



Greening the Supply Chain: A Way towards a New Way

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Abstract

The word 'going green' have become the integral part for businesses as now a days the public awareness regarding sustainability is immense. In the recent time the buyers are very much Vigilant about the health & green lifestyle. Green clothing i.e. eco-friendly is drawing more attention among the buyers & provides them healthier choices. Those enterprises who are putting their effort to raise their environmental performances bear the pressure & the driving forces as a result of globalisation. Therefore the Green supply chain management is a recent technique for creating a sustainable supply chain. The main purpose of this paper is to review the literature on green supply chain & steps to be taken by the enterprises to achieve social, environmental & economic benefits.

Keywords: Green supply chain, Green procurement, Green manufacturing, Green distribution /marketing, Green logistics.

1. Introduction

In the past years the environment has become a challenging concern for the business organisation because of the global warming and climatic conditions. The government is also becoming stringent and forming strict rules and regulation on the other hand the consumers are also shifting towards eco friendly products.

Many enterprises have started investing & implementing greener practices & their approach. For the business, the way to sustainability begins with the supply chain. The supply chain is where organisation is involved in manufacturing a product, distributing of a product or services from supplier to consumer. Business operation such as procurement, manufacturing & logistics are the main responsible factors of concern. Green supply chain emerged as a new path that monitors environmental issues throughout the supply chain [7]. The green supply chain not only mitigates the environmental issue but also provide social and economic stability to the organisation [6]. Green supply chain management (GSCM) is defined as the supply chain management with the desire to reduce the environmental impact of product throughout its lifecycle [11].



1.1. What 'Green' Means?

Green stands for eco friendly & encircle many concerns like air, water & land pollution, energy usage & efficiency, waste generation & recycling. Green initiatives intent to reduce the impact of human activities on the surroundings.

The rising concern for Greener practises is mainly due to:

- Rising emission & climatic changes- In the past recent years the GHG emissions are increasing and has also led to the increase in Global temperatures.
- Rapidly depleting natural resources- With the result of increased population & industrialisation the utilisation of natural resources are increasing & their availability is declining.
- Increase in waste & pollution- With the rapid growth of industrial sector has led to the significant increase in the waste & pollution [2].

1.2. Green facet in the textile & clothing industry

Eco-friendly clothing is created from the available resources that are less contaminated, environmentally friendly & sustainable. This type of clothing requires efficient management starting from the design process, raw material sourcing and procurement, manufacturing of garments, distribution to retail outlets and also keeping in mind the reverse logistics and waste [12].

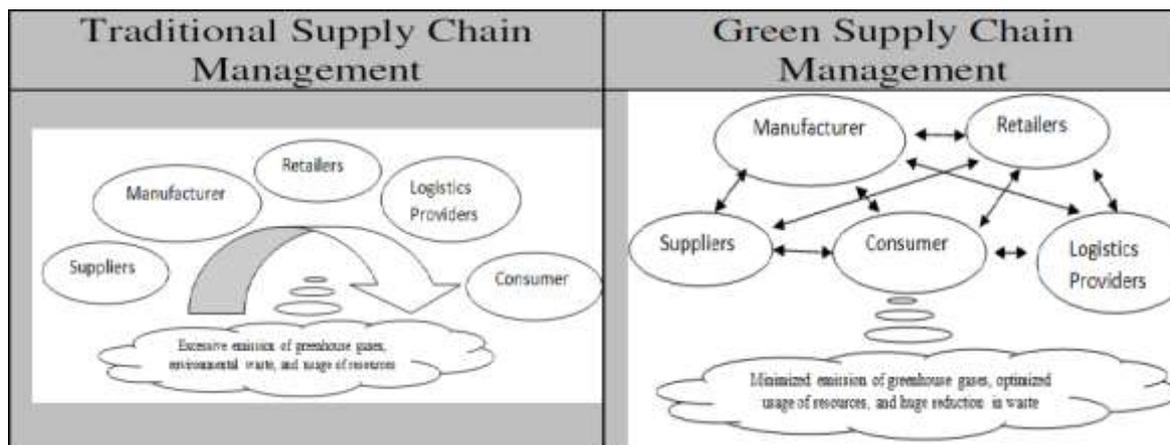
As environmentally responsive supply chain is also known as green supply chain, is a current approach. Now days, the sustainability issue are very crucial for businesses and the introduction to supply chain management is a very new concept. The consumption and production as per the environmental norms is an imperative part of the planning to improve the quality of product and the surroundings and bring about the economic and social growth [1].

1.3. Traditional v/s. Green Supply Chain

The tradition, supply chain is defined as process directly involved in the upstream and downstream of products, services and information from extraction to the final consumer. In Traditional Supply Chain the progression of material from source to the end consumer is direct. On the other hand the Green Supply Chain deal with the environmental effects of all the processes involved in the Supply Chain from the extraction of raw material till the end disposal of the product [1]. The Green Supply Chain is a closed loop of traditional supply chain which include 3 R's (Reuse, Reduce, and Recycle) and remanufacturing. The main



purpose of Green Supply Chain is to reduce and minimize the adverse effects on the environment and waste generated throughout the life cycle of product also assuring the consumer satisfaction and healthy products [6]. As consumers have become more educated and aware about the issues like global warming, sustainability and the organisation are also questioned regarding how green are their processes and supply chain, what kind of packaging is used, do they recycle. The Green Supply Chain Management is one of the new concepts in the enterprises for increasing the ability of their supply Chain Management through green process and increases their profit making as well as maintains a healthy environment [10]. The Green Supply Chain Management can be defined as incorporating the Supply Chain Management with the perspective of environment starting from the design phase, procurement and selection, manufacturing, distribution of product to the end consumer as well as end use & disposal of the product. GSCM is becoming important in the Indian scenario due to the increased awareness to corporate social responsibility and the governmental norms on environment [9].



Source: Bhateja, Babba, Singh, and Sachdeva, 2011

Figure1: Traditional versus Green supply chain

The enterprises have started adapting the GSCM practices to improve their performances related to enterprise, environment as well as socially.

The Green Supply Chain Management involves four activities:

= *Green sourcing /procurement* + *Green manufacturing* + *Green Distribution /Marketing* + *Green logistics*

2. Life Cycle Analysis (LCA)

Life Cycle Analysis is a process to evaluate the environmental, social behaviour of a product during its life i.e. extraction of raw material, sourcing and procurement of raw material, manufacturing processes, transporting, use, re-manufacturing, recycling and final disposal. The LCA involves all the input and output of material, waste generated, and energy used by a



product and also considers holistic environmental impact of enterprises starting from the extraction of raw material till the disposal of the product [11]. The approach of LCA is also called cradle to grave and the recycling processes are advised to be the most environmentally ideal.

LCA also help in determining the impact of different alternative processes to manufacture a product so as to categorise the most eco-friendly one. Now a days the enterprise should compare different products as per the energy used, toxicity, CO₂ emissions, water used so that they can make decision on what parameters to focus on in order to manufacture a more environmentally friendly product [3].

2.1. Green Sourcing and Procurement

Environmental issues are increasingly becoming an important part in today's scenario as well as there is increasing demand of Environmental friendly products but there is a limited market for eco-friendly products. Green procurement is important step in the green Supply Chain. It is putting the 'Green' Concept in the management process and also tries to reduce the environmental impacts of product. Green procurement also involves activities like LCA and 3R's – Reuse, Reduce, Recycle during the process of purchasing and is also considered important approach to promote environmental practices in the business performance.

Green Procurement should implement technology to make the supply chain more efficient and green. Electronic processes can be used to create efficiency in sourcing and procurement, considering eco-friendly designs, working with suppliers who also aim in sustainability, reducing paper during the design plan and contract [1].

Environment Preferable Purchasing (EPP) or green procurement is a process of sourcing product with minimal negative effect over the Life Cycle of Product. In India the textile industry is one of the largest polluter. Large amount of chemicals are used to manufacture raw material then to a finished product. Non-organic cotton also consumes carcinogenic pesticides during its growing process [12].

Now days, use of synthetic fibres and fabrics are declining due to the use of heavy chemical during their processing which in turn have adverse effect on our environment. On the other hand the organic fabrics are healthy, natural and eco-friendly.

These days the companies are also shifting their interests on products made from organic cotton, hemp, soy fibre and bamboo. Organic apparels are produced from fibres grown without exposures to toxins and also utilise the sustainable resources during the production process so as to have minimal effect on environment. Key procurement activities include management, specifications, finding suppliers who practice sustainability, quality inspection, storage and final distribution with minimal impact on environment [3].



2.2. Green Manufacturing

Green manufacturing is defined as production process which utilise raw material with low environmental impact and generate less waste. Green manufacturing can help the company lower its raw material cost, increase the production efficiency with minimal effect on environment [1]. Other green production and manufacturing actions include the concept of returnable and reusable packaging, less use of chemicals and choosing environmentally complaint Suppliers. The textile production includes the use of toxic chemicals which are used for fabric finishing such as bleaching, sizing, shrink resistances, wrinkle resistance, fire proofing, dyes and many more finishes. The water is also used at every step of the textile processing and in turn pollutes the environment with the chemicals used during the processes. We breathe chemicals absorbed through our skin from the fabric that is produced using chemicals. All these concerns can be addressed by following green manufacturing [3]. In green manufacturing the instruments and machinery used should be fast, reliable and energy efficient. Green manufacturing can benefit the organisation in many ways:

- By adopting green manufacturing the impact on the environment is minimal. The government is also providing tax rebates to those organisations who are taking steps towards green products.
- Green manufacturing help in the monetary gains. The manufacturers look at the renewable energy which in turn helps save the cost on energy which in turn reduces the production cost.
- The green manufacturing help the community and new productive plants. Those who are coming with renewable energy sources offer job opportunities to their communities [9].

2.2.1 Transformation to Green Manufacturing

Manufacturing companies can be transformed to Green manufacturing by focussing on:

- Green Energy
Green energy is use of sustainable energy for production. Green energy includes use of energy efficient equipment and renewable energy sources like CNG, wind, solar, biomass.
- Green Product
Development of green product includes recycling, low carbon footprint and eco-friendly products. At the earlier stages the cost of development of green products is higher but can help gain other social benefits.



- **Green Processes**

Implementation of green processes help in the efficient use of resources, minimize waste generation, assessing carbon footprint, optimal utilisation of water and also help in increasing the quality, efficiency and in reduction of cost [5].

Green manufacturing involves activities like reducing, recycling and re-manufacturing. Re-manufacturing involves recovering and reusing. Textile waste can be recycled into a new raw material which can be used to manufacture furniture, mattresses, coarse yarn and paper etc. The old garment can be given to the poor and needy one for reuse.

Reusing can benefit environment and can also be economical. Reusing can reduce the space for land fill as some fibres does not decompose and some decomposed completely and some produces harmful gases which contribute to global warming. Reusing can also reduce the burden on the natural resources to generate the fibre. Reusing the second hand clothes can be beneficial from the environmental point of view. In a study conducted in University of Copenhagen shows using 1kg of second hand clothing can help reduce 3.6kg of CO₂ emissions, 6000 litre of water consumption, 0.3 kg of the fertilizers, 0.2 kg of pesticides.

Recycling – In this process the old textiles are sorted as per the condition, fibre type, and colour. The material is shredded and the fibre is made depending on the end use. The yarn can be used in weaving and knitting and in case of synthetic fibres the fabric is chopped in to small bits then granulated and converted in to chips which is then melted and spun into new filament yarn. Other type of textiles can be reused in to fibres for rugs, upholstery, and insulating material [3].

2.3 Green Warehousing and distribution

Now a day's most companies have started implementing green warehousing and distribution. They have started green practices in inventory reduction, use of reusable containers and equipments, use of renewable energy source to reduce the energy consumption.

Green distribution mainly takes in to consideration the green packaging and green logistics. Packaging is also very important aspect during the life cycle of the product and the material used should be eco friendly.

Green packaging can be achieved by reusing the shipped product, reducing paper consumption while packaging and the designing, reducing packaging materials, reconsidering the loading pattern, utilizing the space in the warehouse and in the trailer effectively. Using recycled and recyclable material and adopting a mechanism of using returnable packaging



materials and focusing on quality packaging than quantity packaging. The end of life and disposal of product is also a crucial stage as the dangerous chemicals are emitted into the air and the water after the disposal in to a landfill so adopting green packaging can be of great help in maintaining the healthy natural environment.

Green marketing assure the client from the organization regarding the environmentally friendly product and also commit to preserve the natural habitat. It is also liable towards the ethical and social behaviour required in the field of marketing [4]. Moving towards green marketing also help in building a good rapport with the customers especially with those who concern for the environment and the depleting natural resources. In short it can be defined as a process of developing, costing and advertising of a product with no damage to our natural resources [9].

2.4 Green logistics

Many manufacturing companies have started their concern for green product which includes production process and warehouse initiatives similarly they started thinking on green transportation. Adopting green transportation in the clothing industry can help lower the final cost and can also help in providing competition and other benefits. The green transportation of product can be done through bulk transportation through railways as in India the railway sector is so vast and has huge connectivity, using more aerodynamic truck, timely servicing of vehicles, reducing empty miles, use of alternative fuels [1]. It also takes in consideration the Reverse Logistics process and it is also a very important concept. In this process the product is recovered from the end consumer for the purpose of disposal. Activities involved are accumulation, inspection, reprocessing, re transportation finally it is disposed off.

Rogers and Tibben-linke defined Reverse Logistics as “the process of planning, implementing, controlling the efficient, cost effective flow of raw material, in process inventory, finished goods and related information from point of consumption to the point of origin for the purpose of recapturing value or proper disposal”. The activities involved vary from product to product. It is estimated that the shipment by air emits large amount of emissions [3]. The road transport for the shipment of product is also increasing at a faster pace. In order to gain fuel efficiency, traffic, the deliveries must be done during the off-peak time and switching to alternative fuel options can help cut down the emissions to the environment.

3. Conclusion

Green supply chain management reduces the risk, enhances the productivity, help in creating a healthy relations with the customers and creating a sustainable surroundings. GSCM also



provide a competitive environment, improves the economic status, help in optimum utilisation of resources, reduction in cost.

The major six activities of the supply chain; namely Green Sourcing & Procurement, Green Manufacturing, Green Warehousing, Green Distribution, Green Packaging, Green Transportation. All the activities are explained to move towards the green future. Recycling of raw materials is the top priority of green manufacturing. Adoption of green practices is highest in those areas of the supply chain where there is a direct relation to cost savings and efficiency, for example inventory reduction, recycling of raw materials. Awareness of green supply chain management in India is lacking, so there will be need to spread the knowledge of green supply chain management so as to get social, economic and environmental benefits.

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