back packaging. Implementing of these GSCM practices has resulted in increase in new market opportunities, product price increase, reduction of solid/liquid waste, market share and sales. Social commitment, profit margin, preservation of environment, quality improvement, reduction of emissions, increased efficiency, productivity improvement, improved corporate image, cost saving, environmental compliance improvement and recycling are also some of the key benefits (Noor, 2012).

The major pressures for implementation of GSCM practices are pressures from consumers, government and general public. Working condition of employees, environmental or green issues, CSR, low wages, human rights and child labor and sustainability are issues in SCM. Building a sustainable supply chain involves four steps: lean and improve, select suppliers and agree to targets, evaluate and develop suppliers and create meaningful expectations. The research depicts that current researchers' focus is skewed on social and ethical issues, followed by environmental (Stephen and Stefan, 2011).

Firms in Malaysia are still under the process of learning as to how to employ GSCM practices in their day-to-day activities. Green purchasing, reverse logistics and eco-design are three core practices of GSM which result in reduction of waste, resources extraction, material extraction and pollution control. Application of GSCM practices is to be done in an integrated way on all sets of supply chain management activities, namely, the product and process development, designing of products, procurement of raw materials, production, assembly, packaging, logistics and the final stage in distribution (Noor, 2012).

To ascertain the performance of GSCM among Indian apparel industry, a performance optimization model has been proposed through integration of structured equation model,

analytical hierarchy process and multi-objective linear programming. The model has been designed within the objective of economic growth and environmental protection attainment. The model tests the robustness and soundness of the performance as to be applied in different supply chain steps. Three echelon supply chain networks have been presented in the model which can be extended to multiple echelons. Scope for intermodal transportation system is likely for further research as for distribution and logistics only single mode of transportation has been considered (Jakhar, 2014).

Glimpse of Sustainability Reports FY 2016 of a Few Companies That Are Leaders in Their Sectors

A. ITC: Project "Wellbeing Out of Waste (WOW)" is a key initiative wherein it inculcates the habit of source segregation and recycling in about 400 municipal wards of Hyderabad, Chennai, Bengaluru, Coimbatore and several towns of Telangana. Project "e-Choupal" which took shape in 2006 has resulted in empowering 4 million farmers as of 2016 covering 40,000 villages.

   Some recognition on sustainability practices:

   - ITC's Sankhya Data Center, Bengaluru became the first data center in the world to get LEED platinum certification from the US Green Building Council.
   - ITC's paperboards Unit in Kovai became the first such unit to receive the CII Green Co Platinum Rating.
   - ITC's personal care factory in Manpura got a 'gold rating' from the Indian Green Building Council in the Green Factory category.
   - ITC's Packaging and Printing Unit in Tiruvottiyur has been conferred the 'Excellent Energy Efficient Unit' award at the 16th CII National Award for Excellence in Energy Management 2015.
   - ITC became the first Indian Company to gain membership with WWF-GFTN for Responsible Forestry (2010). ITC was ranked the world's 6th largest sustainable value creator among consumer goods companies. according to a Report by Boston Consulting Group (2010) (ITC, 2016)

B. Coca Cola India under project CEKOKOOL, "Distribution to provide income generating opportunity for women retailers in electricity deficit areas; 1,700+ coolers distributed so far". 98% of our core supply chain meets human and workplace rights standards, embodied in our supplier guiding principles and workplace rights policy. 'Doh-Bin' created awareness about segregation of wastes in households; 1,495 families covered. Packaging light-weighting across packages including 33% in RGB and over 30% in PET packaged drinking water (Coca Cola India, 2016).

C. Airtel sustainability report is skewed towards areas of talent development, promotion of gender diversity, employee engagement and retention, fostering an ethical work culture, creating a high performance culture through embedding talent first, growing talent through strong learning, mentoring and succession planning and developing a safe and healthy workplace (Airtel, 2016).

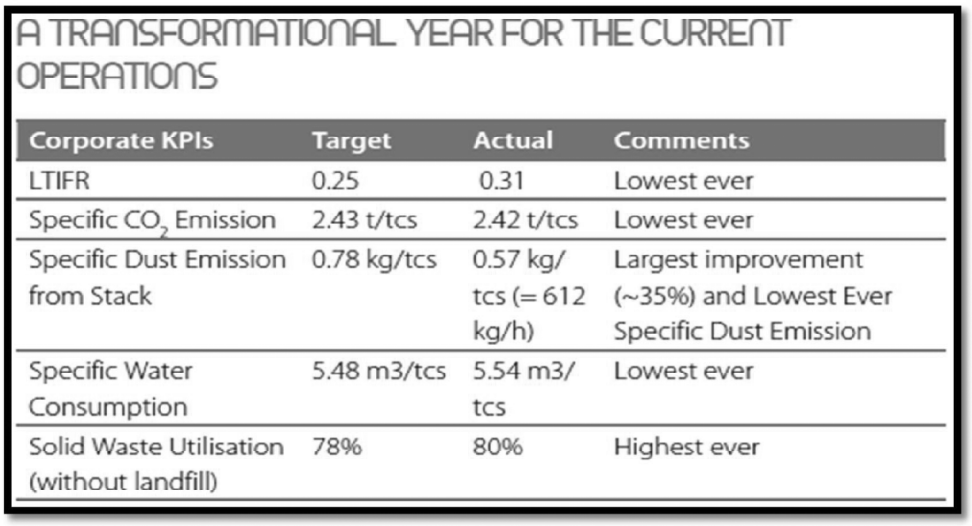
D. Hindustan unilever sustainability living plan reveals that there is a reduction of 48% in water usage, 42% in CO_2 emissions and >92% in disposed waste, 30% reduction in total waste generated from their manufacturing process. Reduce greenhouse gas emissions from transport: innovative and strategic changes in the logistics network have changed the way they look at distribution. They have redesigned their networks and increased direct despatch from factories to customers. In a first of its kind initiative in Unilever Asia, they have successfully installed 100 kW solar panel at Chennai distribution center. This initiative was supported by installation of solar panels and LED lights at their warehouses which we estimate will save 60,000 trees every year and reduce their carbon footprint by 130 tons. Project Shakti network has empowered nearly 70,000 women and 48,000 men. Prabhat's skill development programs have benefited about 1,38,000 people. HUL received the Sustainable Plus Gold Label FY 2015. This is based on Environmental, Social, Governance (ESG) analysis conducted by CII's Center of Excellence for Sustainable Development (CESD) (HUL, 2016).

E. State Bank in its report puts on view statistics like with a market share of 30%, State Bank Group ATM network transacts 51% of the country's total ATM transactions (as of December 2015), >30 crore customers across the globe, 59,000+ number of ATMs globally, 16,784 number of branches in India, 16.7% p.a. Customer base growth, 150 year association with defense force, 12.34 lakh veterans have pension account, etc. Green Channel Counter (GCC), Green Remit Card (GRC), Wealth Management: SBI Exclusif, Digital: The way to go and Swayam (Passbook printing machine), 4.78 crores spent on solar devices in FY 2016 are some key green initiatives (SBI, 2016).

F. Suzuki India reveals in its 2016 report that 1,014 ton of CO_2 offset emission reduction through 1 MW solar power plant, 96% energy generated from natural gas-based captive power plants, 50% water recycled and reused. Solar power plant at Manesar: the solar power plant of 1 MW capacity, commissioned in 2013-14 at Manesar facility generated 1,319 MWh of electricity in 2014-15. This has reduced emission by 1,014 ton of CO_2 equivalent. Automated oil management system, paint-less dent repair system, automatic car washing system and dry wash systems installation and paper consumption reduction in service operations are some of the major green initiations have been introduced (Suzzuki, 2016).

G. Tata Steel in its report reflects the recognition received: The Economic Times Award for Corporate Citizen of the Year for promotion of development in areas of healthcare, education, sports and culture. Tata steel has achieved the remarkable figures in terms of reducing environment waste, as shown in Figure 3.

Figure 3: Tata Steel Efforts Towards Reducing Environmental Wastes



A TRANSFORMATIONAL YEAR FOR THE CURRENT OPERATIONS

Corporate KPIs	Target	Actual	Comments
LTIFR	0.25	0.31	Lowest ever
Specific CO_2 Emission	2.43 t/tcs	2.42 t/tcs	Lowest ever
Specific Dust Emission from Stack	0.78 kg/tcs	0.57 kg/ tcs (= 612 kg/h)	Largest improvement (~35%) and Lowest Ever Specific Dust Emission
Specific Water Consumption	5.48 m3/tcs	5.54 m3/ tcs	Lowest ever
Solid Waste Utilisation (without landfill)	78%	80%	Highest ever

Source: Tata Steel (2016)

Conclusion

GSCM implementation can be eased through following a simple process which starts with making a business case through establishing clearly and communicating the benefits of enhancing public relationship, and cost and risk reduction to the top management. Post conviction, the challenge lies with obtaining appropriate funds which can be attained with the help of sustainable champion's appointments and making them accountable. Involvement and commitment of subordinates is to be encouraged as to benchmark supply chain sustainability. Study on carbon footprint reduction, assessing self green ranking through reviewing locally, state, nation and global standards helps in developing a sustainable plan, followed by setting sustainable goals and tracing the progress. Along with the organization, even the suppliers need help to succeed which can be supported through communicating expectations, making them accountable, measuring and rewarding their performances. Review of the entire process is crucial as to identify the areas of improvement and realign wherever required. Through the review, it can be generalized that internal and external customer pressures are of low impact compared to pressure from the Government. The major barrier to GSCM practices implementation is the willingness

to change and the threat of incurring huge costs without fetching healthy returns. The sustainability report is more of a makeover of annual reports that showcase the overall organization stance in terms of strong footholds and spread failing to produce quantifying data related to green practices barring a few. The green practices have been overlapped extensively with corporate social responsibility, leaving behind an impression of the concept to be in the prematurity state. The study further gives scope to conduct in-depth analysis of sustainability reports produced by Indian companies and comparing the same with benchmarked companies in terms of GSCM practices. ⌘

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