# GREEN SUPPLY CHAIN MANAGEMENT AND PERFORMANCE OF MANUFACTURING FIRMS IN MOMBASA, KENYA

**BY**

**KHATRA MOHAMED**

**D61/64471/2010**

A Management Research Project Submitted in Partial Fulfillment of the Requirement for the Award of the Degree of Master of Business Administration (MBA), School of Business, University of Nairobi

**NOVEMBER, 2012**

# DECLARATION

This project is my original work and has not been presented for a degree in any other university.

……... ……

NAME: KHATRA MOHAMED. Date

REG NO: D61/64471/2010

This project has been submitted for examination with my approval as the university supervisor.

…….. ……

S. O. NYAMWANGE Date

…….. ……

P. MAGUTU Date

Lecturers,

Department of Management Science

School of Business, University of Nairobi.

# DEDICATION

To

My mum, dad and dear husband

Whose support I cannot measure……

# ACKNOWLEDGEMENT

I thank the Almighty God for giving me strength and resources that have enabled me to pursue this MBA degree course.

This management research project would not have been successful without the support and guidance of a number of people who made their contribution in various ways.

I would like to express my thanks and appreciation to my supervisor Mr. S.O Nyamwange for his support, patience, motivation, critique, being with me and for all the long hours he took to review this project at the expense of his busy schedule.

I would also like to thank my family for being very supportive. Thanks for being with me during the difficult times, for your love, inspiration and encouragement.

TABLE OF CONTENTS

# List of Abbreviations

| | |
|---|---|
| CSR | -Corporate Social Responsibility |
| DFE | - Design for Environment |
| ECD | - Environmental conscious Design |
| EPA | - Environmental Protection Agency |
| EMCA | - Environmental Management and Coordination Act |
| EMS | - Environmental Management System |
| GP | - Green Procurement |
| GM | -Green Manufacturing |
| GD | -Green Distribution |
| GDP | -Gross Domestic Product |
| GSCM | - Green Supply Chain management |
| IFC | - International Finance Corporation |
| KAM | - Kenya Association of Manufacturers |
| KEBS | - Kenya Bureau of Standards |
| LCA | -Life cycle Assessment analysis |
| NEMA | - National Environmental Management Authority |
| NBC | - National Bio safety Committee |

SCM - Supply Chain Management

SMEs - Small Medium Enterprises

# ABSTRACT

The green management literature argues that in order for economies to embrace new environmentally responsible values, beliefs and behaviors, there is strong need to green the entire supply chain.

The objective of the study was to identify the GSCM practices and the challenges faced by manufacturing firms. The questionnaires and data collection methods helped to bring out the results of the study as expected. The results obtained indicated that the GSCM had positive impact on manufacturing firms in Mombasa. The relevance of GSCM in overcoming environmental challenges was highly appreciated. Factors acting as barriers to adoption were exemplified.

The conclusions and directions for further research point to the fact that environmental challenges in Kenya are complex and the Green Supply Chain Management practice is yet to be adopted. The government has been viewed as the one responsible for the slow pace towards implementation. This creates the quest for further research in the same area including the service sector.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background

There has been increasing concern on the environment especially in issues dealing with pollution in the industrial sector which need to be addressed together with Supply Chain Management (Sheu et al, 2005). People all over the world have changed their purchasing habits due to increasing emergence of global warming in the world environment. Consumers have become more sensitive to the impacts of the products they consume to the environment, thus companies are forced to produce green products and hence the concept of the green supply chain management (GSCM).

### 1.1.1 Green Supply Chain Management

According to Wang and Lin (2011) GSCM is defined as the improvement in environmental impact which is achieved by the management of raw materials, parts/ components and processes from suppliers to manufacturers to customers. GSCM has increased an environmentally conscious mindset to supply chain management and has been introduced into many final manufacturing processes (Aref et al., 2005). Ninlawan et al (2010) breaks down GSCM into four components, i.e. Green procurement which involves the purchase of products and services that are environmentally friendly. Green distribution- the involvement of environmental thinking in green design, green packaging and eco-labeling. Reverse Logistics- the process of planning, implementing and controlling the effective flow of raw materials, in process inventory, finished goods and related information from the consumer to the point of origin for the purpose of creating value.

The effects of GSCM expand to all area, both tangibly and intangibly. Stevels (2002) demonstrated the benefits of GSCM to different roles of supply chain including environment and society in terms of different categories: material, immaterial, and emotion. For material, GSCM helps lower environmental load for environment, lower cost prices for supplier, lower cost for producer, lower cost of ownership for customer, and less consumption of resources for society. GSCM has played major role in the production of eco-product and in-advancing cleaner production in manufacturing organization (Zhu et al, 2004).

However, according to Wilkerson (2010), companies are likely to face a number of challenges when practicing GSCM, which consists of the following: Various Standards have to be met in order to implement GSCM; this may pose a challenge since one may not be able to meet all the regulations. Creation of awareness and educating the members of the supply chain also pose another challenge in implementing the GSCM. The implementers may lack knowledge of the program and use improper communication channels resulting to high costs and thus exceeding the economic budget of a company with no matching profitability. Companies may be restricted in adapting GSCM practices because of the conflict that may arise among the members in the supply chain as a result of the introduction of the new concept of GSCM, which also lacks metrics and available data for measuring green practices across a global supply chain. Business experts may find it difficult to plan for the development strategies that are essentials for sustainable growth of a business enterprise.

### 1.1.2 Firm Performance

Essential to supply chain performance is improving the effectiveness of materials management- the set of complete cycle of materials flows from purchasing and internal control of production materials, through planning and controlling work in process, to finished products. Managers can

improve their material management performance by first understanding how their decision affect the purchasing, storage, handling, and asset recovery activities throughout their organization. Companies can greatly improve business performance by working with suppliers, shippers, distributors, and customers to better coordinate logistics activities.

Production performance involves green product innovation performance which is defined as the performance of product innovation that is related to green concept. Such product innovations may include those related to conservation of energy, eliminating pollution, recycling waste and green product designs (Chen et al, 2006). Financial performance relates to the level of profitability of firms in relation to competitors (Clemens, 2006; Judge and Douglas, 1998). With that, strategy researchers such as Im and Workman (2004); Montoya-Weiss and Calantone (1994); Paladino (2007) have recommended that we adopt these measures in order to improve firms performance.

### 1.1.3 Manufacturing firms in Mombasa, Kenya

Manufacturing sector in Kenya has been declining over the years coming fifth after agriculture, transport and communication, whole and retail and other services. This poor performance of the sector has largely contributed to Kenyans dismal performance in export trade. It is important to enhance the competitiveness of the manufacturing sector by strengthening the production capacity and the local content of locally manufactured goods.

Pressures that have led to the adoption of GSCM in the manufacturing firms especially in Mombasa have been as a result of changing customer preferences, improving the society at large and compliance with environmental regulations. Customers have become more aware of the importance of environmental preservation. Customers as habitats in the environment have

recognized the role they need to play and hence are more sensitive in their purchasing habits. They tend to prefer products that are biodegradable. Apart from customers, there is the wider society which includes employees, stakeholders and common man who play a role in the evolution and adoption of GSCM. Some of the environmental regulations bodies in Kenya include: The Kenya Bureau of Standards (KEBS)- It is a national standards body with an overall mandate to promote standardization in industry and trade through standards of developments, conformity assessments, testing and metrology. It aims at providing standards based solutions that deliver quality and confidence to the consumers. The National Environmental Management Authority (NEMA) is among the key bio safety regulatory agency represented on the National Bio-safety Committee (NBC) (Retrieved from http://www.nema.go.ke).

### 1.2 Statement of the Problem

Faced with global resource exhaustion and rising environmental deterioration, firms cannot do away with environmental issues any longer in businesses today. Globalization, pressures from the public, laws and environmental standard are making enterprises improve to better environmental practices as well. To maintain sustainable growth and development firms have to integrate their economic performance and the environment.

Not many researches have dealt with this area of GSCM; and those that have been done are mostly based abroad. For instance, a study conducted by Holt and Ghobadian (2009), focused on the GSCM practices amongst UK manufacturers, Trigos (2007) focused on GSCM in the UK but in the construction industry. Other studies have not done an in-depth analysis on green but have combined with other supply chain concepts such as lean. This can be seen through a

study by Mollenkopt et al (2009), which combined the concept of green with lean and global supply chain in USA.

Zhu et al (2004), proposed both environmental and economical performance as the basis for organizational performance in GSCM. Environmental performance focuses mainly on improving the environment through elimination of polluting substances and other emissions. Economic performance on the other hand, focuses on the waste-cost reduction in the manufacturing sector. Shultz and Holbrook (1999), suggested that it is important to balance the economic and environmental performance especially for organization facing competitive, regulatory and community pressures.

In Kenya, the closest study was done by Mwirigi (2007) which focused on the manufacturing firms in Kenya. Mwirigi's study was done at a time when environmental concerns were still low and it also focused only on manufacturing firms that are based in Nairobi. Her findings were that attempts to overcome environmental challenges through practicing some aspects of GSCM were evident but not indicative of full adoption of the strategy A lot has happened that has opened the public's eye and made it realize the importance of environmental conservation. For example, banning of fishing in Lake Naivasha by the Ministry of fisheries in 2010 for 3 months is one case in point (http://ushahidi.internewskenya.org). Hence, there is need to conduct a study for firms in Mombasa because it has its own unique environmental problems e.g. heat and high humidity contribute to a greater rate of pollution like in the case of Kibarani and also because Mombasa is just next to the ocean.

In view of the foregoing discussion and considering the need for GSCM, this research sought to answer following questions: What are the impacts of GSCM on manufacturing firms in

Mombasa? What challenges do manufacturing firms face in the process of adopting GSCM? What are the benefits that a manufacturing firm gains by practicing GSCM?

### 1.3 Objectives of the study

This study sought to address the following objectives;

(i) To establish the benefits of practicing GSCM among manufacturing firms in Mombasa, Kenya.

(ii) To identify the challenges in the process of adopting GSCM among manufacturing firms in Mombasa, Kenya.

(iii)To determine the impact of GCSM on manufacturing firms in Mombasa, Kenya.

### 1.4 Value of the study

**Manufacturing firms**

This research project will help manufacturing firms become more aware of the importance of integrating GSCM in their business processes in terms of its benefits, and the challenges they are likely to encounter in order to improve them. In addition, employees will have the motivation to increase their productivity due to environmentally friendly working conditions.

**Society**

The society at large will be sensitized on the importance of conserving the environment for future and how their (customers, human rights activists and environmentalists) pressure revolutionize the adoption of GSCM.

**Government**

This study will enable the government to identify any loopholes in their existing policies and hence assist them in making new better policies on environmental issues. The government will also realize their role in providing the necessary incentives to facilitate proper implementation of GSCM.

**Researchers and Academicians**

This research paper will give room for further research on GSCM not only in manufacturing but also in other sectors.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

In this section, we discuss literature on various studies and theories in support of GSCM by manufacturing firms by exploring practices employed by organizations in an attempt to overcome environmental challengeson.

## 2.2 Supply Chain Management

There has been no one definition of supply chain management (SCM). This is because supply chain being a wide and new field has been researched by quite a number of people and almost each of them has come up with their own definitions. Some of them may be as follows:

A supply chain as opposed to Supply Chain Management is a set of organizations directly linked by one or more of the upstream and downstream flows of products, services, finance and information from a source to a customer. Managing a supply chain is 'Supply Chain Management. SCM is the systematic process that involve the coordination of the business functions within a particular company and across businesses within the supply chain with the aim of improving the long term performance of the individual companies and the supply chain as a whole (Mentzer et al, 2001).

Another definition by Sarika 2004 is that SCM focuses on increasing sales, reducing expenses and making full potential of organizational resources by involving team work and sharing of information along the supply chain. Christopher 2005 defines SCM as the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole. SCM involves the planning and

management of all activities that are involved in getting the product, processing it, creating demand, and being able to fulfill that demand and all logistic management activities (Gibson et al, 2005).

### 2.3 Green Supply Chain Management

Over the past decade, there has been increasing environmental concerns that have led to the growing issues such as pollution that accompany industrial development. Thus these issues should be taken into consideration into SCM hence contributing to the emergence of Green Supply Chain Management (GSCM), (Sheu et al, 2005). Sarkis2005, suggested that the green components are incorporated to SCM, it results to GSCM which involves the influence and relationship of SCM practices to the natural environment.

GSCM can also be defined as an integrated supply chain system consisting of suppliers, manufacturers, customers and reverse logistics management (Zhu and Sarkis, 2004). GSCM has become an important issue for all types and all sizes of organization rather than just conducting research for academic purposes, for example, the idea of Corporate Social Responsibility (CSR) is now fully adopted in many organizations (Emmett et al, 2010).

GSCM is the integration of environmental concern into SCM which include activities such as product design, material sourcing and selection, manufacturing processes, delivery of final product to the consumers and end-of-life management of the product after its useful life (Srivastava, 2007).

### 2.4 Practices of Green Supply Chain Management

The main practices of GSCM include Green Procurement, Green Manufacturing and Green Distribution.

### 2.4.1 Green Procurement

Green Procurement (GP) refers to the practice of preventing waste and pollution by taking into consideration environmental impact such as price, performance, and other factors when making purchasing decisions (Holbrook, 2004). GP is the way consumers use their power to benefit the environment by buying products that have lesser effect on the environmental impact (Commission for Environmental Cooperation, 2009).

Green procurement is the selection of goods and services that minimizes environmental impact where organizations are required to carry out an analysis of the environmental impact of a product over its lifecycle (http://www.buy-environmental.co.za/index.php/home). Green Procurement is also known as Affirmative Procurement. This is referred to as the purchase of products and services which are environmentally friendly. The products or services purchased should have a lower impact on the environment over their whole life cycle than the standard equivalent (Mulwa, 2010).

Holbrook (2004), suggest that GP encompasses practices that include;Recycled materials, organization can buy or reuse materials in order to reduce cost and pollution in the environment. Energy efficient products and energy efficient standby power devices.This can include procuring for products that can perform highly and use less energy, example, most companies nowadays have replaced human labor with machines which are more efficient and use less energy to operate.Bio based products, packaging materials which are biodegradable instead of using polythene materials.Non-ozone depleting substance and priority chemicals, organizations should adopt chemicals and production practices which are environmentally friendly in order to protect the ozone. Alternative Fuels this includes use of other forms of fuels such as bio-diesel, bio-gas, and ethanol.

### 2.4.2 Green Manufacturing

Green Manufacturing(GM), it is the system that integrates product and product design issues with issues of manufacturing, planning and control in such a manner to identify, quantify, access and manage the flow of environmental waste with the goal of reducing and ultimately minimizing environmental impact while also trying to maximize resource efficiency (Melnyk, Smith, Frost and Sullivan 2009).

GM is where by the organization uses inputs into its production process that are environmentally friendly with the aim of reducing environmental impact. Green manufacturing enable the organization to have a competitive advantage since they will incur lower raw material costs, higher production efficiency and improved corporate image (Ninlaw ,Seskan, Tossapol , and Pilada, 2010).

One of the Green manufacturing practices is the Green technology and Eco- innovation.It is the driver in the move towards green and low carbon economy. In addition, many organizations view the application of green manufacturing technologies as the corner stone for their policies for economic growth (Defra, 2008).

### 2.4.3 Green Distribution

Green distribution (GD) is the incorporation of environmental thinking into product design, packaging and product labeling. Green distribution involves green packaging and green logistics. The mode of transport of a product is determined by the packaging characteristics which include size, shape and materials. Reduced material usage, increased space utilization and reduced handling procedures are some of the advantages that are achieved through better packaging (Ninlawan, Seksan, Tossapol, and Pilada, 2010).

Some of the Green distribution Practices are: Green design which is the use of Environmentally Conscious Design (ECD) and Life Cycle Assessment analysis (LCA) with the aim of developing and understanding how design decisions affect the product environmental compatibility (Glantsching, 1994; Chandra, 1991) and also waste minimization (Johnson, 1998; Sarkis and Cordeiro, 2001). It also involves replacement of potentially hazardous materials or processes by one that appears less problematic. This action can be undesirable if it results in the rapid depletion of potentially scarce resources of increase extraction of other environmentally problematic materials (Graedel, 2002). Green design is an integrated approach for measuring environmental performance of new, product (Azzone and Noci, 1996).

Another Practice of the Green distribution is the Life cycle assessment.It is the process of assessing and evaluating the environmental, occupational health and resource related consequences of a product through all phases of its life (Gungor and Gupta, 1999). It involves tracking all material and the energy flows of a product from the retrieval of its raw materials out of the environment with the disposal of the product to the environment (Arena et al, 2003).

Environmental labeling/Eco-Labeling is another Practice of the Green distribution, which entails describing the information a product provides about environmental impact associated with the production or use of the product (Rotherham, 1999). Terms such as ‘recyclable’, ‘eco-friendly’, ‘environmentally safe’ are vague and may create cynicism among consumer. The large number of symbols/labels adds to consumer difficulty in assessing the comparable advantages of different product. However, some labels are incomplete in terms of proving full environmental disclosure.

## 2.5 Impact of Green Supply chain Management

Zhu et al (2004) discovered that there are two ways of looking at organizational performance in GSCM. These are environmental performance and economical performance. The environmental performance deals with reducing substances that pollute the environment. Economical performance on the other hand is a bit similar to environmental performance but emphasizes more on the element of cost.

Few studies have been made in linking GSCM practices and performance management. For instance, Beamon (1999) suggested that the structure of the traditional performance being implemented in the entire supply chain must now include new techniques such as reverse logistics so as to embrace new performance measurement systems. Since GSCM may include both local and global aspects, this can allow interaction of customer and supplier staff, partnership agreements and joint research which could eventually lead to improvements in environmental performance. This can be greatly achieved through adoption of innovative environmental technologies (Geffen and Rothenberg, 2000).

Production performance involves green product innovation performance which is defined as the performance of product innovation that is related to green concept. Such product innovations may include those related to conservation of energy, eliminating pollution, recycling waste and green product designs (Chen et al, 2006). Financial performance relates to the level of profitability of firms in relation to competitors (Clemens, 2006; Judge and Douglas, 1998). With that, strategy researchers such as Im and Workman (2004); Montoya-Weiss and Calantone (1994); Paladino (2007) have recommended that we adopt these measures in order to improve firms performance.

There has been evident contradiction in the relationship between firm's financial performance and environmental management because of corporate environmental practices which have contributed to both positive and negative economic performance (Wagner et al,2001).

## 2.6 Benefits of Green Supply Chain Management

According to Vermeulen, greening of the global product chains forms a challenging business-to-business shortcut for creating fairer trading relationships, avoiding the long and slow route of negotiating nations. The example of the cut flower supply chain demonstrates how trading barriers have been overcome through certification under MPS (originated in Netherlands) and it is simply an environmental registration and classification system that aims to decrease the environmental impact of cut flower. An example of an environmental and health benefit is illustrated by the Benin cotton project on sustainable chain management where the producers organized for an organic cotton chain for the European market. The farmers claim that the use of chemicals lead to high yields which are diminished by the cost of medicine due to sickness as opposed to the use of manure (Kessler et al 2003).

From the TQM perspective Hanna et al (1995), notes that developing synergies between operational performance and environmental excellence may lead to a more globalized level of customer satisfaction, one that includes both cost competitiveness and environmentally sound products and processes at the same time overcoming the traditional economic assumption that being environmentally sound reduces productivity. Purba notes that there is the general perception that green supply chain management promotes efficiency and synergy among business partners and their lead corporations, and helps to enhance environmental performance, minimize waste and achieve cost savings.

Chandaria Industries uses waste paper as raw material and the firm is ranked as one of the best industrial enterprise in Kenya. Bamburi cement factory in Mombasa put up a park to counter effects of mining on the environment, Pil manufactures biodegradable polythene bags and organic products have become a household name. East African breweries rank highly in profitability though alcohol is subjected to strict legislation to discourage consumption. During budget each year, the price of beer and cigarettes is raised.

In summary, the potential benefits of GSCM are those that relate to cost avoidance and risk reduction. This include cost avoidance of purchasing hazardous materials as inputs, which reflect the internalized costs associated with environmental harm, cost avoidance of storing, managing and disposing process waste, cost avoidance of stigmatization or market resistance to environmentally harmful products and cost avoidance of public and regulatory hostility towards environmentally harmful organizations, plus reduced environmental and health risks, liability risks and safer cleaner factories (Beamon 1999).

### 2.7 Challenges of Green Supply Chain Management

Wilkerson (2010) assets there are five major challenges that companies face in adopting the green supply chain management which are:

For companies to adopt GSCM they have to comply with quite a number of standards such as ISO Standards, ISO 14065, Environmental Protection Agency (EPA) Greenhouse Gas Reporting Rule and many others. Companies find it hard to comply with all of the standards and hence they may only adopt part of them. Knowledge about which standards or rules to apply should be the first step for a company that is newly adapting to GSCM.

Another challenge is that of creating awareness to the members involved in the supply chain. Green awareness has been improving but still people need more to know about the GSCM.In the future, multi-national supply chains will face difficulties in using the limited capital, practicing corporate social responsibility and developing competitive pressures so as to improve on their business to prosper.

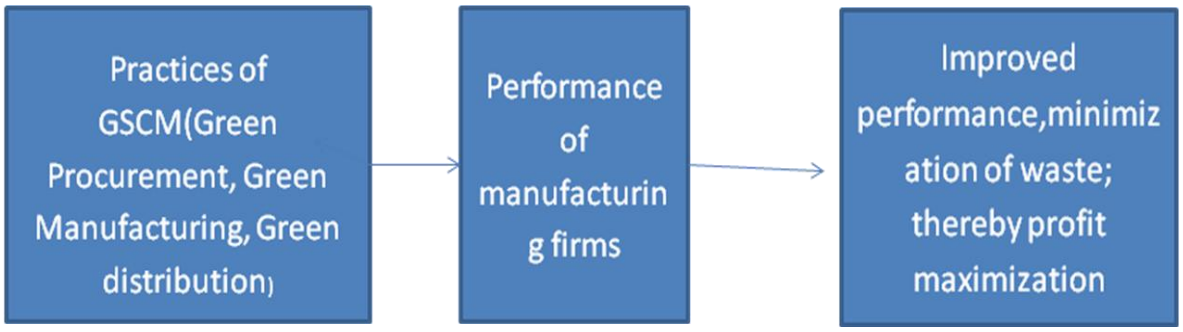
Implementation is another challenge. This is because the organizations do not know the standards that are to be followed. Communication strategies should be planned at the earliest point in the Green Supply Chain planning process. The communications strategy will help the organization to keep long term compliance and reducing emissions.

Other challenges which have been cited by other authors include:Economic factors such as inflation, interest rates, GDP (Gross domestic product) and the level of employment have a greater impact on the economy. Most organizations prefer doing their normal routines rather than adapting green practices because they view them expensive to the organization and in return translated to customers in form of high costs (Min and Galle, 1997; Cox et al.1999).

GSCM is a new concept in the market and so many organizations do not have the adequate knowledge and skills on how to practice it with the fear of failing, thus not acknowledging the new approaches in the market (Wycherley, 1999; Zhu and Sarkis, 2004)**.** Most of the suppliers of any organization are used to the usual way of acquiring and supplying products that are readily available, thus with the adoption of the new concept makes it difficult to shift from the traditional practice to the new practice (Wycherley, 1999; Walker et al, 2008).Due to the fact that GSCM is still emerging, it is difficult to obtain the required data both locally and globally. In addition, organizations view greenness in their own perspective and hence have their own

measuring techniques, thus there can never be one common way of measuring firm's overall performance (Veleva et al, 2003).

**2.8 Conceptual Framework.**




**2.9 Summary of Literature Review.**

In summary, the need for GSCM practices is quite evident but few researches have been recorded for the Kenyan situation and even in areas where this has been done, no reliable performance measurements have been fully explored. Firms are expected to be at different stages of GSCM adoption as is evidenced by the practice in other countries. Beamon (1999) highlights some of the stages as problem solving characterized by traditional approaches, compliance-oriented, managing for assurance where the emphasis is on balancing risk versus environmental costs, pollution prevention (eco-efficiency) and finally environmental quality view (fully integrated) in that order.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Research Design

The study used the survey research design. This is because it aimed at exploring and describing the issues in GSCM by definition of terms, to gain background information, clarify problems and develop questions to be answered. It is also used to describe the characteristics of particular firms, individuals, groups, and products. The target group was manufacturing firms in Mombasa registered with KAM, NEMA and Municipal Council of Mombasa as at March 2012.

## 3.2 Population of the Study

A population census was conducted consisting of 91 firms in Mombasa from 10 sectors according to KAM, NEMA and Municipal Council 2012 directories as shown by Table 3.1.

**Table 3.1: Population of the Study**

| **Sector** | **TOTAL** |
|---|---|
| Pharmaceutical and Medical equipment | 2 |
| Paper and Board | 4 |
| Metals and Allied | 17 |
| Energy, Electrical and Electronics | 2 |
| Textiles and Apparels | 18 |
| Chemicals and Allied | 2 |
| Plastic and Rubber | 10 |
| Food and Beverages | 31 |

| | |
|---|---|
| Mining and Construction | 3 |
| Motor vehicles and Accessories | 2 |
| **TOTAL** | **91** |

Source:KAM, NEMA and Municipal Council of Mombasa 2012 directories

There was no need for sampling since the population is small. A census of all the 91 firms was therefore be conducted. The respondents were persons in the firm who have detailed knowledge of activities of the whole firm.

### 3.3 Data Collection

The tool used in this case was a questionnaire which was designed with the aim of identifying the impact of GSCM in manufacturing firms in Mombasa. The questionnaire had four sections. The first section was giving the general information about the responding firm. Section two aimed at identifying the benefits that a company may enjoy in the process of adopting GSCM practices. The third section aimed at obtaining information on the challenges that manufacturing firms face in the adoption of GSCM practices. The final section in the questionnaire aimed at obtaining information on the impact of GSCM practices which are; on economic performance, environmental.

The questionnaires were targeted to the people who had complete information about the operations and practices of the manufacturing firms, and were distributed to the respondents through drop and pick method and a few others through email

### 3.4 Data analysis

Statistical analysis was used to interpret the results obtained, which consisted the use of Mean, Standard deviation and Rank. The data is indeed large and therefore it was summarized and interpreted with the aid of data analysis computer softwares which are Microsoft Excel and SPSS. Descriptive statistics including graphical presentations was used to help understand effects of a number of variables.

Test of Hypothesis was used.

Null Hypothesis-Green supply chain management has no impact on manufacturing firms.

Alternative Hypothesis-Green supply chain management has impact on manufacturing firms.

The chi-square for statistic is computed as:

$$\chi^2 = \Sigma \frac{[O - E]^2}{E}$$

Where O is observed frequency

E is expected frequency

# CHAPTER FOUR

# DATA ANALYSIS, FINDINGS AND DISCUSSIONS

## 4.1 Introduction

This chapter involves analysis and interpretation of data obtained by means of questionnaires. The total population of the study was 91 manufacturing firms in Mombasa. A total of 36 responses were received; this represents a response rate of 39.56%. The main aim of the study was to determine the impact of GSCM practices on the performance of manufacturing firms in Mombasa as well as the benefits and challenges they faced.

## 4.2 General Information

### 4.2.1 Sector of the manufacturing firm.

The respondents were asked to indicate the sector in which their firm belonged. It was observed that the highest response rate was from Chemical and Allied at 100%. This was followed by mining at 67%. No firm in the Pharmaceutical and Medical equipment sector responded. Of the firms that responded, the greatest proportion of them was from Food and Beverages at 44.44%. The overall response rate was 39.56%

### 4.2.2 Size of the Company

The firms were asked to indicate their size in terms of the number of employees. The data clearly showed that most manufacturing firms in Mombasa are small in size, and employed 20-49 employees as it had the highest frequency of 15 and a percentage of 41%, followed by the medium size of 50-300 employees with a frequency of 10, equivalent to 28%. The large companies had the least frequency of 5

equivalents to 17%. This indicates that most manufacturing firms in Mombasa are small in size.

### 4.2.3 Position of the Respondents

The respondents were asked to identify the position they held in the company.The results indicated that most of the questionnaires were filled by respondents who are well versed with the activities of the entire organization and therefore an assurance that the required information was obtained.

### 4.2.4 Location of the Headquarters

The respondents were asked to state the location of their headquarters. The results evidently showed that majority of the manufacturing firms (71%) had their headquarters located in Mombasa and the least (29%) had their headquarters not in Mombasa. This indicates that most manufacturing firms have their headquarters in Mombasa, probably because it would be cheaper and easier to operate and control in the same region.

### 4.2.5 Suppliers of the firm

The respondents were asked to outline the number of the suppliers that their firm held for their daily operations. From the data, it was noted that out of the 36 manufacturing firms who responded, majority of them (42%) had 1 to 10 suppliers for their daily operations, closely followed by those that had 11 to 30 suppliers (30%). The remaining percentage (28%) was shared equally among the manufacturing firms which had 31-50 suppliers and those that had 51 and above suppliers respectively. Therefore, it can easily be deduced that manufacturing firms in Mombasa held small number of suppliers perhaps to be able to maintain long-term relation with their suppliers.

### 4.2.6 Location of target customers

The respondents were asked to state the location of their target customers. Majority of the manufacturing firms (56%) had their target customers' located locally. 25% of the firms had their customers located both locally and internationally while the rest (19%) had their customers located internationally. Hence, this shows that manufacturing firms target customers that are located locally so that they can increase their market share due to reduced transportation costs because most of their headquarters are based in Mombasa.

### 4.2.7 Performance of the firm

The respondents were asked to state their performance in terms of annual turnover. From the analysis of the data majority of the firms (47%), had an annual turnover of Over Kshs. 5 Million, followed by 28% of the firms that had below turnover of Kshs. 2 Million. The rest of the firms (25%) had an annual turnover of Kshs. 2Million to 5Million. This may be due to the reason that the firms had clear understanding of their customer and their needs.

### 4.2.8 Raw materials of the firm

The respondents were asked to identify the raw materials that their firm used. It was seen that most companies had unique materials that they use in their production, apart from 2 companies which had common materials. It can be inferred that most raw materials have a potential to contribute to the degradation of the environment. From wood which cause depletion of forest cover, to polythene which are non-biodegradable and hence a menace to the environment.

### 4.2.9 Waste materials of the firm

The respondents were asked to state the waste generated by their manufacturing firms. Most of the firms produce no waste perhaps it can be an indication that the firms are starting to embrace Green Supply Chain Management.

## 4.3 Benefits Obtained From The Adoption of GSCM

The respondents were asked to identify the extent to which their manufacturing firms have benefited from the adoption of GSCM. Table 4.1 shows the results obtained from the respondents with a scale of 1 to 5 where 1 represented no benefit at all and 5 representing very high benefit.

From table 4.1, it is clearly evident that manufacturing firms do benefit from the adoption of GSCM practices especially in the case of minimizing waste and therefore increase in the demand for the company's product. This is shown by the fact that they had equal means which is the highest. In addition, increased space utilization has also resulted to increased profitability with the adoption of GSCM practices. This is because they seem to have had equal means indicating that they come in together as benefits. Consequently, most manufacturing firms cannot benefit from reducing the packaging material, maybe because they have no alternative of green packaging or they have to meet their customer's specification to maintain quality in order to become competitive in the market.

This implies that manufacturing firms in Mombasa are conscious about waste minimization which clearly showed that they use their materials more effectively and efficiently thus reducing waste. It is also clear that they utilized the space effectively therefore showing that they practiced capacity planning in their organization.

The total average mean of benefiting from the adoption of green supply chain management is 3.77, illustrating that manufacturing firms in Mombasa highly benefit from GSCM practices. Thus the

standard deviation has no much variation hence the mean was used to rank the benefits accrued in the process of adopting GSCM.

**Table 4.1 Benefits obtained from adoption of GSCM**

| Benefit | Mean | Std. Deviation |
|---|---|---|
| Waste minimization | 4.08 | 1.156 |
| Increase in demand for the company's product | 4.08 | 1.156 |
| Saving and utilizing fully the available resources | 4.00 | 1.121 |
| Suppliers are able to retain their customers | 3.94 | 1.094 |
| Reduced cost of operation | 3.92 | .996 |
| Increased space utilization | 3.89 | 1.190 |
| Increased profitability | 3.89 | 1.304 |
| Increased employee morale | 3.86 | 1.125 |
| Improves market share and supply chain | 3.81 | 1.390 |
| Target marketing | 3.78 | 1.290 |
| Improved public image, brand and goodwill | 3.72 | 1.256 |
| Considerable conservation of resources | 3.61 | 1.248 |
| Gaining competitive advantage | 3.61 | 1.358 |
| Reduced handling procedures | 3.50 | 1.254 |
| Returning back to the society | 3.44 | 1.157 |
| Reduce material used for packaging | 3.22 | 1.416 |

### 4.4 Challenges Faced With The Adoption of GSCM

The respondents were asked to indicate the extent to which their manufacturing firms have faced challenges in the adoption of GSCM. Table 4.2 shows the results obtained from the respondents.

From table 4.2, it is seen that manufacturing companies in Mombasa face a serious challenge on economic factors such as high inflation, high interest rates and the level of employment. Also it is clear that increased domestic and global competition had greatly affected them as they try to expand their operations However, there is good relationship between retailers and manufacturers of these manufacturing firms in Mombasa as there aren't any conflicts arising between them. This clearly shows that economic factors are inventible to any business entity and they cannot be able to control them rather than be able to adopt them. Because of the increased domestic and global completion they should identify their competing priorities and also identify their strengths and weakness.

The average mean of the challenges faced in adopting GSCM is 2.08, indicating that there are no much challenges associated in the adoption of GSCM within manufacturing firms in Mombasa. Similar to other practices, the standard deviation does not have much variability therefore the mean was the main tool for ranking the challenges faced in adopting GSCM practices.

**Table 4.2 Challenges faced with the adoption of GSCM**

| Challenge | Mean | Std. Deviation |
|---|---|---|
| Economic factors such as high inflation, high interest rates and the level of employment | 3.22 | 1.551 |
| Increased domestic and global competition | 3.14 | 1.496 |

| | | |
|---|---|---|
| Competing business priorities | 3.08 | 1.296 |
| Strict government rules and regulations | 2.92 | 1.317 |
| Increased operating cost | 2.89 | 1.326 |
| Insufficient capital for business expansion | 2.86 | 1.222 |
| Increased cycle time | 2.78 | 1.312 |
| Limited access to finance such as bank loans | 2.75 | 1.156 |
| Newness of the concept of GSCM | 2.72 | 1.233 |
| Low level of GSCM awareness | 2.69 | 1.191 |
| Lack of tools and techniques for measuring GSCM Performance | 2.58 | 1.273 |
| Vendors reluctant to going green | 2.56 | 1.362 |
| Lack of sufficient resources | 2.42 | 1.228 |
| Resistance to change | 2.42 | 1.079 |
| Poor planning program implementation | 2.39 | 1.293 |
| Lack of alternative for green products | 2.36 | 1.222 |
| Difficulties in complying with organizational standards | 2.33 | 1.042 |
| Lack of cooperate commitment | 2.31 | 1.191 |
| Little supplier specification | 2.28 | 1.210 |
| Poor information sharing among the supply chain | 2.17 | 1.207 |
| Increased conflict between retailers and manufacturers | 2.06 | 1.351 |

### 4.5 Green Supply Chain Management Practices

As discussed previously the main Green Supply Chain Management practices include Green Procurement, Green Manufacturing, and Green Distribution.

#### 4.5.1 Compliance with Standards

The respondents were asked to indicate the standards with which their manufacturing firms complied with. A 100% of the firms were cited compliance with environmental standards.

#### 4.5.2 Types of Standards complied with

The respondents were asked to identify the standards that their manufacturing firms complied with. Table 4.3 shows the results obtained from the respondents.

**Table 4.3 Types of Standards complied with**

| Standards | Frequency | Percent |
|---|---|---|
| ISO standards | 19 | 53.0 |
| Greenhouse gas reporting rule | 7 | 20.0 |
| NEMA | 7 | 19.0 |
| Other Standards | 3 | 8.0 |
| Total | 36 | 100.0 |

From table 4.3, majority of the firms (53%) had ISO standards compliance, followed by Greenhouse gas reporting rule at 20%. Other standards were also complied with but at a lesser percentage. Manufacturing firms in Mombasa comply with different types of standards so that they can have an effective quality management system.

### 4.5.3 Duration of compliance with standards

The respondents were asked to indicate the duration that their manufacturing firms complied with the environmental standards. It was seen that a majority of firms have complied with environmental standards for a period of Over 5 years, perhaps an indication that the firms are aware of the standards and hence practice Green Supply Chain Management.

### 4.5.4 Practices of Green Supply Chain Management

Different researchers have defined GSCM from different perspectives, driving forces and purposes, for example, Sarkis (1999) refers to the GSCM as a structure which includes green purchasing, green production, green distribution and reverse logistics.

In this study, green supply chain management practices are divided into three phrases: green procurement, green manufacturing and green distribution.

### 4.5.5 Green Procurement Practices

The respondents were asked to indicate the extent to which their manufacturing firms practice green procurement. Table 4.4 shows the results obtained from the respondents.

Table 4.4 show that manufacturing firms in Mombasa prefer purchasing energy saving equipment and also buying materials or parts from suppliers who are compliant with environmental related legislation. It is clear that they do not take more consideration in developing and maintaining database of suppliers in which information relating to environmental conduct is maintained. Hence this implies that manufacturing firms in Mombasa purchase energy saving equipment in order to cut down their cost of operation and in order to be green and to maintain this, they make sure that they purchase their materials from suppliers who are compliant with environmental standards.

There is no much variation in the standard deviation hence the mean was used to rank the practice.

The average of all the means is 3.25 which indicate that most of the manufacturing firms in Mombasa practice Green procurement.

**Table 4.4 Green Procurement Practices**

| Green Procurement Practice | Mean | Std. Deviation |
|---|---|---|
| Purchasing energy saving equipment e.g. machines or vehicles which carry the same load or more and move faster while using less fuel | 3.58 | 1.360 |
| Purchase materials or parts from suppliers who are compliant with environmental related legislation | 3.50 | 1.254 |
| Purchase products that are energy efficient or products which require less energy to manufacture | 3.50 | 1.254 |
| Purchasing equipment that is easy to repair | 3.39 | 1.128 |
| Develop the environmental awareness of procurement staff | 3.36 | 1.150 |
| Require suppliers to limit packaging to the minimum necessary to protect the items supplied | 3.33 | 1.352 |
| Considering suppliers who have acquired or are in the process of acquiring ISO 14000 certification | 3.33 | 1.219 |
| Favoring products which provide information about their effect on the environment | 3.22 | 1.098 |
| Ordering via email | 3.08 | 1.156 |

| | | |
|---|---|---|
| Buying products for which the packaging material is bio-degradable or recyclable | 3.03 | 1.230 |
| Procure products that are made using recycled materials | 2.94 | 1.453 |
| Develop and maintain a database of suppliers in which information relating to environmental conduct is maintained | 2.78 | 1.045 |

### 4.5.6 Green Manufacturing Practices

The respondents were asked to indicate the extent to which their manufacturing firms practice green manufacturing. Table 4.5 shows the results obtained from the respondents.

**Table 4.5 Green Manufacturing Practices**

| Green Manufacturing Practice | Mean | Std. Deviation |
|---|---|---|
| Improve machine performance | 3.86 | 1.355 |
| Promoting environmental consciousness among employees involved in manufacturing the product | 3.75 | 1.204 |
| Controlling power consumption in products | 3.72 | 1.233 |
| Promote environmental occupational safety equipment | 3.69 | 1.32707 |
| Using equipment that consumes less energy (electricity, diesel etc.) | 3.69 | 1.451 |
| Environmental friendly waste management | 3.67 | 1.195 |
| Replacing hazardous substances with other substances that are environmentally friendly | 3.56 | 1.229 |
| Quality control of inputs at vendor site and recheck before processing | 3.56 | 1.362 |

| | | |
|---|---|---|
| Reduce the usage of insignificant materials | 3.53 | 1.483 |
| Promote reuse of products and recycled materials | 3.50 | 1.404 |
| Waste minimization through reusing or recycling of parts | 3.42 | 1.481 |
| Using equipment that use green energy e.g. electricity | 3.36 | 1.588 |
| Rinsing parts with clean water instead of using chemicals | 3.28 | 1.406 |
| Designing products with improved features i.e. which use fewer resources to produce | 3.19 | 1.411 |
| Using inputs with low environmental impacts | 3.11 | 1.450 |
| Provide consumers with information on environmental friendly products and production methods | 3.11 | 1.237 |
| Reusing water instead of leaving it to go to waste | 3.06 | 1.585 |

From table 4.5, it is seen that manufacturing firms in Mombasa take into consideration improving their machine performance as an important practice. It is also clear that they are not only concerned about their operations but are also willing in the promotion of employees who are environmentally conscious since they consider them as important assets of the organization and also in the adoption of GSCM. On the other hand, the least practice was reusing water the firms may not have the appropriate water treatment systems.

With a mean average of 3.47, it can be summarized that Green manufacturing is highly practiced by manufacturing firms in Mombasa. The standard deviation is closely clustered around the mean, an indication that there is a low variability from one practice to the other.

4.5.7 Green Distribution Practices

The respondents were asked to indicate the extent to which their manufacturing firms practice green distribution. Table 4.6 shows the results obtained from the respondents.

Table 4.6 show that manufacturing firms in Mombasa prefer to distribute their products together rather than in small batches. Some companies also packaged their products in such a way that the time required to unpack will be less while some other manufacturing firms used environmentally friendly transportation services. Manufacturing firms in Mombasa gave less importance to the usage of other alternative fuels e.g. bio-diesel, bio-gas and ethanol.

From the analysis in table 4.6, it can be deduced that manufacturing firms in Mombasa are more conscious about the cost of operating in terms of their product distribution and are more concerned of their time in the whole operation process. Nevertheless, they are less concerned about the usage of other alternative fuels.

Since the average is more than 2.5, it indicates that Green Distribution is greatly practiced by the Manufacturing firms in Mombasa. In this case, the standard deviation varies slightly from one practice to the other; hence the mean was used for ranking all the green distribution practices.

**Table 4.6 Green Distribution Practices**

| Green Distribution Practice | Mean | Std. Deviation |
|---|---|---|
| Distributing products together, rather than in small batches | 3.94 | 1.241 |
| Packaging in such a way that the time required to unpack will be less | 3.83 | 1.082 |
| Environmental friendly transportation i.e. well serviced vehicles which minimize air and noise pollution | 3.83 | 1.134 |

| | | |
|---|---|---|
| Using vehicles or transportation modes that carry more load in order to reduce the number of trips made to the customer site | 3.61 | 1.420 |
| Using fuel efficient vehicles | 3.58 | 1.381 |
| Cooperating with vendor to standardize packaging | 3.50 | 1.342 |
| Delivering directly to users' site | 3.47 | 1.320 |
| Communicate with suppliers regarding packaging materials | 3.36 | 1.222 |
| Reducing the size of packaging | 3.25 | 1.360 |
| Use environmental friendly packaging materials e.g. biodegradable packaging materials | 3.22 | 1.312 |
| Promoting recycling and reuse programs among packaging and distribution employees | 3.08 | 1.251 |
| Promoting and adopting returnable packaging methods | 2.50 | 1.424 |
| Usage of other alternative fuels e.g. bio-gas, bio-diesel and ethanol | 2.17 | 1.298 |

### 4.7 Impact of Green Supply Chain Management

Non-parametric test was carried out to determining whether there is significance impact of GSCM and Performance of manufacturing firms. Since on occasion the data are non-normal or contain extreme values or not enough to be able to make any assumption about the distribution. Chi –Square one of the method was used.

Given our $H_0$:. Green supply chain management has impact on manufacturing firms

$H_1$: Green supply chain management has no impact on manufacturing firms

Contingency Table:

| After GSCM / Before GSCM | Negative impacts | Positive impact | *Total* |
|---|---|---|---|
| *Negative impacts* | 2 | 12 | 12 |
| *Positive impacts* | 3 | 19 | 24 |
| *Total* | 5 | 31 | 36 |

From below the computed value of Chi Square is 0.6678 at 5% confidence interval: 1 degree of freedom. The critical value as from the Chi Square table is 9.089. Thus the computed value lies in the acceptance region hence accept null hypothesis. There is an impact of GSCM on manufacturing firms.

| Observations | Expected | (O - E)2 / E |
|---|---|---|
| 2 | 1.34 | 0.3251 |
| 3 | 3.99 | 0.2456 |
| 11 | 11.908 | 0.0692 |
| 20 | 19.267 | 0.0279 |
| | | 0.6678 |

# CHAPTER FIVE

# CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Introduction

The empirical investigation which was obtained through structured questionnaires so as to bring out the extent to which manufacturing firms in Mombasa have adopted GSCM form the basis of this summary discussion.

## 5.2 Summary

The firms which participated were drawn from KAM, NEMA and the Municipal council of Mombasa; and they were found that they were micro, small, medium and large who belonged to different sectors. The study consisted 91 Manufacturing firms in Mombasa where a total of 36 responses were received which represented a response rate of 39.56%.

From the analysis, it can be concluded that most manufacturing firms in Mombasa belong to the Food and Beverages sector. In terms of size, most firms were small in size ranging from 20-49 employees. Also it is evident that a majority of the firms were centralized and their headquarters were based in Mombasa. In addition, it can be said that a majority of the companies had an average of 1-10 suppliers for daily operations; and their target customers were located in Mombasa.

It is clear that most manufacturing firms in Mombasa were performing well since their annual turnover is over kshs.5 million. They also comply with environmental standards especially ISO standards for which they have complied for over 5 years.

Purchasing energy saving equipment was the most practiced element on green procurement. This is because it will try to reduce the overall costs of operations. However, they do not take a lot of

consideration in developing and maintaining a database of suppliers practicing environmental conduct. Hence, it can be concluded that companies are more concerned of greening their internal practices rather than external stakeholders.

As regard of green manufacturing, the most prevalent practice among the firms is on improving machine performance, so that they can realize their desired output and at the same time be environmentally friendly. An important green manufacturing practice that these firms ignore is leaving used water to go to waste instead of cleaning and reusing it. On green distribution, it is evident that most manufacturing firms in Mombasa value distributing products together rather than in small batches. This means that they are consciously trying to reduce overall costs of distributions and unconsciously practicing green distribution.

### 5.3 Conclusion

In conclusion, from the above explanation, it is seen that the first objective of the study is accomplished, and can be concluded that GSCM has a positive impact on most manufacturing firms in Mombasa.

The adoption and impact of GSCM has greatly benefited most manufacturing firms in Mombasa especially minimization of waste and hence leading to increase in demand for the product; thereby profit maximization. However, most companies find it hard to reduce packaging material; maybe because they have no alternative of green packaging or they have to meet their customer's specification to maintain quality in order to become competitive in the market. This led to the accomplishment of our second objective.

Although adoption of GSCM has greatly benefited most manufacturing firms in Mombasa; it is evident that they face a number of challenges. A highly encountered challenge is the economic factors such as

high inflation, high interest rates and the level of employment. There are also other challenges such as increased operating cost. This is because companies have the desire to maintain and improve quality products and at the same time reduce operating cost. It can hence be concluded that good relationship between retailers and manufacturers was less experienced thereby enhancing smooth flow of materials and information among the entire supply chain. This led to the accomplishment of the third objective.

### 5.4 Recommendations

The study recommends more awareness of the role of GSCM practices not only in the manufacturing sector but also others such as the service sector. In addition, the study also recommends that top management commitment is crucial in the successful adoption of GSCM. The government should also play a role, by putting more effort on ensuring that companies do follow environmental rules and regulations appropriately.

The government should ensure the availability of resources and other alternative fuels such as bio-gas. Creation of awareness on Green issues is also recommended for the society.

### 5.5 Limitations of the Study

The biggest challenge was the data collection stage. This is because most companies were not ready to participate; maybe because they did not find any importance in it or they did not want to disclose any confidential information. In addition, a lot of time and costs were involved in the distribution of questionnaires since most of the companies who had the information were located in the outskirts of town.

## 5.6 Suggestions for Further Research

The study shows that GSCM is growing in importance among companies as well as the society in general; and hence there is the need for a similar study to be conducted not only on all the sectors but specific ones. This is because different sectors behave differently.

There is also a need to research on the impact of GSCM in the service sector.

## REFERENCE


Aref, A., Marilyn, M., Sarkis J. (2005). *Performance measurement for green supply chain management,* Vol.5 issue 4.

Arena (2003).The environmental performance of alternative solid waste management options: A life cycle assessment study. *Chemical Engineering Journal*, 96, 207-222.

Azzone, G., Bianchi, R., Mauri, R., Novic, G. (1996). Defining operating environmental strategies, programmes and plans within Italian industries, *Environmental management and Health,*Vol. 8 No.1, pp.4-19.

Bigsten, A. (2001). *History and policy of manufacturing in Kenya, Bigsten and Kimuyu* (Eds.) structured and performance of manufacturing in Kenya, Palgrave, London.

Beamon, B. (1999). *Designing the green supply chain, Logistics information management,*Vol. 12 No.4, pp.332-342.

Clemens, B., and Douglas, T.J. (2006). Does coercion drive firms to adopt 'voluntary' green initiatives? Relationships among coercion, superior firm resources, and voluntary green initiatives. *Journal of Business Research*, Vol. 59 No. 4, pp. 483-91.

Cox, J., Sarkis, J., Wells, W. (1999). Exploring organizational recycling market development: the Texas Mexico Border. In: Charter, M., Polonsky, M.J. (Eds.), *Greener Marketing:A Global Perspective on Greener Marketing Practice*. Greenleaf Publishing, Sheffield, UK, pp. 381–394.

Frost and Suvillan. (2009). *Getting serious about Green manufacturing.*

Gibson, B.J., Mentzer, J.T. and Cook, R.L. (2005). Supply chain management: the pursuit of a consensus definition. *Journal of Business Logistics*, Vol. 26 No. 2, pp. 17-25.

Gungor, A. and Gupta, S.M. (1999). *Issues in environmentally conscious manufacturing and product recovery: a survey. Computers & Industrial Engineering*, Vol. 36 No. 4.

Holbrook, J. (2004). *Integrating Green Purchasing into your environmental management system.*

Holt, D., Ghobadian, A. (2009*). An empirical study of green supply chain management practices amongst UK manufacturers,*Vol.20 1ssue 7.

Mentzer, J.T., Witt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D. and Zacharia, Z.G. (2001). Defining supply chain management. *Journal of Business Logistics*, Vol. 22 No. 2, pp. 1-25.

Mollenkopf, D.A., Hannah S., Wendy L. T. and Monique U. (2009). *Green, lean and global supply chains*. Department of Marketing and Logistics, University of Tennessee.

Mwirigi P. (2007). *A survey of the extent to which Manufacturing Firms in Kenya has adopted Green Supply Chain Management.*

Ninlawan, C., Seskan, P., Tossapol, K. and Pilada, W. (2010). *The implementation of Green Supply Chain Management Practices in Electronics industry*.

Okech, B., Mitullah, W., and Atieno, R. (2002). *Understanding Business systems in Kenya*: Firm Response to changing market environment in the Metal products sector.

Preuss L (2005), *Rhetoric and reality of corporate greening: a view from the supply chain management function*, Royal Holloway College University of London.

Rothenberg, S., PiI, F.K. and Maxwell, J. (2001). Lean green and the quest for superior environmental performance. *Production and Operations Management*, Vol. 10 No. 3, pp. 228-43.

Sarkis, J. (2005). Performance measurement for green supply chain management. Benchmarking: *An International Journal* 12(4): 330–353.

Sarkis, J. (2006). *Greening the supply chain.*

Sheu, J. B.; Chou, Y. H.; Hu, C. C., (2005). *An integrated logistics operational model for green supply chain management.* Trans. Res., 41 (4), 287-313.

Srivastava, S.K. (2007). Green supply chain management: a state-of-the-art literature review. *International Journal of Management Reviews*, Vol. 9 No. 1, pp. 53-80.

Stevels, A. (2002). *Green Supply Chain Management much more than questionnaire and ISO 14.001 In:* IEEE International symposium on electronics and the environment, 96-100.

Trigos, O. (2007). *An investigation of green supply chain management in the construction industry in the UK.*

Vermeulen W.J.V &Ras P.J (2005), *The challenge of Green Global product chains: Meeting both ends,*Copernicus Institute for sustainable development and innovation Netherlands, John Wiley and sons.

Vachon, S., Klassen, R.D., Johnson P.F. (2001). *Customers as green suppliers: Managing the complexity of the reverse supply chain*. In: Sarkis J (Ed.), Greening Manufacturing.

Vachon, S. (2007). *Green supply chain practices and the selection of environmental technologies.*

Van Hoek, R.I. (1999). From reversed *logistics to green supply chains. Supply Chain Management,* Vol. 4 No. 3, pp. 129-34.

Wagner, M., Schaltegger, S. and Wehrmeyer, W. (2001). *The relationship between the environmental and economic performance of firms: what does theory propose and what does empirical evidence tell us?* Greener Management International, Vol. 34, pp. 95- 108.

Walley, N. and Whitehead, B. (1994). Is not easy being green.*Harvard Business Review*, Vol. 72, No. 3, pp. 46-52.

Wilkerson, J., (2010). *5 Major Challenges to Green Supply Chain Management*.

Wycherley, I. (1999). Greening supply chains: *The case of the Body Shop International. Business Strategy and the Environment,* Vol. 8 No. 2, pp. 120-7.

Zhu, Q. and Sarkis, J. (2004). Relationships between operational practices and performance amongst early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management,* Vol. 22, pp. 265-89.

http://business.fiu.edu

http://en.reingex.com/Kenya-Business-Economy.asp

http://www.investmentkenya.com

http://www.nema.go.ke

http://ushahidi.internewskenya.org/reports/view/418

http://engineering.dartmouth.edu/cushman/courses

http://www.buy-environmental.co.za/index.php/home

www.manufacturingcrossing.com

www.kam.co.ke/kam

www.ic.gc.ca/logistics

## APPENDIX B: QUESTIONNAIRE

SECTION I: GENERAL INFORMATION

1. Please select the sector in which your firm belongs and the product you manufacture (Tick one).

| **Sector** | **Tick** | **Major products** |
|---|---|---|
| Chemical and Allied | | |
| Energy, Electrical and Electronics | | |
| Food and Beverages | | |
| Metal and Allied | | |
| Mining and Construction | | |
| Motor vehicle and Accessories | | |
| Paper and Board | | |
| Pharmaceutical and Medical Equipment | | |
| Plastics and Rubber | | |
| Textile and Apparels | | |

2. What is the size of your company?

| | | |
|---|---|---|
| Micro | 1- 19 employees | { } |
| Small | 20- 49 employees | { } |
| Medium | 50- 300 employees | { } |
| Large | above 300 employees | { } |

3. What is your position in the company?

……

4. Are your headquarters located in Mombasa?

   Yes { }

   No { }

5. How many suppliers does your company has for daily operations?

   1 to 10 { }

   11 to 30 { }

   31 to 50 { }

   51 and above { }

6. Where is your target customers located?

   Locally { }

   Internationally { }

   Both { }

7. What is your performance in terms of annual turnover?

   Below turnover of Kshs. 2million { }

   Kshs.2million to 5 million { }

   Over Kshs.5 million { }

8. What are the main raw materials used by the company for production?

   ……

9. What constitutes the major part of the waste produced by your firm?

   ……

SECTION II: BENEFITS

Indicate the extent to which your company enjoys the following benefits as a result of adopting green supply chain management. (Tick one for each)

(1) Not at all (2) Low (3) Moderate (4) High (5) Very High

| **Benefit** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Reduced cost of operation | | | | | |
| Improved public image, brand and goodwill | | | | | |
| Saving and utilizing fully the available resources | | | | | |
| Returning back to the society | | | | | |
| Reduce material used for packaging | | | | | |
| Increased space utilization | | | | | |
| Reduced handling procedures | | | | | |
| Waste minimization | | | | | |
| Increase in demand for the company's product | | | | | |
| Increased profitability | | | | | |
| Considerable conservation of resources | | | | | |
| Suppliers are able to retain their customers | | | | | |
| Gaining Competitive advantage | | | | | |
| Increased employee morale | | | | | |
| Target marketing | | | | | |
| Improves market share and supply chain | | | | | |
| Others (please specify) | | | | | |

SECTION III: CHALLENGES

To what extent do the following challenges impact on your company's operations in adopting green supply chain management? (Tick one for each)

1) No impact 2) Little impact 3) Moderate impact 4) Strong impact 5) Very strong impact

| **Challenge** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Increased operating cost | | | | | |
| Low level of GSCM awareness | | | | | |
| Newness of the concept of GSCM | | | | | |
| Lack of tools and techniques of measuring GSCM performance | | | | | |
| Lack of cooperate commitment | | | | | |
| Lack of sufficient resources | | | | | |
| Resistance to change | | | | | |
| Little supplier specification | | | | | |
| Lack of alternative for green products | | | | | |
| Strict government rules and regulations | | | | | |
| Competing business priorities | | | | | |
| Vendors reluctant to going green | | | | | |
| Poor information sharing among the supply chain members | | | | | |
| Increased processing cycle time | | | | | |
| Difficulties in complying with organizational standards | | | | | |
| Poor planning program implementation | | | | | |
| Increased Conflict between retailers and manufacturers | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Insufficient capital for business expansion | | | | | |
| Economic factors such as high inflation, high interest rates and the level of employment | | | | | |
| Limited access to finance such bank loans | | | | | |
| Increased domestic and global competition | | | | | |
| Other(s) ( Please indicate) | | | | | |

SECTION IV: GREENSUPPLY CHAIN MANAGEMENT PRACTICES

10. Does your company comply with any environmental standards?

    Yes { }

    No { }

11. Which standards does your company comply with?

    ISO Standards { }

    ISO 140065 { }

    Others …….

12. How long has the company been able to comply with the environmental standards?

    Recently { }

    Between 2 to 5 years { }

    Over 5 years { }

Indicate the extent to which GSCM Practices is adopted in your company. (Tick one for each)

(1) Not at all (2)Low (3) Moderate (4)High (5) Very High

GREEN PROCUREMENT PRACTICES

Below is a list of green procurement practices that firms undertake. Please indicate the extent to which each of them is practiced in your firm. (Tick one for each)

(1) Not at all (2) Low (3) Moderate (4) High (5) Very High

| **Practice** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Procure products that are made using recycled materials | | | | | |
| Ordering via email (i.e. paperless ordering) | | | | | |
| Purchasing equipment that is easy to repair | | | | | |
| Develop the environmental awareness of procurement staff | | | | | |
| Favoring products which provide information about their effect on the environment | | | | | |
| Require suppliers to limit packaging to the minimum necessary to protect the items supplied | | | | | |
| Purchase materials or parts from suppliers who are compliant with environmentally related legislation | | | | | |
| Purchase products that are energy efficient or products which require less energy to manufacture | | | | | |
| Considering suppliers who have acquired or are in the process of acquiring ISO 14000 Certification | | | | | |
| Buying products for which the packaging material is bio-degradable or recyclable | | | | | |
| Develop and maintain a data base of suppliers in which information relating to environmental conduct is maintained | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Purchasing energy saving equipment e.g. machines or vehicles which carry the same load or more and move faster while using less fuel | | | | | |
| Other(s) (please specify) | | | | | |

GREEN MANUFACTURING PRACTICES

The following is a list of green manufacturing practices that firms undertake. Please indicate the extent to which each of them is practiced in your firm. (Tick one for each)

(1) Not at all (2) Low (3) Moderate (4) High (5) Very High

| **Practice** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Using inputs with low environmental impacts | | | | | |
| Controlling power consumption in products | | | | | |
| Improve machine performance | | | | | |
| Environmental friendly waste management | | | | | |
| Reduce the usage of insignificant materials | | | | | |
| Promote environmental occupational safety equipment | | | | | |
| Promote reuse of products and recycled materials | | | | | |
| Provide consumers with information on environmental friendly products and production methods | | | | | |
| Replacing hazardous substances with other substances that are environmentally friendly | | | | | |
| Rinsing parts with clean water instead of using chemicals | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Reusing water instead of leaving it to go to waste | | | | | |
| Quality control of inputs at vendor site and recheck before processing | | | | | |
| Using equipment that consume less energy (electricity, diesel etc) | | | | | |
| Using equipment that use green energy e.g. electricity | | | | | |
| Designing products with improved features i.e. which use fewer resources to produce**.** | | | | | |
| Waste minimization through reusing or recycling of parts | | | | | |
| Promoting environmental consciousness among employees involved in manufacturing the product(s) | | | | | |
| Other(s) Please (specify) | | | | | |

GREEN DISTRIBUTION PRACTICES

The following is a list of green distribution practices that firms undertake. Please indicate the extent to which each of them is practiced in your firm. (Tick one for each)

(1) Not at all (2) Low (3) Moderate (4) High (5) Very High

| **Practice** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Use environmental friendly packaging materials e.g. biodegradable packaging material | | | | | |
| Reducing the size of packaging | | | | | |
| Packaging in such a way that the time required to unpack will be | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| less | | | | | |
| Cooperating with vendor to standardize packaging | | | | | |
| Promoting and adopting returnable packaging methods | | | | | |
| Promoting recycling and reuse programs among packaging and distribution employees | | | | | |
| Communicate with suppliers regarding packaging materials | | | | | |
| Environmental friendly transportation. i.e. well serviced vehicles which minimize air and noise pollution. | | | | | |
| Using fuel efficient vehicles | | | | | |
| Delivering directly to users' site | | | | | |
| Distributing products together, rather than in small batches | | | | | |
| Usage of other alternative fuels e.g. bio-gas, bio-diesel and ethanol | | | | | |
| Using vehicles or transportation modes that carry more load in order to reduce the number of trips made to the customer site | | | | | |
| Other(s) (please specify) | | | | | |

SECTION V: IMPACT OF GSCM

Indicate the impact in your company as a result of adopting green supply chain management. (Tick one for each)

(1) Not at all (2) Low (3) Moderate (4) High (5) Very High

| **Impact** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Improving the environment through elimination of polluting substances and other emissions | | | | | |
| Conservation of energy | | | | | |
| Eliminating pollution | | | | | |
| Recycling waste | | | | | |
| Green product designs | | | | | |
| Waste-cost reduction in the manufacturing sector | | | | | |
| Increase of training costs | | | | | |
| Increase of costs for purchasing environmentally friendly materials. | | | | | |
| Level of profitability of firms in relation to competitors | | | | | |
| Increased investments | | | | | |

**Thank you very much for your participation**