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**GREEN SUPPLY CHAIN MANAGEMENT  
PRACTICES BY MANUFACTURING FIRMS IN  
KENYA**

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**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**

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**DECLARATION**

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

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## **DEDICATION**

To my dear husband Mwirigi, children Munene, Mutwiri and Makena.

To my niece Yvonne and Terry, my late brother Dickson and all relatives and friends whose support I cannot measure.

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

Because theorists and practitioners have always built on the research and work of others, theory and practice are seldom completely unique. Thus, in addition to the specific models mentioned, the research and work of many others has influenced my efforts. Most important, I wish to recognize the compelling influence of the lives and thinking of persons who have extensively applied holistic thinking in making this work a success. These are my supervisors Mr. S.O Nyamwange and Mr. L. Mulwa.

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## List of Abbreviations

CBI	- Confederation of British Industries
DFE	- Design for Environment
ECM	- Environmental conscious manufacturing
EIAs	- Environmental impact assessment
EMCA	- Environmental Management and Coordination Act
EMS	- Environmental Management System
GPN	- Green Purchasing Network
GSCM	- Green Supply Chain management
IFC	- International Finance Corporation
KAM	- Kenya Association of Manufacturers
KEBS	- Kenya Bureau of Standards
KNCPC	- Kenya National Cleaner Production Centre
NEMA	- National Environmental Management Authority
NGO	- Non Governmental Organization
PPRC	- Practical Solutions for Economic and Environmental vitality
SCM	- Supply Chain Management
SMEs	- Small Medium Enterprises
TQM	- Total Quality Management
WTO	- World Trade Organization

## **ABSTRACT**

The green management literature argues that in order for economies to embrace new environmentally responsible values, beliefs and behaviours, 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 practice that received the least consideration was reverse logistics and that the multinationals were more aware of the practice than the locals. 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

The impact of manufacturing operations on the environment may be categorized as; waste (all forms), energy use, and resource use (material consumption) and as a result, manufacturing organizations must develop procedures that focus on operations analysis, continuous improvement, measurement, and objectives, which according to Beamon (1999) lead towards green supply chain. The term "green supply" indicates green (chain) management activities that are attempts to improve the environmental performance of purchased inputs, or of the suppliers who provide them (Bowen et al, 2001). This is what gives rise to greening of product chains which in turn lead to an emphasis on managing supply chains, an idea which was first postulated by Taylor (1975) in his argument that, the solution to "waste" problem (environmental problem) would be found in the development of a new skill for purchasing, namely "resource management". According to Taylor (1975), "resource management" is the management of physical resources from their origin, through the various stages of production and distribution, to their final consumption, recycling, or re-use.

According to Vermeulen et al (2005), the critical issue is that of trying to find procedures to meet the consumptions demand of products in this growing global market, while promoting positive ecological and social impacts through out the value chain. Vermeulen concurs with World Bank (2003) in the observation that, there is a paradigm shift from the old notion of 'development versus environment' to a new view in which better environmental stewardship is essential to sustain development. In an argument advanced by Welford (2003), it is noted that the current wave of globalization has increased the need for companies to externalize more of the production activities. Systems use an internal management tool, which means the new trend would leave environment issues planned poorly if managed this way. The writer argues that new emphasis must be placed on environment supply chain management practice and extended producer responsibility by running in parallel with new initiatives on social responsibility and fairer trading relationships.

According to Shepherd (2006), market globalization, intensifying competition and an increasing emphasis on customer orientation are regularly cited as catalyzing the surge in interest in supply chain management, the auspice under which greening of the supply chain is considered. For

example, to compete globally, organizations need to ascribe to international standards such as ISO 14001 and to have competitive advantage, firms must have environmental strategies and products that are not only unique but meet customer demands. Further, the decision to apply supply chain is dictated by the need to anticipate increasingly strict legislation and consumer pressure or the risk of negative public image. Customers and other stakeholders do not always differentiate between a company and its suppliers and hence they will hold them accountable for all their supply problems. For example, in Kenya it is only the large enterprises that are subjected to environmental audits, but the cause of pollution range from domestic, small enterprises and industrial with the latter carrying the biggest if not all the blame.

In Kenya, Nairobi River presents an example of the main environmental challenge with level of pollution ranging from agricultural nutrients and raw domestic sewage to the highly toxic industrial waste. According to Kenya National Cleaner Production Centre (KNCPC), the solution to reduce this pollution and to restore the quality of the river lies in adoption of contemporary tools of environmental management such as green supply management, eco design, cleaner production, environmental accounting and life cycle analysis ([www.cpkenya.org/projects](http://www.cpkenya.org/projects)).

According to Sarkis (2001), any organization is a member of some kind of supply chain or network and the numerous production, marketing or sourcing decisions it makes leads to a myriad of implications for its supply chains, including implications for its natural environment. According to (Shane 2003), manufacturers and service providers are coming under increased scrutiny regarding environmental performance for their products. Not only must their products meet user needs for quality and cost, they must address the environmental concerns of society at large. Beamon (1999) noted that the state and trend of environmental degradation (from regulatory, consumer, and moral standpoints) was calling for change in manufacturing philosophy. He further notes that though ISO 14000 is indicative of the shift in environmental philosophy, it focuses only on procedures and systems and says nothing on discharge standards, limits, or test methods. Hence the notion that greening of supply chains is a response to a new challenge on manufacturing and production enterprises worldwide. Beamon notes that the challenge is to develop ways in which industrial development and environmental protection can symbiotically coexist.

The desired results of environmental performance according to Roberts (1988) is the process of minimizing the environmental impacts of ones organization by controlling the aspects of the firms

operations that cause, or could cause, impacts to that environment. Thus in order to meet the demand for environmental conscious products, the need for green supply chain management (GSCM) which incorporates green purchasing, green manufacturing and green marketing should be embraced as a corporate strategy. For example, the Green Purchasing Network (Japan) is a green purchasing strategy seen as the most effective driving force for businesses to promote the development of environmentally conscious products and services and to make green supply chain. This law obligates all of their government ministries and agencies to implement green purchasing policies and it became enforceable law in Japan in 2001 showing the role legislation may play in the adoption of a GSCM practice by manufacturing firms and economies.

For the case of China, Zhu et al (2005) compounds that the scarcity of resources, degradation of environment, and increasing pressure from Chinese consumers have caused the Chinese government, both local and national to also exert pressures through increasing environmental regulatory and tax policies. To control over-exploitation and over-consumption of resources, the Chinese government has levied resource taxes and implemented quota-pricing systems for some resources such as water. The recently concluded world social forum held in Kenya between 22<sup>nd</sup> and 26<sup>th</sup> January 2007 echoed the need to rethink how to manage the environment. The forum noted that in developing countries the rate of deforestation was alarming, there was indiscriminate exploitation of mineral resources and increased production of industrial waste. They expressed the need for commitment by the government; better environmental management measures by NEMA and scrutiny of all activities that impact on the eco-system (Standard newspaper 25/01/07).

Environmental design has implications for the industrial design of products, for example, solar-electric equipment, wind electricity generators or even innovative automobiles which would serve as alternatives for energy (<http://en.wikipedia.org/wiki/environmental>). A firm that employs GSCM will include in its decisions; screening of suppliers for environmental performance, working collaboratively with them on green design initiatives and providing training and information to build suppliers environmental management capacity (<http://www.apo.tokyo.org.gpeco2004/bakkent>).

The U.S environmental protection agency for example, offers assistance within their green suppliers' network- aiming at suppliers and manufacturers to help them eliminate waste, save money, and reduce their eco-impact ([www.planeta.com/ecotravel/trade](http://www.planeta.com/ecotravel/trade)). Manufacturers depend

heavily on global supply chains for raw materials or supply of their finished products. Kenya for example imports petroleum for energy, electronics, pharmaceutical products and industrial chemicals. Exports include raw and finished agricultural products. Hence, manufacturing occupies a key position in the supply chain as it serves as a gateway for most products. The focus is on manufacturers to offer a solution to the environmental problem through sustainable business practice.

### **1.1.2 Manufacturing Firms in Kenya**

Manufacturing is a member of supply chain and some of the functions it performs include; new product development, marketing, operations, distribution, finance and customer service and therefore the environment is important for the supply chain operations as well as manufacturing (Sunil et al 2004). There are a myriad of manufacturing firms and according to the Kenya Association of Manufacturers (KAM) (established 1959), they may be categorized into 14 sectors. These sectors are classified by the type of raw material companies' import or the products they manufacture. Manufacturing accounts for 13% of gross domestic product (GDP) of Kenya's industrial sector. KAM notes that 80% of the 600 members are based in Nairobi.

According to National Environment Management Authority (NEMA), large industrial establishments are subjected by Law (The Environmental Management and Coordination Act (EMCA) 1999) to Environmental Impact Assessments (EIAs) and Annual Environmental audits (IAs). EMCA does not extend to the Small and Medium Enterprises (SMEs) despite their role in the supply chain network and the fact that they accounted for 43 percent of Kenya's export according to baseline survey report 1999 ([www.nema.go.ke](http://www.nema.go.ke)). According to the Kenya bureau of standards, there are only four firms that are ISO 14000 certified including Pan African paper mills and Central glass industries while a few others like Kenya breweries are ISO 22000 certified ([www.kebs.org](http://www.kebs.org)).

Green supply chain management helps organizations look critically into the role played by each channel member in the effort to meet customer needs and at the same time meet desired environmental standards. Thus it is not enough for a firm to be ISO 14000 certified or to have NEMA certificate for the Kenyan situations, but there should be another practice for environmental sustainability. Some of the manufacturing firms in Kenya are multinationals and hence their response to green issues could be different from the local ones. For example, in the

motor industry, General Motors a multinational, had this to say in answer to the question; why green your supply chains? "Working together with our suppliers, we can accomplish much more to improve the environment than GM can alone" (<http://www.pprc.org/pubs/grnchain>).

According to the Economic Survey (2005), major exports included horticulture, coffee and tea, iron and steel, soda ash and fish. Imports included crude petroleum and petroleum products, industrial machinery, motor vehicles, iron and steel, plastics in primary form and non-primary form, medicinal and pharmaceutical products, chemical fertilizers and animal and vegetable oils and fats. Manufacturing firms face challenges in managing the supply chain which range from logistical marketing, purchasing and operational emphasis on greener products worldwide. For example, the threat to ban flower export and other horticultural to the European Union from Kenya citing pollution due to the need to airlift them besides being grown in green houses which lead to high concentration of carbon dioxide. Recent studies by Jaffee et al (1995) on horticultural exports have explored the need for supply chain management citing Kenya as a key player. Other products that are subjected to trade restrictions or ban include batteries, products with short life cycles and tobacco. This triggers the need to assess how manufacturing firms in Kenya are responding to the green supply chain management initiatives and the challenges.

## **1.2 Statement of Problem**

Davies et al (2007) notes that, it is nearly impossible to open a magazine or newspaper without reading about the potential impact of global climate change and how important it is for companies to "get green". Manufacturing and production operations are the most commonly perceived enemy to environmental protection because of waste generation, ecosystem disruption and depletion of natural environment (Beamon 1999). According to the Kenya Economic Survey (2006), NEMA's major challenges were solid waste disposal and emerging environmental health issues, whereas those faced by Nairobi City Council were plastic bags menace, noise, river, water and air pollution with tree planting as the only achievement. Water resources are also under pressure from agricultural chemicals and urban and industrial wastes as well as use of hydroelectric power. There is often closure of some industries followed by rise in cost of their products due to the high cost of production resulting from power rationing and high fuel costs. Kenya's forest cover is only 2 percent and yet there are local manufacturers of paper and other wood products.

The economic performance of Kenyan manufacturing firms is also threatened by legislation and the customer demands. Kenya for example encounters restriction in exporting agricultural products, which is her main source of foreign exchange. Some of the reasons cited have to do with the environment and the supply chain. Food miles for example has introduced another criterion for selecting a food product: Its carbon footprint, reports Patton (2007) writer of article on "War on greens: How British consumers are busy stabbing Kenya in the back" (Sunday Nation 25/02/2007). The International Finance Corporation (IFC) will not grant loans to businesses if they are not satisfied with the environmental standards they ascribe to.

The designing of eco-friendly products and services is high on everyone's environmental, economic social and political agenda but networking may be far from reach. According to Rao (2005), there exist potential linkages between green supply chain management as an initiative for environmental enhancement, economic performance and competitiveness. Lawson (2002) argues that demand trends and competitive priorities have led to the development of an operations strategy. According to authors on GSCM, adoption of the strategy may take various forms and reasons for adoption range from legislation, customer demand, own initiative and competitiveness.

Research work done on firms in China, U.S, Europe and Japan show a strong tendency towards adoption of green supply chain management as an environmental response initiative. For example, Zhu et al (2005) found that external GSCM practice has grown in importance where he compliments his argument based on the findings of Zsidisin and Hendrick (1998) who by investigating purchasing managers in Germany, the UK and the USA, identified key factors for environmental purchasing as those providing design specification to suppliers that include environmental requirements for purchased items, cooperation with suppliers for environmental objectives, environmental audit for supplier's internal management and suppliers' IS014001 certification. For China, investment recovery and eco-design were found to be the two emerging environmental practices that have significant internal and external influences on GSCM, with the conclusion that Chinese enterprises have increased their environmental awareness due to regulatory, competitive, and marketing pressures and drivers. Hence the conclusion that green marketing, together with eco-design and green purchasing, is a necessary element of improved environmental performance for Chinese companies and/or their products/services.

In other terms, GSCM is an operational initiative that organizations may adopt to address environmental issues such as, complying with mounting environmental regulations, addressing the



environmental concerns of their customers, and to mitigate the environmental impact of their production and service activities. It may be seen as an initiative through which manufacturing firms attempt to answer the question; "What is product stewardship?" The need for GSCM in Kenya calls for exploration considering the current state of affairs, empirical evidence in other parts of the world, and as an attempt to answer the questions: What are the manufacturers doing to address the green issues in the country, and what challenges are they facing with the practice?

### **1.3 Objectives of the Study**

1. To establish the green supply chain management practices by manufacturing firms in Kenya.
2. To identify the challenges manufacturing firms in Kenya face in adopting the GSCM practice.

### **1.4 Importance of the Study**

#### **Government**

The study was expected to be of importance to the government in formulating policies relating to green issues in the country. The public procurement Act 2006 does not have a guide on green supply chain practice in Kenya despite the role played by procurement and the government in creating environmental friendly environment.

#### **Organizations**

Organizations do not exist in an environmental vacuum and thus the business world will appreciate the role of supply chains in tackling new challenges especially where there is empirical evidence as may be reviewed by the research.

#### **Researchers/Academicians**

The study will also contribute to the wider body of knowledge both in academics and research, in the area of green supply chain management.

#### **Society**

The study will assist consumers in their choice of green suppliers and their products and other benefits that may accrue from an environmentally guided decision.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

This literature reviews various studies and theories in support of the adoption of GSCM by manufacturing firms by exploring practices employed by organizations in an attempt to overcome environmental challenges.

### 2.2 Supply Chain Management Concept

According to Sherer (2005), SCM dates back to 1980 and the term, which was coined by Keith Oliver in 1982 has its historical roots in the control of fulfillment activities that support the linear physical flow of goods from suppliers to manufacturers to distributors to retailers. However, the term is now commonly used to encompass every effort involved in producing and delivering a final product or service, from the supplier's supplier to the customer's customer (SCC, 2005). SCM is still evolving and as a result many other definitions have emerged. For instance, New (1994,1997) envisage that SCM may coin its meaning from the following three meanings (with a possibility of a few more) namely, the supply chain from the perspective of the individual firm, a supply chain related to a particular product or item and "Supply chain" used as handy synonym for purchasing, distribution and materials. Handheld et al (1999), on the other hand defines it as one encompassing three interrelated elements: the management of all the activities associated with the flow and transformation of goods, from the raw material stages to the final user, the associated information flows up and down the supply chain and the management of supply chain relationships.

According to Mentzer (2001), Supply Chain Management may be defined as the systematic, strategic, coordination of the traditional business functions within a particular company and across businesses within the supply chain for purposes of the individual companies and the supply chain as a whole. This definition according to Burgess (2006) is broad and it is not confined to any specific discipline area and it adequately reflects the breath of issues that are usually covered under this term. For instance, Burt et al (2003) found out that SCM mutated first into a commercial orientation with an emphasis on cost savings and then into a proactive strategic outlook that is fully integrated into the competitive strategy of the company and notes further that SCM is enjoying an increasing economic importance as for manufacturing companies bought-in

components account for the largest share of total company economy. Thus, the flow of goods through the supply chain is the life-blood of the modern world.

According to New (1997), viewing SCM from a broad perspective allows us to appreciate the fact that different industries may be making different SCM decisions that affect one part and not the other. For example, in management of external resources the firm plays the gate-keeping role in terms of guaranteeing the quality of incoming goods and when considering the aspect of sustainability both organization's production and consumption patterns must be considered.

The role of purchasing in supply chain management is very important as an intermediary step in the supply chain because it connects suppliers with purchasing internal customers, who in turn provide products and services for external customers. The importance of the purchasing function can be easily understood if one also considers that purchased goods and services typically represent from 50 to 70 percent of a company's revenues (Spekman et al., 1999). Purchasing decisions have a potentially great impact on the firm's end product and the overall business performance. SCM is integrally linked to the processes of consumption in society, and consumer demand determines how organizations set their expectations and justify adaptation to their operations. The first step in meeting new challenges is to re-define the basic structure of the entire supply chain by accommodating environmental concerns associated with waste and resource minimization.

SCM practices vary with different industrial sector and according to Wong et al (2005), some of the sectors that have been studied include pharmaceutical, automobile, apparel, chemical, computer, agriculture/food and grocery; telecommunication, but notes that creative industry which covers toys has not been broadly explored. In Kenya most of the toys are imported despite the fact that they have short product life. Another example of a unique supply chain is that of Kenya cut flower production and distribution. According to Jafee et al (2005), flowers are highly perishable and variable, hence the need for an effective and uninterrupted cold chain, highly efficient long and short distance freight transportation arrangements and mechanisms for rapid sales. Thus achieving growth and security within the dynamic cut flower supply chain, which is an export oriented supply chain, is quite a challenge.

In designing SCM solutions certain challenges are encountered with Karkkainen (2002) taking note of three major ones as follows: The first challenge to overcome is fast and efficient handling of differentiated material flows, for example where customization leads to increased number of delivery addresses. Secondly, with efficient customization the company has to know what to do with each individual product. Thirdly, this challenge is related to product identification and hence the need to control production and logistics accurately and flexibly across multi-company networks.

### **2.3 Green Supply Chain Management Practices**

According to Azzone et al (1997), environmental strategies within profit organizations may be considered as a set of guidelines that the firms define to respond to current internal and/or external pressures and/or to anticipate future evolution of the competitive environment, of regulators and of the customer's needs. Thus each firm — according to its own "strategic orientation" decides whether to include environmental factors into the overall process of strategy formation. Consequently the company's environmental culture represents one of the most important determinants in the definition of the environmental strategies, which depends on the company's history, the fields where it operates and the country in which it has the headquarters or its plants.

According to Pun (2006), there are various tools and methods practitioners and researchers use to implement environmentally responsible operations with environmental management in industry. The tools and methods were developed to help understand what and how to address environmental concerns and for practitioners to identify opportunities and translate understandings into unambiguous strategies directed to improve and sustain eco-performance of products and operations. Some of them include green supply chain (which is the main area of concern in this study), green purchasing, life cycle assessment, green quality function deployment and recycling and remanufacturing.

According to Green et al (1998), GSC is a method to design and/or redesign the supply chain that incorporates recycling and remanufacturing into the production process and it involves minimization of the firm's total environmental impact from start to finish of the supply chain and also from beginning to end of the product life cycle. Studies by (Abounaga 1998; Lawrence et al, 1998; Pun et al, 2002) show that adopting (TQM) helps manufacturers to understand the products

they are creating, from the point of design, through the value chain (both forward and backward) to the ultimate use and final disposal and respond to increasing pressures for environmental quality improvements.

Citing the case of China by Zhu et al (2002), developing countries face substantial environmental burdens as part of supply chains since they have been used as a point of disposal of end-of-life products for multinational organizations and developed countries. For example, the end-of-life products have been shipped to developing countries, such as China and Kenya, (this may include electronics, motor vehicles and other machinery) where these developing countries do not have the infrastructure or tools available to care for the end-of-life products (Puckett and Smith, 2002), causing greater environmental burden on these nations. The appropriate development of GSCM concepts and practices may indeed aid these countries by lessening the environmental burden of both manufacture and disposal of products, while even potentially improving their economic positioning.

According to Harris (2002), green organizational culture values upon which firms may be positioned include; the need for firms to incorporate environmental considerations throughout the entire organization, such concerns should be considered throughout the value chain, economic goals should be tempered, spirituality, morality, smallness and futurity should be embraced and the environment should be afforded intrinsic valuation and respect. The U.S environmental protection agency for example offers assistance within their green suppliers' network- aiming at suppliers and manufacturers to help them eliminate waste, save money and reduce their eco-impact. ([www.planeta.com/ecotravel/trade](http://www.planeta.com/ecotravel/trade)). Thus, the increasing consciousness of sustainable development and reconciling of production with ecosystem conservation have fostered the adoption and implementation of EMS (Pun et al, 2002).

Environmental management encompasses all efforts to minimize the negative environmental impact of a firm's products or services throughout the entire life cycle, from "cradle to grave" (Idassen and McLaughlin 1996). Environmental concerns in purchasing and SCM deal with an assortment of issues, such as: water, ground, air and noise pollution, the use, storage and disposal of hazardous materials and its waste in manufacturing, waste water management, unsafe and unhealthy working environments, unsafe finished products, industrial harm to plant and animal life, recycling or disposal of excess inventories, equipment, and manufacturing-generated

scrap, recycling of obsolete or scrapped end products, design of products and manufacturing processes for material conservation, reuse, or recycling, and restoration and reclamation of lands scarred by industrial activity.

The concept of GSCM may encompass environmental initiatives in a number of areas along the supply chain including: in-bound logistics which comprises green purchasing strategies adopted by organizations in response to the increasing global concerns of environmental sustainability; production or the internal supply chain where concepts such as, cleaner production, design for environment, remanufacturing and lean production, outbound logistics which relates to concepts such as; green marketing, environment-friendly packaging, and environment-friendly distribution and finally reverse logistics.

The results of the research carried by Purba et al (2005), on the above supply chain functions demonstrate that greening the inbound function, as well as greening production, significantly lead to greening outbound, as well as to competitiveness and economic performance of the firm. Greening the inbound function involves the integration of suppliers into a green supply chain. Getting the suppliers to have their own EMS and greening their operations helps tremendously to cut down production of waste at source. Hence, the company gains in terms of less or minimal environmentally hazardous waste, even non-hazardous solid/liquid waste and air emissions leading to reduced costs for waste disposal, compliance with regulation, reduced pollution, improved resource utilization and enhancement in economic performance.

In reference to an analogy of quality chain, SCM function can be perceived as coordinating environmental protection initiatives in many organizations that constitute the supply chains or network. Through the various links the supply chain manager can initiate a green multiplier effect, which leads to environmental protection with greater impact than any other agent in the whole organization. This leads to the conclusion that SCM is a term that refers to the operationalization of many of the topics within the industrial ecosystem and industrial ecology (Preuss 2005).

### **2.3.1 Green Purchasing**

Green purchasing is generally defined as environmentally conscious purchasing practice that reduces sources of waste and promotes recycling and reclamation of purchased materials without adversely affecting performance requirements of such materials (Pun, 2006). From an environmental life cycle and quality perspective, it is important to consider the sources of materials

or components from which products are made. From the "inbound" perspective of the supply chain it is argued that greening the supply chain has numerous benefits to an organization, ranging from cost reduction, to integrating suppliers in a participative decision-making process that promotes environmental innovation (Rao, 2002). This is to say that a large part of the inbound function essentially comprises of green purchasing strategies adopted by organizations in response to the increasing global concerns of environmental sustainability.

According to the Green Purchasing Network (GPN) the demand side has the most influential power on the supply side. Therefore green purchasing is an effective market- oriented tool utilized by the demand side to promote the development of environmentally conscious products and all purchasers can use their purchasing power to leverage supplier practices, products and decisions for better environmental protection, more so since industrial buyers and governmental bodies command the larger proportion of all purchases.

According to GPN Japan, green purchasing consists of four main principles namely; to deliberate the necessity before purchasing, considering the environmental impact of a product at all stages of its life cycle, assessing suppliers' environmental management and activities, and gathering environmental information on products and suppliers. The above principles show a strong emphasis on purchaser's role in selecting products based on their environmental load from processing of raw materials to its ultimate disposal and the need for suppliers that adopt environmental policies, who have environmental management systems, are engaged in various environmental activities, and also disclose environmental information.

Pressus (2005) envisage that, owing to the strategic importance and scale of the supply chain impact on manufacturing, greener supply first focus is on the products to be purchased. The buying could stipulate minimum standards the raw material or component has to fulfill. Secondly, the manufacturing processes may call for the buying company to demand accreditation to an environmental management standard or the introduction of environmental policy by suppliers. Green purchasing may also operate to stipulate minimum threshold in terms of environmental performance as a precondition for being awarded a contract. The third focus for environmental initiatives is where the buying company, include environmental in its supplier assessment. According to (PPRC)-Practical solutions for economic and environmental vitality, the checklist for environmental purchasing would include the following:

- (1) Work to secure management commitment, and publicize a statement of intent or mission.
- (2) Designate one (or more) staff to coordinate environmental purchasing efforts at the company.
- (3) Request suppliers to help set up an evaluation system that allows end users to test and evaluate a new office product, supplies, materials and other.
- (4) Become familiar with available "green" products and suppliers.
- (5) Network and share information internally and externally.
- (6) Know what products you currently purchase, then work with suppliers on finding alternatives for any products with high life cycle impacts, contain hazardous or toxic materials, etc.
- (7) Let end users make the final purchasing decisions after evaluation.
- (8) Buy or lease refurbished goods.
- (9) When possible, close the loop by having suppliers take some of your end-of-life products and refurbish them for reuse at your business.
- (10) Don't forget to buy green energy.
- (11) Green your supply chain.
- (12) Publicize successes and lessons, including product performance, cost and environmental savings (<http://www.pprc.org/pubs/epr/purchase.cfm>).

By adapting purchasing to supply chain management Leenders (1994) argues that the strategic contribution required of supply may be based on the conviction that suppliers and the way in which we relate to them must provide a competitive edge. That is as long as purchasing is focused on selecting the best value option from a number of different bidders, any other purchaser has exactly the same right and opportunity. Pressus argues that if supply chain managers are serious about the environmental performance of their company and its products, then the environmental credentials of their suppliers should emerge as one criterion to strongly influence the selection and evaluation of suppliers. Thus green purchasing initiatives have emerged to support manufacturing design and green marketing whose aim is to respond to the needs of the customer. According to Beamon, the role of public pressure indicates that in U.S 75 percent of consumers claim that their purchasing decisions are influenced by a company's environmental reputation.

### **2.3.2 Design for Environment**

According to Klassen and McLaughlin (1993), environmental excellence starts during the initial product and process design. According to Pun (2006), environmental issues have become critical concerns of operations management arena forcing manufacturers to comply with regulations, to



search for potential legal findings of financial liability for environmental damage and increasing customer scrutiny of environmental effects related to product manufacture, which have made the environmental factor a key strategic variable with implications for the design of products, the design of processes and operating procedures.

Azzone et al (1997) envisage that, environmental issues were receiving growing concern from top managers with external pressures following from public opinion, regulators, governments, "green" movements and financial enterprises - such as banks and insurance companies - and internal drivers related to the change of employees' environmental awareness which have led executives to consider the environmental variable as a significant competitive priority and, hence, to include it into the overall process of strategy formation.

The Design for Environment (DFE) concept and its implementation offer manufacturing companies the opportunity to achieve world-class economic performance by producing world-class products, which increasingly means products that are environmentally acceptable throughout their lifecycles (Pfahl 1994). For example, the chemical manufacturers practice green chemistry technique which according to Lies (2006) is defined as the design of chemicals, processes and reactions to reduce environmental and health hazards at source and to enhance sustainability, particularly through molecular design of chemicals. Some of the ways in which green chemistry can propel change include for raw materials, the use of biomass feed stocks instead of petrochemical and certain biological processes like fermentation and through products - reformulate chemicals or redesign consumer products or introduce new ones so that toxic, chemicals are incorporated into products.

The environmental trilogies, reduce, reuse and recycle on the other hand, create the challenge of designing and manufacturing in a more environmental friendly manner (Flalevi, 2001). The impact of manufacturing on the environment cannot therefore be underscored and hence the need to optimize manufacturing to have the least environmental impact. This leads to the concept of 'Green Manufacturing' or in other terms environmental-conscious manufacturing (ECM).

ECM according to Halevi may be defined as the deliberate attempt to reduce the ecological impacts of industrial activity without sacrificing quality, cost, reliability, performance or energy utilization efficiency. The principle of ECM is to adopt those processes that reduce the harmful environmental impacts of manufacturing including minimization of hazardous waste and

emissions, reduction of energy consumption, improvement of materials energy utilization efficiency and enhancement of operational safety. As a consequence both manufacturing and design engineers have to design and manufacture in a more environmentally friendly manner and implementation must also consider the company's internal and external elements. According to Halevi (2001), topics such as those listed below are covered to embrace both the philosophy of design and manufacturing including the set of tools used based on solid engineering principles as follows:

### **Design for disassembly**

Waste disposal is an important issue. The objective is to reduce waste at the design stage, by using material that can be recycled and designs that consider ease of disassembly. The use of biodegradable materials is in many cases recommended.

### **Manufacturing for the environment**

The objective is to improve the production processes and product performance by using a 'cleaner' technology that reduces waste and pollution, such as more effective and less- energy — consuming motors. This may also include the process remanufacturing which consists of collecting a used product or component from the field, assessing its condition, and replacing worn, broken, or obsolete parts with new or refurbished parts.

### **Total quality environmental management.**

The method looks for total harmonic commitment between the organization and nature. Nature is not only a source of resources; the long-range welfare of both nature and organization is interdependent.

### **Industrial ecosystems**

This is a new term in configuring the relationships between organizations. It calls for a relationship between organizations that will supplement each other in terms of ecological conservation. Organizations are linked together so that waste from one can be used as raw material for another.

### **Technology assessment**

This is a measuring tool to understand and measure the effect of a new technology in one plant on itself, its surroundings, its country and the universe. It reaches the cost-effectiveness of the technology in terms of the social, ecological, and political environment.

Design also includes the component of performance measures without which it would be difficult to determine the efficiency and/or effectiveness of an existing system, or to compare competing alternative systems (Beamon 1999). Joint action with suppliers in the management of the productive flow and design/product development can, in fact, help the firm to improve its time, costs and quality performances. Producers are compelled to change their approach in responding to customers by incorporating their requirements right from planning and design.

Stronger consumer sentiment for environmental accountability coupled with tougher environmental statutes has pressured a growing number of companies to develop "proactive" environmental programs. Shane et al (2003), "To improve the environmental performance of their products, firms must look to the product planning and design stage. Little can be done to improve a product's energy consumption, materials usage, recyclability or toxicity beyond its originally designed performance levels. It has been estimated that 80-90 percent of a product's environmental impacts are determined early in the product development process (Design Council, 1997). To reduce these impacts, firms employ a variety of design for environment (DFE) practices and tools. The intent of DFE is to make environmental considerations an integral part of product design by helping product designers to understand and reduce a product's impact on the natural environment over its life-cycle from materials procurement and manufacture through distribution, consumption, and end-of-life disposition".

DFE based on the principle of industrial ecology is a means to achieve environmentally conscious designs, which are a necessary step towards sustainable economic development. It is however hampered by some local, state, national and international regulations. Taking the example of the American electronics industry Pfahl Jr. notes that in a command-and-control environment, regulations are designed for the existing industry and by-and large assume static technology (indeed, by mandating certain controls technologies, such regulations frequently freeze technological evolution). He attributes this negative impact to the lack of significant technological experience or education by environmental regulators.

A goal-oriented approach, which fosters a more cooperative, consensual effort among regulators, industry and some environmental groups is highly recommended. According to Allenby (1992), there are indications that the more environmental management systems in Europe and Japan result

in more technologically sophisticated and efficient environmental regulations which may also give firms operating in those areas some competitive advantages as well. This leads to the conclusion that environmental stewardship is the entire corporation's responsibility and that internal environmental organization is responsible for facilitating and measuring the activity. For example, with concurrent engineering manufacturing method, the role of materials standardization is achieved through collaboration between the purchasing and design functions. Consequently, a firm that fails to integrate environmental costs considerations into its technology decisions can create higher economic costs for itself even in the short-term. Hence DFE from a supply chain perspective is a shift from end-of-pipe approach which calls for an integrated supply chain focus (Pfahl .Jr)

### **2.3.3 Reverse Logistics**

According to Preuss (2005), the link between supply chain management and environmental protection also needs to be considered from the opposite perspective. Whereas design for environment technique is dependent on the availability of materials and technical capabilities of the supply chain; product take-back requires well honed logistics operations. Managing the reverse flow of product is an important ability for any company, since the product life cycle offers a valuable source of insight about the changing needs of marketing and logistics over the life of a product. Recycling is a technique that is used to reduce the solid waste stream volume, though the reverse logistics channels used seem to have received minimal attention (Lembke 2002).

Efficiency, accuracy and timeliness in reverse supply chains activities are a priority for leading manufacturers ([www.suppl-chainseVICES.com](http://www.suppl-chainseVICES.com)). Products that are returned or are traded-in are usually of value. Failure to address the reverse supply chain can lead to lost revenues and additional expenses. (Helms 2002) asserts that, with all the attention to the forward action of the supply chain, manufacturers are now considering how this supply chain can work in reverse to reclaim products at the end of their life cycle and return them through the supply chain for decomposition, disposal, or re-use of key components. Strategic factors to consider in reverse logistics include costs, overall quality, customer service, environmental concerns and legislative concerns.

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On the operational side, factors to consider are cost-benefit analysis, transportation, warehousing, supply management, remanufacturing and recycling, and packaging. Often incentive systems or

no-cost return systems must be in place to make reverse logistics work without external governmental regulation. The use of reverse logistic operation by firms' in their management plans can bring added profits and create a more competitive environment. Reverse logistics can significantly impact a company's profits by recapturing value (Helms 2002).

#### **2.3.4 Green Marketing**

Green marketing supports green manufacturing since it is customer or demand focused as opposed to product oriented manufacturing strategy. Through green marketing initiatives firms are able to develop their own positive efforts to be more socially responsible and to meet customer expectations for more environmentally conscious products (Shane 2003). According to lies (2006), chemical manufacturers can use green chemistry as a sustainable tool to reduce toxicity, resource and energy use, and pollution of chemicals. To market green chemistry companies need to generate more information internally, build new relations across the supply cham and provide more information externally.

In 1994, the Confederation of British Industries (CBI) identified the factors driving competitive advantage through environmental performance as market expectations, risk management, regulatory compliance and business efficiency. According to Hutchison (1998), GSCM has a key role in ensuring all diese factors are addressed since environmental impacts occur at all stages of a product's life cycle which also includes getting a market for old materials. Hence it is an archetype for enterprises to achieve profit and market share objectives. Consumers along the supply chain center their expectations on orgamcs, food safety, fair trade, choice and lower prices. The industry worry that a poor or unsafe product if tracked back to a local producer, not only tarnishes the reputation and reduces the prospects of future marketing for the producer, but may easily prove to be one rotten apple that spoils the basket (Van Hooven, 2004). The product life cycle has been a valuable source of insight about the changing needs of marketing and logistics over the life of a product (Lembke 2002).

Without green marketing initiatives, manufacturers of products that have negative impact on the health of the consumers, like tobacco and beer would render such producers out of business since even the adverts are restricted and the retail,,prices are regulated by the government. For Kenyan East African breweries and BAT are some of the most profitable firms in the country despite the challenges. Thus green marketing may be viewed as a means by which producers respond in

meeting the requirements to become a sustainable market with the potential to grow and gain competitive advantage.

## **2.4 Drivers of Green Supply Chain Management**

It is not easy being green (Harvard business review 1994), though the influence of environmental pressures is transmitted through the supply chain (Green et al). According to Pun et al (2001), statutory requirements of government policies and regulations, the pressure from consumers and the life threatening of the global ecosystem deterioration are seen as the major drivers towards the concept of preserving the environment. From the producers view point, both environmental and health benefits are strong drivers too. In an argument advanced by Welford (2003), it is noted that the current wave of globalization has increased the need for companies to externalize more of production activities. Systems use an internal management tool, which means the new trend may leave environment issues planned poorly if managed on this note, the writer argues that the new emphasis must be placed on environment supply chain management and extended producer responsibility by running in parallel with new initiatives on social responsibility and fairer trading relationships.

According to McIntyre et al (1998), supply chains of the future are expected to bring true competitive advantage to companies. Customers' requirements are becoming more stringent and companies aim to become increasingly customer focused and information to meet these customer demands is the key factor in the continuing development of supply chain operations. Competitive advantage is the outcome of the moral practice, which is compounded by Poksinska's (2003) argument that showing care for the environment and establishing a strong environmental image may help organizations to attract environmentally conscious customers and suppliers. Consequently, through adopting a resource-based perspective on competitive advantage, it is argued that the incorporation of environmental concerns into the firm may deliver environmental capabilities that competitors would find hard to imitate (Harris et al 2002).

Davies et al (2007) envisage that early adopters of environmental initiatives into the supply chain operations will have better opportunities. Manufacturing is a key determinant of the economic success of a product, that is, the profit margin earned on each sale of a product and on how many units of the product the firm can sell. The number of units sold and the sale price are to a large degree determined by the overall quality of the product. Thus economically successful design aims

at high product quality while minimizing manufacturing costs. Through design for manufacturing practice, most firms have been able to achieve GSCM objectives in addition to the objective of economic success ([www.design\\_manuf.htm](http://www.design_manuf.htm))

According to Vermeulen, the natural base of a country and the quality of its air, water and land presents a common heritage for all generations and hence the need for policy-makers to incorporate some form of environmental accounting into their decisions. For instance relative scarcity of resources and the potential pressure of "green barriers" to trade, both the government and enterprises have had increased reasons to initiate corporate and industrial environmental management measures (Sarkis et al).

Firms may adopt a green strategy for various reasons and according to Azzone (1997), those under environmental related pressures end up with a reactive strategy. For example, where there are green movements, firms are forced to improve environmental performance of their products. There could also be a ban on the use of certain raw materials or products such C4 used in refrigerators, use of leaded fuel, thin plastic material, wood, products whose life cycle is short, products produced in green houses and many more. Through government policies the raw materials would be raised to discourage producers from using such products in their manufacturing processes. Government policy places an emphasis on manufacturing firms to be environmentally certified before engaging in any production activity. For example in Kenya NEMA is responsible for this and Kenya bureau of standards (KEBS) monitors what is imported, produced and exported. This may result in rejection of products if they do not meet certain standards.

During this years budget, Kenya imposed a ban on the importation of thin plastic bags and also raised export duty on used batteries to encourage innovative thinking in tackling environmental issues. To comply with regulations also firms get environmental certification like ISO14000 or other international quality standards. It is worth noting that compliance by itself is extremely expensive, hence die need for an approach that focuses on sustainability (Davies, 2007).

According to Zhu et al (2005), pressures and drivers for adoption and improving environmental performance arise from a number of external and internal groups or "stakeholders". For example, Chnstmann and Taylor (2001) suggested that export and sales to foreign customers are two major drivers for improving the environmental performance of enterprises in China. For example, many

countries require a certificate for wood products in order to show that their harvest does not harm their forest's sustainable development.

Another example is that shoes made in Fujian, a province in southeast China, could not be exported because the glue used in shoe manufacturing does not satisfy the environmental requirements of the customers. Some countries, including Japan, the United States, the Netherlands, Norway, France and Sweden, have also put forward different environmental requirements for the fabrics and dyes of clothes imported from China (Ministry of Foreign Trade and Economic Cooperation of PRC, 2002). Thus, the benefits from China's entry into the World Trade Organization (WTO) could be diminished unless it meets the relevant international environmental standards.

## **2.5 Benefits of GSCM**

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.

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).



Reverse logistics programs can recover assets that would otherwise be lost, so firms are urged to place a greater emphasis on managing returned products. According to Helms (2002), a study of the recycling and disposal of pharmaceutical products in the United Kingdom which focused on reverse logistics and analyzed returned stock from 28 hospitals, found there were significant financial and operational advantages to the National Health Service through developing the reverse logistics processes.

Lovins et al (1997), argues that business strategy built around the radically more productive use of resources can solve environmental problems at a profit. Supply chain management function leads to coordination of environmental protection initiatives in the many organizations that constitute its supply chains or network resulting into a green multiplier effect, which could achieve environmental protection more thoroughly than any other agent in the organization (Preuss 2005). Firms that have the green philosophy in place have fewer challenges than their counter parts and are likely to pursue a differentiation strategy on the bases of green issues with success.

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).

## **2.6 Challenges**

Efficiency, reliability and responsiveness of supply chains are key drivers of a firm's profitability however, in the recent past much of the SCM efforts have focused on increasing efficiency

(lowering costs) of supply chain operation and less on increasing robustness and reliability of supply chains since it is much harder to place a value on robustness and reliability (Kevin et al 2005). In addition, a common tool for evaluating supply chain performance lacks with many firms or practitioners having to rely on benchmarking which aims at identifying parts of the supply chain that do not meet customer needs only for improvement. Grankvist (2002) envisage that people often harm the environment despite holding attitudes that are positive toward environmental friendly behaviour. A study done in UK established that supply chain managers were skeptical about the economical benefit of a business strategy that included more choices of environmental friendly alternatives (lies 2006).

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Supply chain management technique occupies a rudimentary position in Kenya since the discipline is taught by the universities as a supplementary subject. On the hand, Pfahl envisage that where environmental regulations are imposed by agents with little technical or industry background, the implication to both the organization and the environment would be serious. For example, in the case of replacement of chromate coatings in the American electronics industry, as an environmental requirement rendered the technology obsolete. The governments play a crucial role in the adoption of any technique and where the proponents lack this support the adoption of GSCM would be far from reach. The technique is also expensive to implement and difficult to implement. Davies (2007) notes that, transforming the supply chain to reflect a more environmental friendly approach to business is not a simple matter of buying another software module or changing a light bulb in your facility but calls for innovativeness.

In conclusion, 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 Introduction

The chapter gives the method and procedures adopted in investigating the GSCM practice by manufacturing firms in Kenya with a view of establishing whether they carry out certain environmental practices known to support sustainable environment and business, and the challenges they encounter.

### 3.2 Research Design

The study adopted a survey research design, which according to Kathuri and Pals (1993) aims at describing and exploring a phenomenon. According to Dillon et al (1994), the objectives of a survey research are to describe and explain selected characteristics of a pre-specified group of individuals, households, institutions or objects. The target group was hence the manufacturers registered with KAM as at 2006 and falling in the region Nairobi and its surrounding areas. KAM is an umbrella body under the Ministry of trade and it addresses the needs of both large and small manufacturers.

### 3.3 Population and Sample

The population consisted of 367 members in Nairobi from the twelve sectors. According to KAM directory 2006, 80 percent of its members are based in Nairobi mainly in the industrial area with only a few spread all over Nairobi and its surrounding areas (www.kam.co.ke July 2007).

According to Shaughnessy et al (2003), the method of choice for portraying all the variety of a large heterogeneous population is that of sample survey. The sample size of 100 was deemed appropriate to cover all the 12 sectors by drawing the respondents proportionately across the sectors. According to Lucey (1996), a sample where  $n > 30$  or  $n < 5\%$  of the population leads to a very small standard error and hence greater precision. This was achieved because the response rate was 60 percent and it's only the Metal and allied sector which that failed to respond very well.

### 3.4 Data Collection

The tool used in this case was a questionnaire which was designed with the aim of identifying the impacts of manufacturing on the environment under the heading waste generation, energy use and resource use. The other part brought out what GSCM practice entails including benefits and challenges. The questionnaire targeted those in purchasing, operations or environmental departments to appropriately respond to the four identified areas of GSCM practice. They were

distributed to the respondents through drop and pick method and a few others through email. This had the advantage of respondent anonymity, confidentiality and leisureliness of response made.

### **3.5 Data Analysis**

Data was received from 60 firms who responded by answering all parts of the questionnaire save for 10 who skipped some parts for reasons that signaled a lack of understanding of certain issues associated with the concept of greening. The data was indeed large and therefore it was summarized and interpreted with the aid of data analysis computer software. These were Microsoft excel and SPSS. To help understand effects of a number of variables on final outcome and to assess effects of one scenario in relation to another, descriptive statistics including graphical presentations will be used.

## CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSIONS

### 4.1 Introduction

This chapter presents analysis and interpretation of data obtained by means of questionnaires where a total of 60 responses were received. The purpose of the study was to investigate to what extent GSCM practices were adopted by our manufacturing firms and the challenges they faced.

Green supply chain management practices have been found valuable in overcoming environmental impacts arising from manufacturing operations from the perspective of "cradle to grave" approach, since environmental impacts occur at all stages of a product's life cycle. Kenya like other parts of the world experience serious environmental constraints characterized by poor economy and environmental degradation. Research shows that Chinese enterprises have increased their environmental awareness due to regulatory, competitive, and marketing pressures and drivers, and that implementation of a variety of GSCM practices lead to improved environmental performance (Zhu et al 2005).

### 4.2 Respondents Characteristics

The first part of the questionnaire aimed at assessing the environmental impacts associated with manufacturing followed by evaluation of GSCM practice and finally the challenges of adoption of the practice. All the sectors responded in varying degree as shown in table 4a below:

**Table 4.1: Responses per each Manufacturing Sector**

No.	Sector	response	sample	percentage
1.	Building, construction and mining	1	2	50.0
2.	Chemical and Allied	4	11	36.4
3.	Energy, Electrical and electronics	7	7	100
4.	Food, Beverages and Tobacco	15	22	68.2
5.	Leather products and Footwear	2	2	100
6.	Metal and Allied	2	10	20.0
7.	Motor Vehicle Assembly and Accessories	3	4	75.0
8.	Paper and Paperboard	10	12	83.3
9.	Pharmaceutical and Medical equipment	5	5	100
10.	Plastics and Rubber	4	13	33.3
11.	Textile and Apparels	5	9	55.6
12.	Timber, Wood Products and Furniture	3	3	100
	Total	60	100	

Source: Research data

General information on the company's profile show that the large firms were 25 out of 60 and that very few firms employed more than 500 employees. Firms with more than 10 years experience were 35 whereas the multinationals were 16 and falling in the category of large firms save for two. Raw material was sourced equally both locally and internationally. The biggest market for the finished products was domestic representing 66%. This tallies with the small number of respondents who indicated that they encountered export trade barriers.

It was noted that half of the respondents were members of certain environmental management bodies or movements. The most notable were NEMA, ISO where three firms indicated certification of ISO 14001 and ISO 22000, SACCO and NQA Those subjected to environmental audits were 2/3 of the total respondents. The remaining 1/3 were either in the food and beverage sector producing water, paper and paperboard and a majority of the small firms.

### **4.3 Determinants of environmental impact**

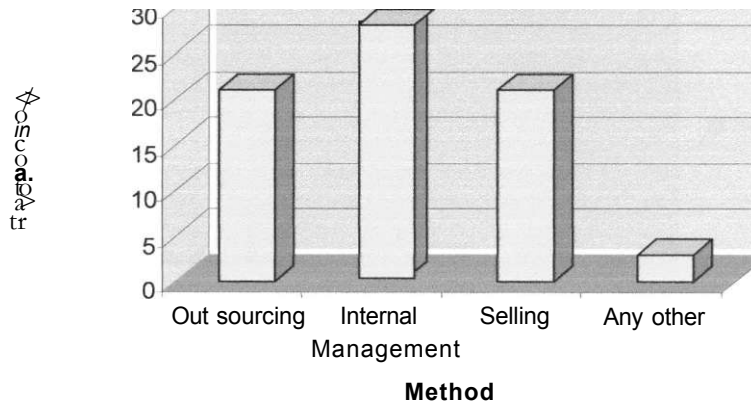
This was assessed by presenting questions on waste generation, energy consumption and resource use followed by environmental impact assessment.

#### **4.3.1 Waste generation**

Questions in this section entailed assessment of volume and nature of waste produced and the disposal methods used. There was strong evidence of high volumes of waste generated by the firms where three quarters of them produced more than a ton per month. Most of this waste fell under the category of biodegradable and un-biodegradable. Other forms of waste included toxic and **hazardous** waste which was produced in minimal amounts.

A look at the disposal methods show that out of the three disposal methods, internal waste management method was more commonly used. This included discharge of waste through the city council water sewage system. With outsourcing waste management and selling, it means there could be environmental challenges for which the producer has transferred responsibility to a third party. This also presented a high response rate as shown in figure 4.1.

**Figure 4.1: Waste Disposal Method**



Source: Research data

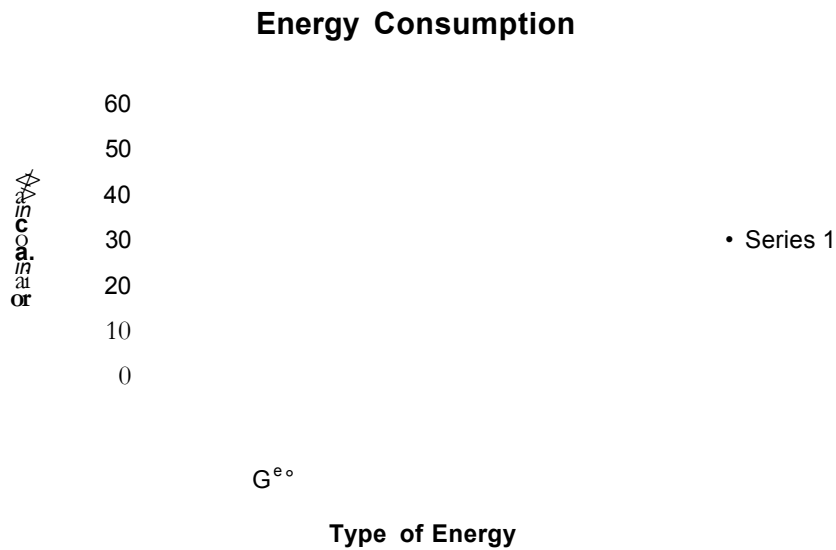
#### **4.3.2 Energy consumption**

Depending with the source and type of energy, there are both negative and positive environmental impacts. Thus, hydroelectric, petroleum and wood energy harm the environment while solar, geothermal and bio-gas does no harm to the environment and in addition they are cost effective.

Respondents were presented with questions on type of energy used in their operations. The results reviewed that, almost all the firms used hydroelectric power with petroleum as the alternative, but none used geothermal (figure 4.2). This may be construed to mean that energy considerations do not count in terms of environmental impact for most of the manufacturers in Kenya.

In regards to resource use, six categories that give some approaches for effective resource use were listed namely; use of energy savers, waste material as raw material for another, recycling, automation, material standardization and use of biodegradable material. The use of all of them was found to be sub-optimal.

Figure 4.2: Type of Energy used.



Source: Research data

#### 4.3.3 Nature and level of environmental impact

Table 4.2 shows the means obtained through the assessment of environmental impacts under five main categories and by ranking responses from no impact to very high impact. There was strong evidence that generation of solid and water waste was high in polluting the environment followed closely by air, noise and dust pollution. However, there were a number of firms whose operations appeared not to cause any harm to the environment. These were mainly in the food and beverage sector because of those producing water. Construction affected the soil structure the most. The standard deviations were also computed to show how the responses were distributed. Figure 4.3 shows the level of impact per sector.

Table 4.2; Environmental Impact Assessment

Environmental impact	Air, noise and dust	Generation of solid waste	Public health and safety	Occupational health and safety risk	Disturbance of soil structure
Valid	53	% 52	52	52	52
Missing	5	6	6	6	6
Mean	1.02	1.50	.88	.87	.58
Std. Dev	.990	.939	1.041	.886	1.036

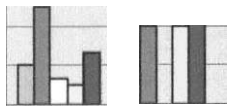
Source: Research data



Figure 4.3: Environmental Impact per Sector

### Environmental impact per Sector

4.50  
4.00  
3.50  
3.00  
2.50  
2.00  
1.50  
1.00  
0.50  
0.00



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Sector

- Air, noise and dust
- Public health and safety
- Disturbance of soil structure

- Generation of solid waste
- Occupational health and safety risk

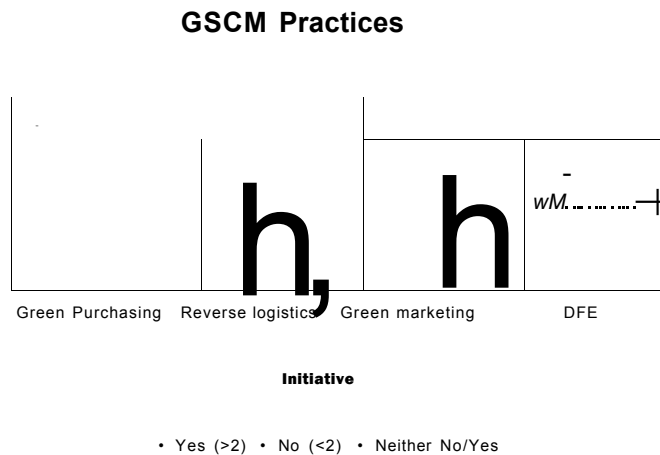
Source: Research data

In conclusion, the high generation of solid waste and waste water followed by other pollutants, disposal of waste by means where the responsibility of the manufacturer ends at the firm, high usage of hydroelectric as opposed to other sources of energy, clearly show the state of affairs in terms of environmental impacts.

#### 4.4 The Practice

Four GSCM practices namely green purchasing, design for environment, reverse logistics and green marketing were evaluated by considering those who had at least three yeses to the at least seven of the listed activities associated with the practice. All but reverse logistics appeared to be on almost the same level. The activities listed under reverse logistics included use of returnable packaging material, giving of incentives for return of packaging material and shared transport. These three were not regarded as important and no wonder the practice lagged behind the rest. Green marketing expressed the view for corporate social responsibility where participation in green initiatives such as tree planting was selected by many. The table below shows the spread of the responses including non responses and those who responded to two or less yeses.

Figure 4.4: GSCM Practices

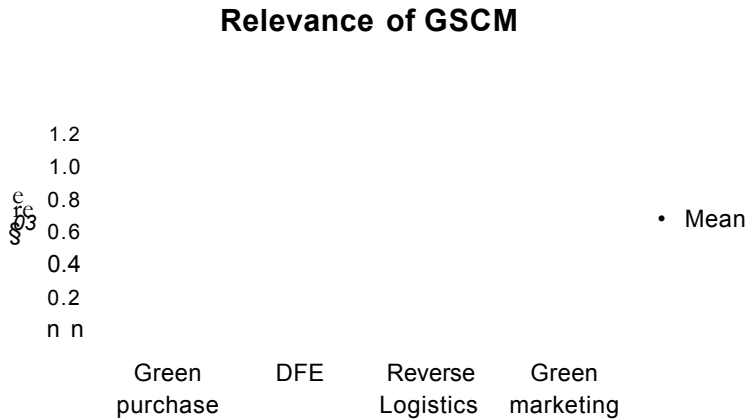


Source: Research data

#### 4.4.1 Relevance of GSCM

Questions to collect views from respondents on how relevant GSCM practice was in overcoming environmental challenges, reviewed that DFE was the most relevant. Reverse logistics on the other hand did not appear so popular.

**Figure 4.5: Relevance of GSCM**



Source: Research data

Consequendy, views on who should be responsible for implementation of green initiatives reviewed that among the stake holders, the manufacturer followed by both the government and the society in that order should be responsible. Others but to a small extent included the non governmental organizations (NGOs).

**4.4.2 Drivers of GSCM**

Five major drivers of GSCM were identified and ranked on Likert scale five to one to assess their influence on adoption of green initiatives. All the five identified drivers were found to have very strong influence with requirement by financial enterprises occupying the lower position alone (table 4.3). ITie standard deviations are indicative of how the responses valid considering the large number of sctors that were considered.

Table 4.3

<b>Drivers of GSCM</b>	Demand	Regulation	Own Initiative	Competition	Financial Enterprise
Valid	51	51	51	52	51
Missing	7	7	7	6	7
Mean	1.10	1.27	1.61	1.35	1.98
Std. Deviation	1.082	1.097	1.282	1.101	1.157

Source: Research data

### 4.4.3 Extent of Challenge Encountered along the Supply Chain

To assess extent of challenges encountered respondents were asked to rate the extent of challenge on Likert scale five to one where one was very challenging to no extent. Challenges along the supply chain were experienced in varying degrees as shown by the means. The standard deviations indicate that whereas some experience big challenges at one stage others did not experience any challenge. There are still others who are not aware of the impact. The data confirms supply chain management is a necessity for all industry players.

Table 4.4

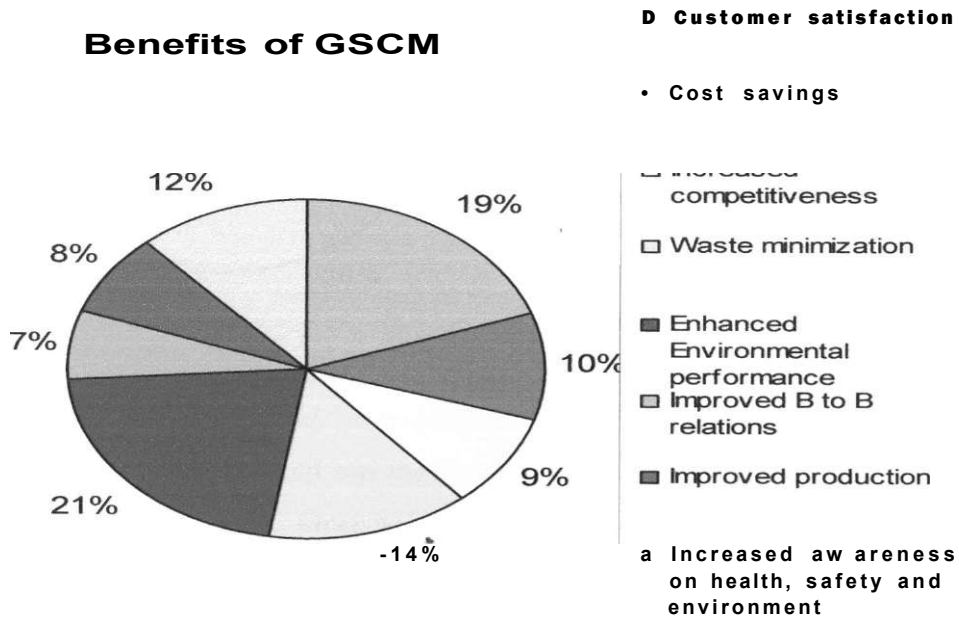
Extent of challenges along supply chain	Acquisition	Production	Selling/Marketing	Distribution /Logistics	Disposal
Valid	53	52	53	53	53
Missing	5	6	5	5	5
Mean	1.66	1.73	1.79	2.19	2.28
Std. Deviation	1.270	1.285	1.350	1.287	1.561

Source: Research data

### 4.4.4 Benefits

An evaluation of how beneficial GSCM would be, reviewed the importance attached to each benefit as shown in the figure below.

Figure 4.6: Benefits of GSCM



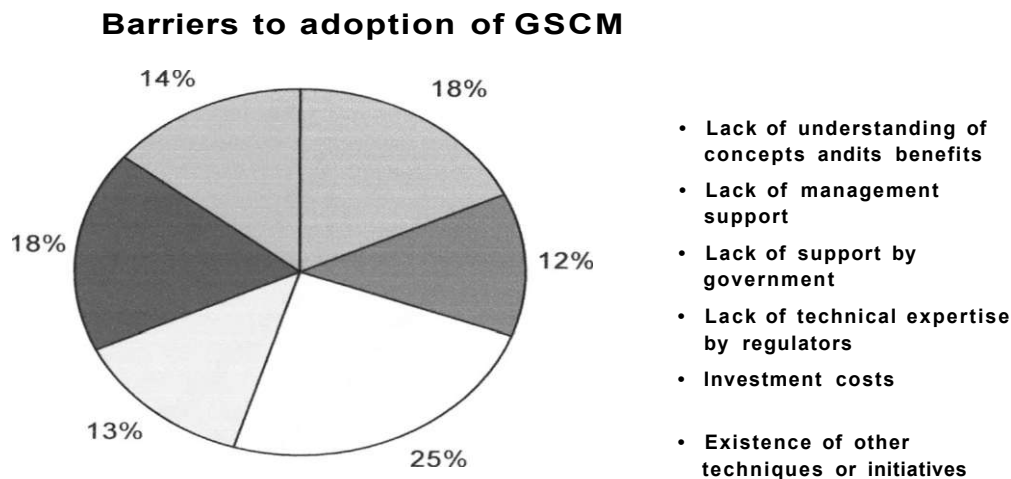
Source: Research data

The enhancement of environmental performance, customer satisfaction and waste minimization were the most beneficial. Improved business - to - business relations and improved production were not found very beneficial as represented by the table below. The results tally with the main objectives of GSCM which is viewed as one of the best approaches towards sustainable environment.

#### 4.5 Factors Hindering Implementation

To identify the challenges associated with the implementation of GSCM practices the respondents were asked to rate the six identified factors which hinder implementation. The results reviewed that lack of government support, lack of understanding of the concept and its benefits and investment costs have played a crucial role in the slow adoption of GSCM as demonstrated by the table below where views were collected by ranking responses at a scale of four starting with great extent to no extent.

**Figure 4.7: Barrier to Adoption of GSCM**



An investigation on who should be responsible for the implementation of GSCM initiatives reviews that manufacturer should top the list followed by government and the society. Others such as NGOs may contribute. Once again the role of the government in policy implementation was revisited.

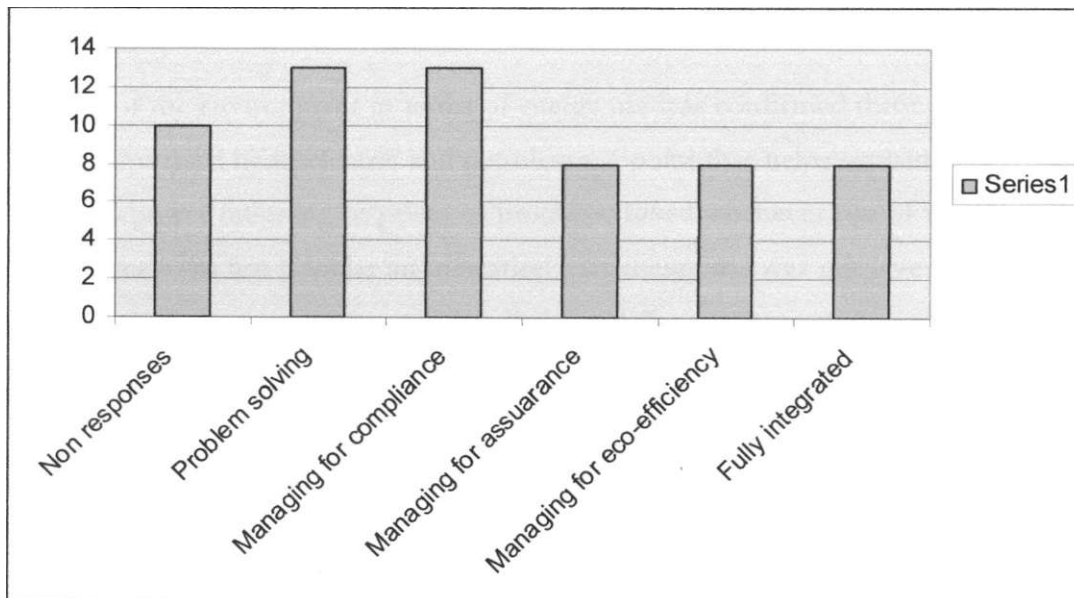
#### 4.5.1 Source of information

Seminars/workshops/exhibitions were found to play a crucial role as a medium for disseminating environmental information followed by the media. KAM agency and others which included researches were not very popular.

#### 4.6 Levels of Adoption

A look at the response on where the different firms have placed themselves in terms of levels of adoption shows that 10 out of 60 did not know where to place themselves. Stage one of adoption which is problem solving had a majority from the medium and small enterprises and it was popular together with stage 2 which is termed as managing for compliance. Stages three to five represents high levels of adoption and this is were fourteen out of the sixteen multinationals and a few of the large local firms were found. This is to mean that the GSCM practice is still evolving in Kenya. Figure 4.8 shows the number of respondents per stage.

Figure 4.8: Levels of Adoption



Source: Research data

## CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The empirical investigation which was obtained through structured questionnaires so as to bring out the impact of the manufacturing firms to the environment, the practice and the pressures form the basis of this summary discussion.

### 5.1 Summary

The firms which participated were drawn from the KAM register and it was found that there were both large and small, who belonged to different sectors. The most notable thing is that the environmental impact associated with manufacturing varied from sector to sector and size of organization. It is also quite evident that Nairobi, from where the sample was drawn, faced serious environmental challenges a proportion of which is contributed by manufacturing firms. The firms participate in certain green initiatives such as tree planting, cleaning the Nairobi River, cleaning the city and beautification. These were the most popular green marketing activities. The plastic paper menace did not come out clearly since the response from the plastic manufacturers was very poor. Those who responded from this sector dealt with rubber which had minimal impact to the environment.

The impact of the environment in terms of energy use was confirmed through the research in that almost all firms used hydroelectric and petroleum, a point that helps explain why companies close down due to power rationing or prices of products hiked whenever rise of fuel prices. Alternative energy sources were not popular an indication that energy use was not given due consideration in eco-management. Resource use was handled by different firms differently thus there was no justified generalization other than viewing it as internal management affair.

The first objective was further compounded by the fact that firms interviewed impacted the environment most through solid and water waste generated by their operations. This further supported by Kiyiapi the Permanent Secretary Environment and Natural Resources whose quote refers: "Environmental challenges facing Kenya are complex. A strong environmental policy framework would be a good beginning to address these problems" (Daily Nation October 29, 2007 pg.25).

The second objective of the study is backed by findings which reviewed that where there is environmental degradation as a result of manufacturing activities, governments respond by putting pressure on these firms through legislation and firms respond by reviewing their manufacturing philosophy. Both regulation and demand were found to be key drivers of a GSCM strategy. Competition followed closely. A few firms had been found to have responded by adapting to ISO 14001 which focuses mainly on procedures and systems but says nothing on discharging standards, limits, or test methods. Thus the few firms who were ISO certified were not necessarily at the fully integrated stage of GSCM practices. A great majority were either in problem solving or managing for compliance meaning that the strongest driver is regulation. Also cited as one other factor hindering implementation of GSCM was presence of other techniques which stood at 14%.

An attempt to ascertain the GSCM practices by manufacturing firms entailed picking a few factors (activities) within a category of practice to identify whether these were applicable. This section of the question had the most unanswered questions an indication that may be construed to mean that there was a strong indication of lack of awareness of the strategies. Azzone (1997) argues that the type of environmental strategy a firm carries out depends on the industry the firm operates in addition to the firm size and whether the firm is a multinational. This was indeed the case where multinationals ranked high in understanding the concept as was found in their readiness to respond and in responses to the whole sections of the questionnaires.

Azzone (1997) found that multinationals in Italy were found to practice proactive green programmes which he attributed to the influence of their countries which have high environmental awareness. Firms also adopt a strategy that aims at confirming the company's environmental performance to prescription by regulators. A majority of the Kenya's firms were found in this stage where the adoption is due to compliance and problem solving.

The practice that seemed to be understood was DFE and this may be termed as one where the activities are not necessarily aligned to the environment, but they relate to efficient business operations. No firm named GSCM as an environmental management strategy, nor membership to an environmental body other than ISO, NEMA, NQA and SACCO. Further the findings show that most of the respondents were not aware of the concept and its benefits which stand at 18%. The source of information which was the seminars/workshops/exhibitions is indicative of lack of a body to push forward the strategy.



The third objective was to find out what challenges the firms encounter or may encounter in an attempt to adopt GSCM practices. The results show a strong indication of lack of government support as a major hindrance. This is compounded by the Minister for Environments' statement as late as October 2007, which says that, the country has been operating without an overarching environmental policy (Daily Nation October, 2007). The investment costs and lack of understanding of the concept and its benefits are other issues that affect implementation of such a strategy.

## **5.2 Conclusion**

According to Beamon the supply chain concept may grow out of recognition that the process of transforming raw materials into final products and delivering those products to customers is becoming increasingly complex. This study has shown that manufacturers in Kenya though faced with certain environmental challenges do not have serious distribution and disposal problems.

The management of most of the firms is supportive of green change because of its benefits. However, the field does not seem to be ready for a green change because of government laxity in implementation of policies that support GSCM. Such policies would include green purchasing policy like that of Japan and other environmental related policies that were found lacking.

This study has helped to review the level and characteristic of the GSCM practice with the conclusion that the concept of greening the entire supply chain is lacking. Attempts to overcome environmental challenges through practicing some aspects of GSCM were evident but not indicative of full adoption of the strategy. For example, most of the multinationals were found to be high in environmental awareness even though their operations had very minimal environmental implications. These include those in the motor industry and food and beverage sector.

GSCM practice has a place in Kenya if the awareness is created. This calls for the need to address all the factors raised as factors hindering the implementation in the process of this study.

## **5.3 Recommendations**

The study recommends the creation of awareness of the role of GSCM practices for the benefit of all the stakeholders and for sustainable economic and environment. The research strongly

supported the view that to green the environment requires collective responsibility by the manufacturer, society, the government and NGOs.

The government should speed up the process of drawing up the environmental policy whose input should include those of the manufacturers, professionals from the fields of operations management, purchasing, marketing and academic institutions to mention but a few.

#### **5.4 Limitations of the Study**

The first challenge was to do with data collection cost, time and the unwillingness of respondents to participate. The plastics and metal sectors posed the greatest challenge and greatly hampered the expected response rate. The topic too posed a challenge because a majority of the small firms did not understand it and therefore creating the need for more time and also calling for clarification.

#### **5.5 Suggestions for Further Research**

The study shows that more can be learnt about GSCM practices by accommodating more views from the players. This study gives room for a descriptive study as now some insight has already been obtained. Thus there is need for a similar study targeting fewer sectors since even one sector in itself was already heterogeneous, for instance the food, beverage and tobacco behaved differently.

The findings of the study also raise a number of additional research questions which may include similar research on the service sector and the role of the government in the implementation of GSCM practices.

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## Appendix A

School of Business  
Department of Management Science  
University of Nairobi  
P.o Box 30179, Nairobi

1<sup>st</sup> October, 2007

To whom it may concern.

Dear Respondent,

### **RE: MBA RESEARCH PROJECT QUESTIONNAIRE**

In reference to the above, I am a student at the University of Nairobi pursuing a Masters degree in operations management (MBA). As part of my study, I will appreciate your input in terms of response to the questionnaire am presenting to you.

The information I seek is on Green Supply Chain Management (GSCM) a concept applied by firms in response to environmental challenges faced by most enterprises ('green' means environmental friendly). Your criterion for selection is on the basis of Kenya association of Manufacturers membership register as at 2006. The information you give will be purely for academic purposes and will be treated with confidentiality.

Thanking you in advance for your participation.

Yours faithfully,

#### **Student**

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#### **Supervisor -Lecturer**

O. Nyamwange  
University of Nairobi

# APPENDIX B: QUESTIONNAIRE

## SECTION I: GENERAL INFORMATION

1. According to Kenya Association of Manufacturers (KAM) membership status 2006, please select your sector from the table below and state your major products?

Sector	Tick	Major products
Building, construction and mining		
Chemical and Allied		
Energy, Electrical and electronics		
Food, Beverages and Tobacco		
Leather products and Footwear		
Metal and Allied		
Motor Vehicle Assembly and Accessories		
Paper and Paperboard		
Pharmaceutical and Medical equipment		
Plastics and Rubber		
Textile and Apparels		
Timber, Wood Products and Furniture		

2. Size of the enterprise on the basis of annual turnover

Below turnover of Kshs 3.6m (Small)

3.6m to 10m (Medium) [ ]

Over 10m (Large)

3. How many employees does your firm have?

Below 50 [ ]

Between 51 and 500 [ ]

Over 501 [ ]

4. State type of ownership/ headquarter

Local

Multinational [ ]

Any other (state)

5. Period/experience of operation

Less than 5years

5-10years

10-20years

Over 20 years

6. In the absence of an operations or supplies department, who makes the buying decision?

Finance department

Marketing department

Director

Any other (state)

7. State the main raw materials used in your production processes?

Indicate the source of these raw materials accordingly.

Local

Import

Any other (state)

8. Where is the market for your manufactured goods/products?

Domestic

Export

9. State any environmental management bodies/movements you are members of?

10. Are you subjected to environmental management audits?

**Yes No**

**[ ] [ ]**

11. Are you classified as a large manufacturing enterprise by the NEMA



**SECTION II: THE PRACTICE**

12. What is the main component of waste produced by your production processes?

13. What category<sup>7</sup> of waste is it?

Hazardous

Biodegradable

-jj Q(\AM~biodegradable

[ ]

Any other (state)

14. What is the approximate volume of waste produced by your firms per month?

Below a ton

Between1- 3tons

Over 3tons

15. How do you dispose of waste?

Out sourced waste management service

Internal waste management

Selling

[ ]

Any other (state)

16. Select the extent by which the following environmental impacts arising from manufacturing

Operations vary according to your processes: No impact (1) Little impact (2)

Moderate impact (3) strong impact (4) Very strong impact (5)

<b>Types of environmental impacts</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Air, noise and dust pollution					
Generation of solid waste and waste water					
Public health and safety					
Occupational health and safety risks					
Disturbance of soil structure					

## Green Purchasing

17. Listed below are some purchasing activities firms carry to promote the environment.

Please indicate those practiced by your firm by ticking in the box for Yes or No.

**Yes No**

Do you consider environmental issues in your choice of raw material?

Do you use environmental issues in your criteria for selecting suppliers?

Do you have a staff to coordinate environmental purchasing efforts?

Are you familiar with "green" products and suppliers?

Do you allow end users to make final decisions after evaluation?

Do you buy or lease refurbished goods?

Do you have any published successes and lessons on environmental savings? [

## Design for environment

Listed below are some activities within manufacturing that are associated with environmental conscious manufacturing practice.

Please indicate those practiced by your firm by ticking in the box for Yes or No.

18. Do you employ the following resource utilization controls? **Yes No**

Use of energy savers

Use of waste material as raw material for another

Use of recycled materials

Automation

Use of biodegradable materials

Do you standardize materials?

Any other.....•

19. Do you use the following types of energy in your production operations? **Yes No**

Hydroelectric

Petroleum

Geothermal

Solar

[ ] [ ]

Wood

\*

[ ] [ ]

Any other

20. In your design for products, do you consider the following environmental friendly practice?

**Yes No**

- Design of products for reduced consumption of material/energy
- Design of products for reuse, recycle or recovery of material
- Design of products to avoid or reduce hazardous products or processes [
- Cooperation with customers for eco-design
- Providing design specifications to suppliers of green purchased items

21. How often do you review the designs of product or manufacturing processes?

- Every year
- When need arises
- Hardly ever

22. What is the force behind new product designs (environmental friendly) by your firm?

Indicate the extent of each by choosing a number as follows:

Very strong-force (1) Strong force (2) Moderate (3) Little force (4) Not at all (5)

<b>Reason behind new product designs</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Demand					
Regulation					
Own initiative					
Competition					
Financial enterprises					

### **Reverse Logistics**

23. Refer to some of the reverse logistics activities manufacturing firms practice and

select those applicable to your operations by ticking Yes or No.

**Yes No**

- Do you use returnable packaging material?
- Do you charge a fee for replacing of packaging materials
- Do you have shared transport arrangement with you suppliers
- Do you offer incentives for return process or materials
- Do you value product trade-in arrangements
- Do you have warehousing arrangements

## Green Marketing

24. From the listed green marketing initiatives, select those practiced by your firm. **Yes No**

Do you get demands for green products?

Does your firm participate in socially responsible environmental initiatives such as tree planting, cleaning rivers and others?

Do you educate consumers on the benefits of organic products and food safety? [ ]

Do you produce to meet customer demand for green products?

Do you consider the cost of supplying green products challenging

Do you sponsor any environmental-conscious programmes or movements?

Do you consider your competitors 'green' strategies?

25. What benefits would you associate with the adoption of green supply chain strategies and to what degree? High benefit **(1)** Little benefit **(2)** No benefit **(3)**

<b>Benefit</b>	<b>1</b>	<b>2</b>	<b>3</b>
Customer satisfaction			
Cost savings			
Increased competitiveness			
Waste minimization			
Enhanced environmental performance			
Improved business-to-business relations			
Improved productivity			
Increased awareness on health, safety and environment			

26. How did you learn about green supply chain initiatives? Choose from the given options:

Media [ ]

Seminars / workshops / Exhibitions

KAM agency [ ]

Any other

27. In your own opinion, who should be responsible for green initiatives?

Organization / manufacturer

Government

Society \*

Any other

**SECTION III: CHALLENGES**

28. Common constraints to healthy business environment Yes No

Do you experience trade barriers with your products for export?

Do you experience importation barriers

Have you lost business due to environmental requirement

Do you conflict with authority due to waste management issues?

29. Indicate the extent of the environmental challenge you encounter at different stages of the supply chain as follows:

Very challenging (1) challenging (2) No idea (3) Little challenge (4) No challenge (5)

Supply chain stage	1	2	3	4	5
Acquisition of raw materials					
Production					
Selling/marketing					
Distribution/Logistics					
Disposal					

30. Show degree to which changes initiated environmentally have impacted your operations

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

	1	2	3	4	5
Cost					
Efficiency					
Quality					
Delivery					
Flexibility					

31. Of the following green supply chain management initiatives, select and indicate the extent by which you consider them relevant in overcoming environmental challenges.

Very relevant (1) Relevant (2) No opinion (3) Little relevance (4) No relevance (5)

GSCM initiatives	1	2	3	4	5
Green purchasing					
Design for environment					
Reverse Logistics					
Green Marketing					

32. What would you cite as factors hindering the implementation of green supply chain in your firm and to what extent? Show by ticking against the numbers given.

Great extent **(1)** Moderate extent **(2)** Very small extent **(3)** No change **(4)**

<b>Factors</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Lack of understanding of the concept and its benefits				
Lack of management support				
Lack of support by the government				
Lack of technical expertise by regulators who impose it				
Investment costs				
Existence of other techniques or initiatives				

33. For how long have you had green/environmental policies in your organization if any?

Less than 3years

Between 3 to 8 years

Over 8 years

34. At what stage of environmental management would you place your firm?

Problem solving

Managing for compliance

Managing for assurance

Managing for eco-efficiency

Fully integrated

THANK YOU FOR YOUR COPERATION