

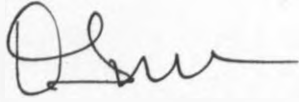
**A SURVEY OF GREEN SUPPLY CHAIN  
MANAGEMENT PRACTICES IN THE PETROLEUM  
MARKETING FIRMS IN KENYA**

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D6I/70505/2009**

**A Management Research Report Submitted In Partial Fulfillment of the  
Requirements for the Award of the Master of Business Administration (MBA)  
Degree, School of Business, University of Nairobi**

## DECLARATION

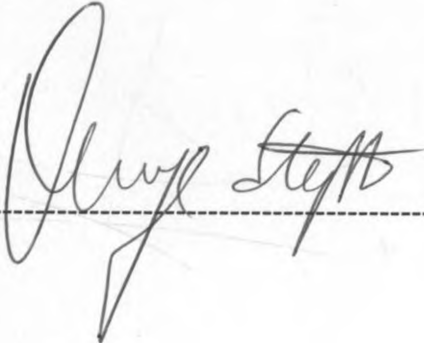
I declare that this research project is my original work and has not been  
Presented for the award of any other degree in any other university

Signed: -----

Date: 05/11/2011-----

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This research project has been submitted for examination with my approval as the  
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## **DEDICATIONS**

I would like to dedicate this MBA research to the Department of Management Science, University of Nairobi. There is no doubt in my mind that without their continued support and counsel I could not have completed this process.

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I would like to acknowledge the inspirational instruction and guidance of my supervisor S.O.Nyamwange and Moderator Thomas Ombati for the support they accorded me while conducting this research. Both of these men have given me a deep appreciation and love for the beauty and detail of this subject. The MBA office was there whenever I required assistance, thanks for your support. I won't forget my program mates whom we traveled together this journey.

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## ABSTRACT

This research surveyed current green supply chain management practices adopted by the petroleum marketing firms in Kenya and establish green supply chain management extent. To survey current green activities in the petroleum marketing firms in Kenya, 29 firms were surveyed to provide in-depth interview on green procurement, green manufacturing, green distribution, waste management and reverse logistics. To establish current green supply chain management, a questionnaire to investigate GSCM practices, measure GSCM performance, and explore GSCM pressure/driver within Kenyan petroleum marketing firms was used to obtain survey results. Further, suggestions on how to develop and adopt GSCM in the petroleum industry are presented.

The current study revealed that internal environmental management, investment recovery and green distribution emerged the major GSCM practices being considered currently and being adopted to some degree by the petroleum marketing firms in Kenya, This result indicated that the adoption of GSCM practices had a positive relationship with the environmental performance of the petroleum marketing firms. Further, the current research showed that the pressure on petroleum marketing enterprises to adopt green supply chain management practices mostly come from the government environmental policy of environmental regulatory factors, regional environmental regulations and green movement activism pressures. It was found that mostly GSCM adoption by petroleum marketing firms is for problem solving and compliance to ERC and NEMA regulatory requirements.

To be efficient and effective in GSCM, collaboration among important stakeholders in the petroleum marketing firms supply chain must be strongly concerned. This 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 development. The research strongly supported the view that to green the environment requires collective responsibility and cross-functional cooperation for environmental improvements by the petroleum marketing firms, society, the government and Non governmental organizations.

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# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the study

An increasing number of consumers and businesses are choosing safe and environmentally friendly products when making a purchase decision. In addition, global health and environmental legislations and standards are requiring compliance by manufacturers, retailers, brand managers, traders, and distributors. Diffusion of environmental practices throughout the supply chain has garnered significant attention over the past couple decades (Sarkis et al., 2011).

Initially, organizations focused on reactive internal initiatives to improve environmental performance through the introduction of environmental management systems and compliance with regulations (Hoffman, 1997; Revell, et al., 2010). This internal focus on improvement of environmental operations and performance has started to shift to inter-organizational collaboration within the broader supply chain, as organizations increasingly realize that the savings from low-hanging fruit of internal environmental operations improvements have been increasingly harder to come by (Carter & Rogers, 2008; Walley & Whitehead, 1994).

Business all over the world is currently threatened by globalization of markets, short product life cycles, and need of lower costs and ever increasing demands of the customer. The environment, in particular, global warming, is attracting considerable attention today from the media, academics, analysts, and the business community.

Companies are optimizing transportation operations and reducing their energy consumption. They are exploring ways to recycle and reduce packaging in their products. The expansion of green consciousness globally makes the business case for green a compelling one. Capturing the green advantage involves incorporating green strategies into planning, processes, products and promotions, reducing costs in some areas and improving materials and ingredients in others and making sure customers understand the benefits of being green ( Green Supply Chain Forum, 2008)

### 1.1.1 Green Supply Chain Management

Green supply chain management (GSCM) is an emerging field that strands out of the traditional supply chain and environmental perspectives. GSCM has gained popularity with both academics and practitioners to aim in reducing waste and preserving the quality of product-life and the natural resources. Global market demands and governmental pressures are pushing businesses to become more sustainable (Guide & Srivastava, 1998; Gungor & Gupta, 1999).

GSCM concept, definition and terminology over the years have variations including: sustainable supply network management (Cruz and Matsypura, 2009; Young and Kielkiewicz-Young, 2001); supply and demand sustainability or corporate social responsibility networks (Cruz and Matsypura, 2009; Kovács, 2004); supply chain environmental management (Lippman, 2001; Sharfman et al., 2009); green purchasing (Min and Galle, 1997) and procurement (Günther and Scheibe, 2006); environmental purchasing (Carter et al., 2000; Zsidisin and Siferd, 2001); green logistics (Murphy and Poist, 2000) and environmental logistics (González-Benito and González-Benito, 2006); sustainable supply chains (Linton et al., 2007).

Srivastava (2007) defines GSCM as integrating environmental thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life.

In Kenya, ground water, air, human and animals healthy and safety and land damage present examples of the main environmental challenges caused by petroleum products, activities and services with levels of pollution ranging from toxic industrial waste, oil and gas leakages, end-of-life lubricant packages, product spills, tanker accidents, fires, emissions to the atmosphere, interceptor effluence and illegal oil makeshifts (depots) which cause greater environmental burden. According to Kenya National Cleaner Production Centre (KNPC), the solution to reduce this pollution and to restore the quality of the environment lies in adoption of contemporary tools of environmental management such as green supply management, eco design, cleaner production, environmental accounting and life cycle analysis.

There are different motivators for companies to switch to greening their supply chains. Although some of the motivators are quite unclear (Wu & Dunn (1995) suggest that some organizations are simply doing this because it is the right thing to do for the environment. Perhaps some are more radical to environmental change, but others may not (Wu & Dunn, 1995). Studies, however, have shown that profitability and cost reduction are some of the main motivators for businesses to become 'green' in the supply chain (Srivastava & Srivastava, 2006; Srivastava, 2007; Darnall et al., 2008). Johnson (1998) argues that reverse logistics are motivated primarily by economic factors and not concerns about protecting the eco-system.

The United States Environmental Protection Agency (EPA) issued a guide entitled 'The Lean and Green Supply Chain: A Practical Guide for Materials Managers and Supply Chain Managers to Reduce Costs and Improve Environmental Performance'' (McDaniel et al. 2000). This guide provides a systematic approach to implementing a green Supply Chain. The proposed model is created through a collaboration program with US industry, trade associations, research institution, and government agencies. In a manufacturing process, the company can apply green by several methods to reduce the energy and resource consumption. This is where reuse and recycling are referred.

The Chinese sugar refinery and Indian paper firm case studies brilliantly apply the green '3R' s principle of 'Reduce, Reuse and Recycle'; with both firms diversified into related industries like sugar, paper, alcohol, cement and ethanol and utilize the waste products of other industries as raw material or for power generation. For example, in a Chinese sugar manufacturer, Guitang Group can reduce the wastes and improve their financial performance by using waste from the upstream as raw materials for downstream production (Zhu & Cote, Integrating Green Supply Chain into An Embryonic Eco-Industril Development: A Case Study of the Guitang Group, 2004).

Environmental issues under legislation and directives from customers are an important concern in the oil industry in Kenya. To survey current green activities in the petroleum marketing firms in Kenya, 29 firms will be studied to provide an in-depth interview on green procurement, green manufacturing and remanufacturing, green distribution, waste management and reverse logistics. The petroleum products

traded include bitumen, fuel oil, industrial diesel oil, premium, regular, kerosene, diesel, LPG and lubricants. Also involved are suppliers, customers, petroleum waste oil collectors, petroleum package dealers, waste packages, illegal depots, disassembly/recycle plants, and final chemical treatment/landfill companies ((PIEA, 2010 & Industry of Green Supply Chain Management Model and Content-Enterprise Resource Papers,2011)

### **1.1.2 The Petroleum Industry in Kenya**

The petroleum industry includes the global processes of exploration, extraction, refining, transporting and marketing. The largest volume products of the industry are fuel oil and gasoline (petrol). It is a raw material for pharmaceuticals, solvents, fertilizers, pesticides, and plastics (Petroleum Industry, 2011)

The industry is usually divided into upstream, midstream and downstream. Waste and pollution attract much attention in the petroleum industry. Oil exploration, production, development and marketing lead to oil leakages and evaporation causing ground water and air pollution, land damage, property destruction and affect animals and humans health and safety. Therefore, we must attach great importance to oil production in various sectors of security, environmental protection and energy conservation management.

Information extracted from Petroleum Insight, The Magazine of the Petroleum Institute of East Africa (PIEA), 2010, shows that Kenya's major source of commercial energy is petroleum and accounts for about 80% of the country's commercial energy requirements. Demand in Kenya is quite small due to the country's underdeveloped economy, which is heavily dependent on labor intensive and rain-fed agriculture systems. The domestic demand on average stands at 2.5 million tons per year, all of it imported as crude or as refined petroleum products. Liberalization in 1994 led to new companies establishment. Government and foreign companies dominated the Kenyan market before liberalization in October 1994.

Cheng & Wu (2004) note that oil companies strive to strengthen supply chain management, optimization and coordination of the supply chain to maximize value, but ignore the supply chain activities' negative impact on the environment like

resource depletion, ecological destruction and environmental degradation. The oil Industry is an important source of pollution. Petroleum products in themselves are non-renewable pollutants likely to cause the atmosphere, groundwater and marine pollution. Also the oil and gas exploration, development, refining, storage and transportation processes easily pollute and damage the environment of the entire oil supply chain..

ERC (2010) website indicates that there is more awareness today about the impact of human activity on the environment than there ever was in the history of mankind. The production, conversion and use of energy are recognized as one of the major contributing factors to environmental degradation, including atmospheric pollution, land degradation and global warming. To address these concerns, the Government of Kenya enacted the Environmental Management and Co-ordination Act, 1999, (EMCA 1999) which is framework legislation for the sustainable management of environmental and natural resources.

The Energy Act No. 12 of 2006 empowers Energy Regulatory Commission (ERC) in Section 6(c) to formulate, enforce and review environmental, health, safety and quality standards for the energy sector, in coordination with other statutory authorities. Section 98(1) requires petroleum business operators to comply with the relevant Kenya Standard and in the absence of such standard any international standard approved by the Commission from time to time on environment, health and safety in consultation with the relevant authorities and in conformity with the relevant statute (Energy Act, 2006)

## **1.2 Statement of the problem**

With the increase in environmental concerns during the past decade, a consensus is growing that environmental degradation issues accompanying industrial development should be addressed together with supply chain management, thereby contributing to green supply chain management (Sheu et al., 2005). Davies et al (2007) note 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.

Many scholars and academicians argue that GSCM is a recent innovation: Kleindorfer, singhal and wassenhove (2005) carried out research on sustainability including integrating environmental management, green product design and closed-loop supply chains. Trowbridge (2006) studied environmental practices of advanced micro devices (AMD) and their ability for greening the supply chain. Torunick (2006) discussed the importance of the logistic companies being more concerned on the GSCM. Srivastava (2007) conducted empirical studies related to green and sustainability supply chain. In the packaging Industry, results from a survey shows that green supply chain practices are positively linked to operational performance.

Designing of eco-friendly products and services is high on Petroleum marketers' environmental, economic, social and political agenda to minimize or eliminate the negative ecological effects though networking may be a challenge. According to Rao (2005), there exist potential linkages between green supply chain management as an initiative for environmental enhancement, economic performance and competitiveness. According to various authors on GSCM, adoption of the strategy may take various forms and reasons for adoption ranging from legislation, customer demand, own initiative and competitiveness.

Research carried out in countries such as China, US, UK and Japan show increased interest in adoption of GSCM strategy for environmental sustainability, economic benefits and competitiveness. For China, investment recovery and eco-design are 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.

In Kenya, Mwirigi (2007) did a study on green supply chain management practices by manufacturing firms in Kenya, and found out that the adoption of GSCM was way below expectation. Most manufacturing firms admitted being at the problem solving stage or managing for compliance in terms of environmental management. Kalama (2007) studied green marketing practices by Kenya petroleum refineries: A study of the perception on the management of oil marketing companies in Kenya and found out that the Kenya Petroleum Refineries is perceived to be practising green marketing

by the management of the oil marketing companies but failed on doing enough to give back to the society.

These studies failed to address the issue of GSCM practices implementation by the oil marketing companies. This study seeks to fill this gap by undertaking a survey on the adoption of GSCM practices in the petroleum marketing firms in Kenya.

The oil and gas concerns occasioning this study encompass, pollution of the environment by the petroleum firms' production and service activities, stringent NEMA & ERC regulations, declining profitability, increased competition and cost of operating, demand for environmentally friendly products and services by customers, government price controls, and, the exodus of oil multinationals from the local scene due to poor business regulatory regimes coupled with declining performance. Ecological side effects caused by oil spills and emissions have led to waste generation, ecosystem disruption and the depletion of natural environment.

Therefore, GSCM is an operational innovation that petroleum firms may adopt to address environmental concerns, such as, complying with stringent environmental regulations, addressing the environmental concerns of their suppliers and customers, and to mitigate the environmental impact of their production and service activities. It may be seen as an initiative through which petroleum firms attempt to answer the question; what is product stewardship?

These effects and concerns call for the need to explore the adoption of GSCM practices in the oil industry considering the current state of affairs, empirical evidence in other parts of the world, and as an attempt to answer the questions: Are the petroleum marketers still in the 'early adopter' phase of greening their supply chains or is this trend more widespread? What factors are driving petroleum companies to become more green? How is GSCM practices adoption influencing performance? Simply stated, what is the current state of Green Supply Chain management practices implementation in the petroleum marketing firms in Kenya?

### **1.3 Objective of the study**

The purpose of this research is to survey current green activities in the petroleum marketing firms in Kenya and to evaluate green supply chain management. The specific objectives of the study are:

- i) To establish current state of GSCM practices adoption in the petroleum marketing firms in Kenya
- ii) To establish the relationship between GSCM adoption and performance of oil firms in Kenya
- iii) To determine the drivers of GSCM practices in the petroleum marketing firms in Kenya.

### **1.4 Value of the study**

In future, implementing a green supply chain will be even more important than it is today. Reasons for this, center around more government regulations, increased awareness for environmental concerns, and a push from customers to be more sustainable. Greening the supply chain is not optional, it's becoming the standard.

#### **1.4.1 Petroleum marketing firms**

The petroleum companies will learn GSCM as a critical business function in assessing and evaluating both economic and ecological benefits associated with its adoption. They will also obtain information on the pressures, practices and how adoption of GSCM influences performance. Information on GSCM adoption constraints will be obtained and strategies to solve such problems sought in Kenya and other similar organizations in the world.

#### **1.4.2 The Government**

The government is regulating environmental policies in the petroleum industry through the Energy Regulatory Commission (ERC) and National Environmental Management Authority (NEMA). The results from this study can act as the source of information in which the government policies on GSCM can be accessed and used in other companies in the country.



### **1.4.3 Academicians and Researchers**

The area of GSCM is relatively young and is still suffering from a shortage of information. This research will help to bring forth unknown information in the petroleum industry that will go along way in facilitating further understanding of GSCM practices adoption. Future researchers will empirically test the relationships suggested in this paper in different countries, to enable comparative studies. A larger sample would also allow detailed cross-sectoral comparisons which are not possible in the context of this study.

### **1.4.4 Strategic Investors**

The study will help strategic investors who provide funding for GSCM in their organizations to better understand the exposure and best opportunity to invest their money. Investors should understand whether GSCM practices adoption have any economical and ecological benefits in the long term. This is because when the word ‘natural environment’ and ‘sustainability’ comes into the picture, most Operations Managers and Stakeholders would see this as a constraint to the organization’s generation of profits.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

This chapter seeks to review the relevant literature available that focuses on the concept of green supply chain management practices adoption. It looks at how other writers and scholars view the concept of GSCM adoption in various organizations.

### 2.2 Supply Chain Management concept

Supply Chain(SC) and Supply Chain Management (SCM) terms were introduced for the first time in the middle of 1980s and later became more widespread in the 1990s (Jones & Riley 1985). The concept of supply chains and supply chain management is a relatively recent managerial principle. The term supply chain also describes the network of suppliers, distributors and consumers. It also includes transportation between the supplier and the consumer, as well as the final consumer, thus the environmental effects of researching, developing, manufacturing, storing, transporting, and using a product, as well as disposing of the product waste, must be considered (Messelbeck and Whaley, 1999, 42).

The field has evolved from a number of sources including purchasing, marketing (distribution channels), logistics, and operations management. The issues include management of inventory, customer-supplier relationships, delivery time, product development and purchasing.

According to Handfield and Nichols (1999), a supply chain encompasses all activities associated with the flow and transformation of goods from raw materials (extraction), through the end user, as well as associated information flows, material and information flow both up and down the supply chain. Chopra and Meindl (2001), state that a supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Supply Chain Council (2007) defines SCM as a process which encompasses every effort involving producing and delivering a final product or service, from the supplier's supplier to the customer's customer.

Kenya faces substantial environmental burden in the oil marketing supply chains. For example, the end-of-life lubricant packages, product spills, tanker accidents, interceptor waste, emissions to the atmosphere, illegal oil makeshifts (depots), products out of specifications, fires, land damage and human health and safety cause greater environmental burden on these companies. The appropriate development of GSCM concepts and practices may indeed aid these oil companies by lessening the environmental burden of both distribution and disposal of products, while potentially improving their economic positioning.

Oil and gas companies are adopting a variety of operational and organizational practices in order to make themselves greener. On the operational side, they have increased supply diversification to include less carbon-intensive fuels, improved upstream productivity, increased pipeline and transportation safety and broadened the downstream product range to include 'greener' outputs like lower sulfur diesel or biofuel blends.

Organizational considerations include new approaches to corporate governance, such as internal greenhouse gas (GHG) emissions trading, and, most importantly, new public relations initiatives. Quite aside from the environmental benefits, carbon reduction and alternative energy projects are seen to have a tangible effect on income. The following extract from Chevron's environmental policy explicitly demonstrates that point: "We also know that a record of environmentally sound operations makes us more competitive in the global marketplace, helps us gain permission to operate and is essential to profitability."

Various sectors of different industries apply different supply chain practices in managing their supply chains. For example, Jaffee et al (2005), found out that 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.



The supply chain of the petroleum industry is extremely complex compared to other industries. Supply chain management in the petroleum industry contains various challenges, specifically in the logistics area, that are not present in most other industries. The logistics network in the petroleum industry is highly inflexible, which arises from the production capabilities of crude oil suppliers, long transportation lead times, and the limitations of modes of transportation. Every point in the network, therefore, represents a major challenge (Jenkins and Wright. 1998). These logistical challenges are a major influence on the escalating cost of oil and its derivatives.

When designing SCM solutions certain challenges are encountered with Karkkainen (2002), taking note of three major ones: 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.**

The issue of greening supply chains is critical for the successful implementation of industrial ecosystems and industrial ecology. Zhu and Sarkis (2004) suggest that GSCM practices consist of four major dimensions: internal environmental management, external environmental management, investment recovery, and ecodesign. Bacallan (2000) suggests that some of these organizations are enhancing their competitiveness through improvements in their environmental performance to comply with mounting environmental regulations, to address the environmental concerns of their customers, and to mitigate the environmental impact of their production and service activities.

Organizations have a number of reasons for implementing these green supply chain policies, from reactive regulatory reasons, to proactive strategic and competitive advantage reasons. Oil marketers may choose environmental strategies to guide them on how to respond to internal and external or anticipated competition. Thus the oil firms according to their own strategic orientations make decisions whether to include

environmental factors into the overall process of strategy formation. Consequently the firm's environmental culture represents one of the most important determinants in the definition of the environmental strategies, which depends on the firm's history, the fields where it operates and the country in which it has its plants.

Various approaches to GSCM practice have been identified by various researches; Lamming and Hampson (1996) explored the concepts of environmentally sound management (e.g. life cycle analysis, waste management, product stewardship and the like) and linked them to supply chain management practices such as vendor assessment, lean supply, collaborative supply strategies, establishing environmental purchasing policy and working with suppliers to enable improvements.

Lippmann (1999) proposes various critical elements for the successful implementation of supply chain environmental management. They include GSCM policies, supplier meetings, training, collaborative R&D, top-level leadership, cross-functional integration, effective communication within companies and with suppliers, effective processes for targeting, evaluating, selecting and working with suppliers and restructuring relationships with suppliers and customers.

Yuang and Kielkiewicz-Yuang (2001) present an overview of current practices in managing sustainability issues in supply networks. Crossfunctional teams, consisting of sales, environmental personnel, purchasing personnel and others from relevant departments, can be found in organizations with the most advanced strategies for sharing sustainability-oriented information like customers/ suppliers sustainability purchasing policy, goals and future targets via open days, recognized standards (ISO14001), technical and performance specifications that its suppliers must meet to be recognized as preferred suppliers and on-site third-party auditing or periodic self-assessment by suppliers.

Rao (2002) argues that GSCM practices should include working collaboratively with suppliers on green product designs, holding awareness seminars, helping suppliers establish their own environmental programs and so on. Zhu et al. (2005) describes a number of GSCM practices implemented by Chinese enterprises to improve their performance. Internal environmental management is a key to improving enterprise

performance in terms of senior manager commitment and cross-functional cooperation. Commitment of senior managers is extremely conducive to the implementation and adoption stages for GSCM, because without such upper management commitment most programs are bound to fail.

Factors and drivers to adopt GSCM in different industries are differently. In a study of (Zhu et al. 2008) Green Supply Chain Management Implications for "Closing. The Loop", developed a survey for 4 industries in China to evaluate their perceived GSCM practices and relate them to closing the supply chain loop. Results showed that automobile industry lagged behind the other industries, power generating, chemical/petroleum and electrical and electronic. They assumed that the reason may result from a high level of complexity in the adoption of GSCM practices.

The motivations that cause organizations to make efforts to implement and develop GSCM are threefold: To meet environmental regulatory compliance. Many organizations which utilize environmental regulatory compliance tend to advance GSCM by screening suppliers for their environmental performance and then by doing business with only those that meet the environmental regulations (Rao, 2002; Min and Galle, 2001). To comply with the needs of markets and customers that prefers to purchase eco-products. To improve the competitiveness of manufacturers so that they may take a more superior position in the market.

### **2.3.1 Green procurement**

Green procurement is to source materials considered environmentally-friendly, recyclable and degradable, and will enable to remove waste. Chen (2005) proposes that green purchasing provides a positive effect on the implementation of ISO 14001 environmental management. Oil marketing firms can through an Environmental Quality Management, ISO14001 Environmental Accreditation, HSE management; supplier environmental audits and third-party training achieve green suppliers.

### **2.3.2 Green Manufacturing and Remanufacturing**

Green production in the petroleum industry requires a continuous application of environmental strategies to energy conservation, pollution reduction and energy efficient technology management. There should be frequent production process sewage audit, screening, implementation of pollution prevention and control measures to reduce the human and ecological risks. This will maximize the prevention of pollution, increase economic efficiency, green the oil industry production, including raw materials and energy saving, reducing emissions and strengthen safety management to prevent accidents and other risks. Shane et al (2003), to improve the environmental performance of their products, firms must look to the product planning and design stage. .

### **2.3.3 Green distribution**

Green distribution embraces green storage, green transportation, green packaging and green marketing. Green oil marketing companies look at marketing pricing, promotion and distribution throughout the marketing process, with the guidance of the concept of environmental protection, promote enterprise and society, and consistent with the interests of consumers. Green user requirements of oil and gas products require the process to be reflected in the consumer awareness of environmental protection to avoid environmental pollution, and consciously resist pollution and destruction of the environment.

### **2.3.4. Reverse logistics.**

Rogers and Tibben-Limbke (1998), define reverse logistics (RL) as the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. Green recycling and reuse should give full consideration to recycling costs and use value based on the least cost and to obtain the highest recovery value. Recovery of the waste through landfill, incineration, and chemical treatment and other means to avoid environmental pollution.

### **2.3.5 Waste Management**

Waste Management is the management of waste generation and its impacts through activities such as source reduction, pollution prevention, and disposal. Marguglio (1991) defines waste minimization as reducing hazardous waste generated during production and operations, or afterwards treating, storing, or disposing wastes. Source reduction and pollution prevention strategies try to hinder pollution at the generation source; while disposal is intended to dispose waste after its generation (Marguglio, 1991).

## **2.4 Drivers of Green supply Chain**

Being green and ethical is no longer an option; it is a necessity for all participants in supply chain management. Those companies that have adopted green supply chain management are convinced that being environmentally conscious is a win-win for the business and environment. Some of the key drivers of green supply chain management are:

### **2.4.1 Government**

Governments, national standard institutes, industrial development bureaus, and local authorities have a great impact on industries by passing laws and regulations and controlling the industries to implement these regulations. Agencies implementing the laws and regulations include Environmental Protection Agency (EPA) and National Environmental Management Authority (NEMA).

### **2.4.2 Market and Competitors**

Some studies about the relationship between applying GSCM with customer's requirement (Simpson et al. 2007) explored the moderating impact of relationship between a customer and its suppliers and effectiveness of customer's environmental performance requirements. Due to competition, companies must stand out from others to satisfy their customers by being environmental friendly.

### **2.4.3 Company**

Numerous studies support that adopting GSCM can reduce the company cost (Duber-Smith, 2005), (Stevens, 2002), and (Gunther, 2006). GSCM adoptions also lead to



increasing efficiency, eliminating waste and pollution, and generate brand reputation. In terms of human resources (Duber-Smith, 2005), mentioned that more sustainability enhances employee morale from some green programs such as wellness programs, ergonomic work environment in Chinese industry.

#### **2.4.4 Own Initiatives/Organizational Green Awareness.**

The economical impacts of using old and worn products for purposes such as repairing, reusing, reassembly, refurbishing and recycling on organizational productivity and cost reduction is another important initiative for companies to develop GSCM practices. Some organizations have gone green through their own initiatives of corporate social responsibility, plant trees and collecting wastes where they operate.

### **2.5 Performance of Oil Industry in Kenya**

According to the Petroleum Insight, The Magazine of the Petroleum Institute of East Africa (PIEA), 2010, volume sales for the multinational firms in Kenya have been declining as those of local independent firms grow. The cost of compliance especially in areas of safety, health, environment and business ethics are very high especially in the Kenyan downstream market because retail is no longer an appealing area with margins being generally low. Oil firms are torn between provision of quality service as well as their margins.

The majors are known to uphold values and codes of practice that guarantee consumers good quality service and their exit will compromise quality and pricing. Multinationals who are ready to fully comply with environmental and safety regulations are constrained with the cost of doing it while it places them at a competitive disadvantage compared to smaller companies that do not comply. Sluggish enforcement of regulatory compliance has put compliant companies at a disadvantage in the market

## **2.6 GSCM Performance**

Over the past decade, GSCM has emerged as an important component of the environmental and supply chain strategies for a number of companies. Studies have attempted to explore economic and environmental performance of GSCM. Walley (1994) stated that many managers consider environmental management as compliance with regulations while evaluating tradeoffs between environmental and economic performance.

Zhu et al. (2007) indicates that enterprises implementing GSCM in China have only slightly improved environmental and operational performance and GSCM practices have not resulted in a significant economic performance improvement. Some anecdotal evidence shows that substantial environmental management performance leads to lower manufacturing costs by eliminating waste (Allen, 1992).

A study indicated that environmental performance positively affected financial performance of the firms through both increasing the market share and decreasing cost (Klassen and Mclaughlin, 1996). These studies differ from each other due to the heterogeneity of environmental management practices adopted by organizations and industries (Elsayed and Paton, 2005).

Numerous studies have tried to find the relationship between strategies and environmental performance. Klassen and Mclaughlin (1996) state that environmental management performance is derived from longer term decisions. They also indicated that environmental management is associated with corporate and functional strategies. The performances of environmental management system and the green supply chain were positively related to corporate competitive advantage (Yu-Shan et al., 2006).

## **2.7 Green Supply Chain Performance Measurement**

Oil firms often decide a certain performance criteria and also have to come up with away of measuring that the criteria is met. The firms therefore decide on what indicators they will use to measure their progress in meeting strategic goals and objectives, gather and analyze performance data, and then use this data to drive improvement (Mentzer et al., 2001). The framework used for performance

measurement is Kaplan and Norton's Balanced Scorecard (BSC). It is a management system that maps a firm's strategic objectives into performance metrics in four perspectives: financial, internal processes, customers, learning and growth (Kaplan & Norton, 1996).

The mindset of the BSC is based on the perception of the firm as a profitability machine, which needs to be optimized to reach maximum efficiency through measuring and controlling for mostly company-owned processes. The focus is the single company. Kaplan and Norton (1996) argue that for firms environmental clean is a competitive advantage. Sidiropoulos et al. (2004) refers that there are three possibilities to integrate environmental and social aspects in BSC: i) metrics can be integrated in the existing four standard perspectives, ii) an additional perspective can be added to take environmental and social aspects into account and iii) a specific environmental and social scorecard can be formulated.

Sidiropoulos et al. (2004) & Hubbard (2009) argue that there are specific measures for environmental perspective namely, energy use, water use, material use, hazardous materials use, emissions to water and to air, solid and hazardous wastes. Instead, Sidiropoulos et al. (2004) use relative measures such as percentage of recyclable components, average half life of non-recyclable components, average time span of products and number of substitutes.

## **2.8 Challenges of Green Supply Chain adoption**

In (Zhu & Cote, Integrating Green Supply Chain into An Embryonic Eco-Industrial Development: A Case Study of the Guitang Group, 2004), studied the integration of green supply in sugar industry. They mentioned three barriers: maintaining close relationships with their main suppliers, obtaining a larger market share through competition with other domestic sugar refineries by improving product quality and reducing costs, and ensuring the sustainability of their operations including reducing the environmental impacts. At the same time, there are some research studied barriers of applying GSCM from supplier's perspective.

Wycherley (1999) conducted a qualitative study on the suppliers' barriers of GSCM implementation for an environmental-friendly image products like the Body Shop International. He realized that existing investments, information systems and habits are costly and difficult to change. Perron (2005) summarized that there are 4 barriers found to impede the adoption of green initiatives in SMEs, which are: Attitudinal and perceptions barriers, Information related barriers, Technical barriers, Resources barriers. Cost of designing such a supply chain will pose as an important barrier.

Another concern is that managers today still do not know how to incorporate social responsibility into their daily decisions. To design and implement a successful green supply chain it is vital to make employees understand the concept and to train and development in this project. Firms function as an issue if organizations act with a mind set of environment versus profit. The most important issue created externally would be the poor or bad supplier relationship

Standards, first step for someone new to the green supply chain topic is to understand which standard (s) or rules apply. This provides organizational direction and is a necessary first step. Awareness, green awareness is improving but has been a challenge particularly in Africa. Business Case Development, Corporate social responsibility, competitive pressures, as well as where to use limited capital will be a choke point for multi-national supply chains in the future.

Sustainability Program Implementation is a challenge because organizations don't know which rules or standards to follow. Communications Planning, organizations have to develop a communication strategy early in Green Supply Chain planning process. The communications strategy is keep to driving long term compliance and reducing emission

# CHAPTER THREE: RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter addresses the methodology used in data collection. The purpose of this chapter was to explain the methods and tools used in presenting and analyzing data to achieve and justify relevant information to be used for the topic under study.

## 3.2 Research design

This research is descriptive in nature. Descriptive research was chosen because it is accurate and has a low requirement for internal validity. The two most common types of descriptive research tools are surveys and observation. This study surveyed the adoption of GSCM practices by the 29 petroleum marketing firms in Kenya. The research was a census study covering all the petroleum firms registered by PIEA in Kenya. Saunders (2003) stated that census study examines the whole population without sampling it. It is considered the best research design since it gives total presentation thereby producing highly reliable information. However it is time consuming and utilizes a lot of resource.

## 3.3 Population

The population of interest in this study consisted all the 29 petroleum marketing firms headquartered in Nairobi and was members of the Petroleum Institute of East Africa (PIEA) in 2011. Thus, this study was a census and sought to describe the current status on the implementation of green supply chain management practices in the petroleum marketing firms in Kenya. The method was chosen because the population was small and the area could be accessible.

Noting that the adoption of GSCM practices is across functional activity, the researcher interviewed the HSEQ Department managers from the selected petroleum companies. HSEQ Managers were chosen because in organizations, they are responsible for the health, safety, environmental and quality management of various major and minor M&E projects across the departments. They also produce and approve method statements and risk assessments for installations across the

organizations. Where the petroleum marketing company had no HSEQ manager, the Distribution manager/Procurement and Supply Chain Manager was interviewed.

### **3.4 Data Collection**

Primary data was collected using a combination of “self administered” structured questionnaires in this study. In the questionnaire both open ended and closed questions were asked. Secondary information that was required during the research was obtained from the companies’ records. For this study, the questionnaire contained three sections: GSCM practices, GSCM performance and GSCM driver. GSCM practices questions about current GSCM practice adoption were answered using five-point Likert-type scale (1 = not considering it, 2 = planning to consider it, 3 = considering it currently, 4 = carrying out to some degree, 5 = carrying it out fully), GSCM performance questions about the influence of adopting GSCM on these performance factors were answered using a five-point Likert-type scale (1 = not at all, 2 = a little bit, 3 = to some degree, 4 = relatively significant, 5 = significant) and GSCM pressure questions about affecting or motivating adopting were answered using a five-point Likert-type scale (1 = not at all important, 2 = not important, 3 = not thinking about it, 4 = important, 5 = extremely important).

### **3.5 Data Analysis**

The survey was set out to determine whether GSCM practices were being adopted by the petroleum marketing firms in Kenya. After data collection examination for completeness, reliability and consistency was done on the data. To determine whether GSCM practices were being adopted, this study undertook analysis of data collected by use of frequencies and percentages to determine factors affecting GSCM practices adoption and their evaluation on performance.

The statistical package for social sciences (SPSS), Version 17 was used; whereby mean, standard deviations, variance correlation coefficient and frequencies generated from the various data categories was computed and shown in different graphs, pie charts and tables. All GSCM performance dimensions were ranked using mean values from higher to some degree to relatively significant ranges. To be able to determine drivers of GSCM practices, establish current state of GSCM practices and the relationship between GSCM practices adoption and performance, mean scores were

computed from the responses given by respondents on the Likert Scale. The factors scoring higher mean scores for each objective were assumed to be the ones with the most significant effect on each of the objectives of the study.

# CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSIONS.

## 4.1 Introduction

This chapter presents an analysis and interpretation of data obtained by means of questionnaires. The aim of the study was to survey the extent GSCM practices have been adopted by the petroleum marketing firms and how the adoption has influenced environmental and financial performance. It was also to investigate the drivers/pressure for petroleum marketing firms to adopt GSCM practices.

GSCM is a relatively new green issue for the majority of Kenyan corporations. From the perspective of management, GSCM is a management strategy, taking into account the effects of the entire supply chain on environmental protection and economic development. The present study investigated the GSCM practices adopted by the petroleum marketing firms in Kenya. The pressures or drives to adopt GSCM practices and the relationship between GSCM practices and environmental performance were also studied. The approach adopted in the present study included a questionnaire divided into three sections and in-depth interviews with the petroleum marketing firms which are registered with PIEA in 2011.

## 4.2 Respondents details

The basic data of the respondents answering the questionnaire were first analyzed per each GSCM factor; the results are shown in Table 4.1, 4.2 & 4.3. The response rate was 66%. The titles of the respondents were Managers in the environmental, healthy and safety departments accounting for 67 % of all respondents. Others were operations managers 33%. The findings obtained from the 19 firms who responded are described as follows:

## 4.3 GSCM practices

The respondents were asked to rate each GSCM practice factor on the current GSCM practice adoption using a five-point Likert-type scale (1 = not considering it, 2 = planning to consider it, 3 =considering it currently, 4 = carrying out to some degree, 5 =carrying it out fully) to indicate the extent to which their organization practiced them. The GSCM Practice factors in the questionnaire included internal environmental management, green purchasing, ecodesign, green distribution,



cooperation with customers for ecodesign and investment recovery. Each GSCM practice factor had various variables which were rated. All the scores from the 19 petroleum marketing firms who responded were summed up and a mean for each factor variable computed.

From the analysis of the questionnaires it was found that the Petroleum marketing firms supply chains are currently considering adoption of GSCM practices with mean values over 3.00 (3=considering it currently) for some of the six GSCM factors; especially for internal environmental management on the company's environmental mission with the highest mean value of 3.58 (4=carrying out to some degree). Investment recovery (sale of excess inventories/ materials, sale of scrap and used materials and sale of excess capital equipment) and green distribution (use of pipeline for product transportation and optimization of transport operations to reduce carbon footprint) are the other GSCM practices with mean score values over 3.00 adopted by petroleum marketing firms. GSCM practices 'adoption rate lagged with the lowest mean values of 2.42 (2=planning to consider it) for eco-labeling of products. GSCM practices on eco design, green purchasing and cooperation with customers recorded low mean score values within 2.00 and 3.00 (2=planning to consider it) indicating that these practices are at the initial stage of adoption for some petroleum marketing firms. The results for GSCM practices adoption are shown in table 4.1 below.

This study indicated that internal environmental management, investment recovery and green distribution emerged the major GSCM practices being considered currently and adopted to some degree by the petroleum marketing firms in Kenya. The internal environmental management, investment recovery and green distribution variables had high mean scores probably because petroleum firms are required to comply with ERC and NEMA regulations and standards of waste management, low sulphur diesel use and environmental management through a committed and supportive management team for GSCM. This kind of adoption can be described as reactive meant to comply with the regulators requirements. This fits well is consistent with research conducted on the Chinese enterprises that 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).

**Table 4.1 Survey results of GSCM practices**

	<b>Green Supply Chain Management practices</b>	MEAN
Internal environmental management	Company's environmental vision & mission application.	3.58
	Commitment of GSCM from senior managers	3.53
	Support for GSCM from mid-level managers	3.32
	Total quality environmental management	3.21
	Environmental compliance and auditing programs	3.11
	Support of regulation environment	3.05
	Cross-functional cooperation for environmental improvements	2.95
	Increase use of renewable energy sources (e.g. solar, wind)	2.89
	Reduce energy consumption in manufacturing and buildings	2.58
	ISO 14001 certification	2.53
	Environmental Management System exist	2.47
	Eco-labeling of Products	2.42
Green purchasing	Cooperation with suppliers for environmental objectives	2.74
	Reduced packaging	2.58
	Environmental audit for suppliers' internal management	2.53
	Suppliers' ISO 14000 certification	2.53
	Second-tier supplier environmentally friendly practice evaluation	2.47
	Providing design specification to suppliers that include environmental requirements for purchased items	2.37
	Design products with lengthened lifecycle and less deterioration	2.74
	Design of product for support regulation	2.74
	Design of products to avoid or reduce use of hazardous of products and/or their manufacturing process	2.68
	Design the products to be easy set up for users in the most energy saving way	2.58

Eco design	Design for Environment practices in product development implementation	2.53
	Design usability of part particularly for extending using products, repair easy and increase efficiency	2.53
	Design of products for reduced consumption of material energy	2.47
	Design of products for reuse, recycle, recovery of material component	2.46
Distribution	Optimize transportation operations to reduce carbon footprint	3.47
	Use of pipeline for product transportation	3.37
	Redesign supply chain network to reduce carbon footprint	2.74
	Petroleum hauler companies' transport agreements with petroleum marketing firms contain green clauses.	2.47
Cooperation with customers	Cooperation with customers for cleaner production	2.84
	Cooperation with customer for eco-design	2.74
	Cooperation with customers for using less energy during product transportation	2.74
	Cooperation with customers for green packaging	2.47
Investment recovery	Sale of scrap and used materials	3.26
	Sale of excess capital equipment	3.11
	Investment recovery (sale) of excess inventories/ materials	3.05
	Recycle returned products or scrap material	2.84

#### 4.4 GSCM performance

The respondents were asked to indicate how the adoption of GSCM has influenced the relationship between GSCM adoption and performance of petroleum marketing firms in Kenya. GSCM performance questions were answered using a five-point Likert-type scale (1 = not at all, 2 = a little bit, 3 = to some degree, 4 = relatively significant, 5 = significant). The GSCM performance factors in the questionnaire included environmental, positive economic and negative economic. Each GSCM performance factor had various variables which were rated. All the scores from the 19 petroleum marketing firms who responded were summed up and a mean for each factor variable computed.

From the analysis of the questionnaires it was found out that GSCM performance dimensions were ranked from higher to some degree to relatively significant, with mean values within 3.00 and 4.00 (3= to some degree and 4=relatively significant) ranges. Environmental and positive economic variables have mean score values within 3.00 and 4.00 (Both environmental and positive economic are in relatively significant ranges) as indicated in table 4.2. Negative economic variables had mean score values within 2.00 and 3.00 (2= a little bit) as compared to environmental and positive economic mean score values. Thus there was a little bit increase of investment cost, operational cost, training cost and costs of purchasing environmentally friendly materials. Results for all the GSCM performance factor variables are as shown in the table 4.2

**Table 4.2. Survey results of GSCM performance**

	<b>Green Supply Chain Management performance practices</b>	<b>MEAN</b>
Environmental	Reduction of waste water	3.74
	Reduction of solid wastes	3.53
	Reduction of air emission	3.26
	Decrease of frequency for environmental accidents	3.26
	Decrease of consumption for hazardous/harmful/toxic materials	3.16
	Eliminate, reduce, or repurpose manufacturing waste	3.10
	Improve an enterprise's environmental situation	3.00
Positive economic	Decrease of fine for environmental accidents	3.32
	Decrease of cost for materials purchase	3.16
	Decrease of cost for energy consumption	3.16
	Decrease of fee for waste treatment	3.11
	Decrease of fee for waste discharge	3.11
Negative economic	Increase of operational cost	2.95
	Increase of training cost.	2.95
	Increase of costs for purchasing environmental friendly materials	2.89
	Increase of investment	2.84

This result indicated that the adoption of GSCM practices had a positive relationship with the environmental performance of the petroleum marketing firms. Adoption of GSCM practices can enhance the environmental and financial performance of corporations, consistent with the findings of Parka (2002) and Sarkis (2001), who emphasized the beneficial effects of the implementation of GSCM practices in improving environmental and financial performance.

Thus petroleum marketing firms should not overlook long-term sustainability while pursuing short term profit. It is important to pursue economic development and at the same time consider environmental burden, thereby preserving the natural resources and environment on which the entire human race is dependent, instead of relentlessly exploiting available resources.

#### **4.5 GSCM pressure/drivers**

Respondents in this section were asked to rate each GSCM pressure/driver variable to determine the drivers of GSCM practices in the petroleum marketing firms in Kenya. GSCM pressure questions affecting or motivating adoption were answered using a five-point Likert-type scale (1 =not at all important, 2 = not important, 3 = not thinking about it, 4 = important, 5 = extremely important). The GSCM pressure factors in the questionnaire included regulatory, competition, market, suppliers and those classified under others. Each GSCM pressure factor had various variables which were rated. All the scores for each variable from the 19 petroleum marketing firms who responded were summated and a mean for each factor variable computed.

The analysis from this study showed that petroleum marketing firms have experienced significant pressures and incentives to adopt GSCM, with mean values over 4.00 (4=important) for some driver factors as shown in table 4.3. Pressure from government environmental regulations is the highest with a mean value of 4.42. Regional environmental regulation pressure is the second with a mean value of 4.21 and green movement activism pressure with mean value of 4.05 is the third important driver for Kenyan petroleum marketing firms supply chains to adopt GSCM.

The mean values of 4.42 (government environmental regulations), 4.21 (Regional environmental regulation) and 4.05 (green movement activism) indicated that regulatory and green movement activism factors have a larger effect on petroleum marketing firms' adoption of green supply chain management practices in Kenya. Suppliers, market and competition variables have some effect but firms do not think about them as they have mean score values within 3.00 and 4.00 (3=not thinking about it). Results for all the GSCM pressure factor variables are as shown in the table 4.3

This study indicated that the pressure on petroleum marketing enterprises to adopt green supply chain management practices mostly come from the government environmental policy of environmental regulatory factors, regional (external) environmental regulations and green movement activism pressures. This showed that adoption is for problem solving and compliance to ERC and NEMA regulatory requirements.

From the present study, and the studies of Seuring (2004) and Gottberg, et al. (2006), it is found that regulations and external stakeholders exert pressure on corporations to implement/adopt GSCM practices. Mwirigi (2007) in her study also found out that a majority of the Kenya firms (petroleum marketing firms included) were found adopting GSCM due to compliance to regulations and problem solving which fits well with the current study.

Kalama (2007) studied green marketing practices by Kenya petroleum refineries: A study of the perception on the management of oil marketing companies in Kenya and found out that the Kenya Petroleum Refineries is perceived to be practising green marketing by the management of the oil marketing companies but failed on doing enough to give back to the society. From this study it shows that Kenya petroleum refineries is practicing some degree of GSCM and this fits in well with the current study.

**Table 4.3: Survey results of GSCM pressure**

	<b>Green Supply Chain Management driver practices</b>	<b>MEAN</b>
Regulatory	Governmental environmental regulations	4.42
	Regional environmental regulations	4.21
	Regulations: RoHS	3.89
	Regulations: REACH	3.21
	Regulations :Eup	3.16
Competition	Industrial professional group activities	3.21
	Competitors' green strategies	2.79
Market	Export	3.42
	Sales to foreign customers	3.32
	Kenyan consumers' environmental awareness	3.37
	Establishing company's green image	3.21
Suppliers	Making sure that suppliers will remain in business (business continuity)	3.68
	Environmental partnership with suppliers	3.26
	Supplier's advances in providing environmentally friendly packages	3.26
	Supplier's advances in developing environmentally friendly goods	3.11
Other factors	Green movement activism (NGOs)	4.05
	Company own initiatives (CSR)	3.58
	Demand (organic food & energy savers)	3.42
	Financial institutions ( peg loans to green activities)	3.00

## **CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

This chapter presents the summary, conclusions and recommendations from the findings. The overall purpose of the study was to survey the GSCM adoption and its evaluation by the petroleum marketing firms. From the study it is observed that the petroleum marketing firms have to some degree adopted GSCM.

### **5.2 Summary**

The petroleum marketing firms which participated were drawn from the PIEA register and it was found that there were multinationals and independent petroleum marketing firms, who belonged to different shareholders. The most notable thing is that the GSCM adoption varied between established multinationals and local independent petroleum marketing firms. It is also quite evident that multinationals were way above the independents in adoption of GSCM.

GSCM practices consist of six observed factors which have different variables: internal environmental management, green purchasing, eco design, distribution, cooperation with customers and investment recovery. Internal environmental management variables have mean score values ranging from 3.58 to 2.42. Green purchasing variables mean score values range from 2.74 to 2.37. Eco design mean values from 2.74 to 2.42. Distribution mean values are from 3.47 to 2.47.

Cooperation with customers mean score values from 2.84 to 2.47 and investment recovery from 3.26 to 3.05. This study indicated that internal environmental management, investment recovery and green distribution emerged the major GSCM practices being considered currently and adopted to some degree by the petroleum marketing firms in Kenya. The internal environmental management, investment recovery and green distribution variables had high mean scores probably because petroleum firms are required to comply with ERC and NEMA regulations and standards

This kind of adoption can be described as reactive meant to comply with the regulators requirements. This fits well and is consistent with research conducted on the Chinese enterprises that 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). This result indicated that petroleum marketing firms have adopted some degree of GSCM practices especially for internal environmental management, green distribution and investment recovery.

GSCM performance factors included variables for environmental, positive economic and negative economic factors. GSCM performance dimensions were ranked from higher to some degree to relatively significant, with mean values within the 3.00 and 4.00 ranges. Environmental mean score values were within 3.10 and 3.74. Positive economic mean score values were within 3.11 and 3.32 while negative economic mean score values were within 2.84 and 2.95. Both environmental and positive economic were to some degree to relatively significant. Negative economic mean score values were low as compared to environmental and positive economic mean values.

This indicated that the adoption of GSCM practices had a positive relationship with the environmental performance for the petroleum marketing firms in Kenya. Adoption of GSCM practices can enhance the environmental and financial performance of corporations, consistent with the findings of Parka (2002) and Sarkis (2001), who emphasized the beneficial effects of the implementation of GSCM practices in improving environmental and financial performance.

GSCM pressure/driver had regulatory, competition, market, suppliers and other factors with various variables. Petroleum marketing firms experienced significant pressures and incentives to adopt GSCM, with mean values ranging between 3.00 and 4.50 for the five driver factors. Mean score values for the variables were: regulatory 3.16 to 4.42, competition 2.79 to 3.21, market 3.21 to 3.37, suppliers 3.11 to 3.68 and others 3.00 to 4.05. Regulatory and green movement activism factors have a larger effect on petroleum marketing firms' adoption of green supply chain management practices in Kenya than suppliers, market and competition. This indicated that the pressure on petroleum enterprises to adopt green supply chain management practices comes from the government environmental policy of environmental regulatory factors

and green movement activism pressures. This showed that adoption mostly is for problem solving and compliance to ERC and NEMA regulations.

According to Azzone (1997), 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. The current study ties with Azzone's assertion since during the interviews multinational companies appeared more aware of the GSCM concept and were ready to respond to the questionnaires within the shortest time possible than the independent petroleum marketing firms. Most petroleum firms (especially independents) were found to be reactive in the adoption of GSCM due to requirements of ERC and NEMA regulations. Mwirigi (2007) found out that a majority of the Kenya firms (petroleum marketing firms included) were found adopting GSCM due to compliance to regulations and problem solving which fits well with the current study.

Green supply chain management practices have been found valuable in overcoming environmental impacts arising from petroleum marketing 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 a 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).

### **5.3 Conclusion**

GSCM practice has a place in the petroleum marketing firms in Kenya if the awareness is created and limitations of adoption addressed. This study has shown that petroleum marketing firms in Kenya though faced with certain environmental challenges; do not have serious internal environment management, green distribution and waste management problems.

Commitment and support for GSCM from senior and mid-level managers is a pointer to embracing green supply chain management in the petroleum marketing firms in

Kenya. Most firms are supportive of green change because of its benefits. The government's formulation and enforcement of policies that support GSCM will encourage this sector to green their supply chains. Countries like Japan and China have clear policies that support GSCM.

This research has enabled reviewing the level of the GSCM practices adoption with the conclusion that the concept of greening the entire petroleum marketing firms' supply chains is not attainable. Attempts to overcome environmental challenges through practicing some aspects of GSCM were evident but not indicative of full adoption of the strategy by all the petroleum marketing firms. For example, most of the multinationals petroleum firms were found to be high in environmental awareness than the independents though their operations had very minimal environmental implications

Adoption of GSCM practices can provide benefits to organizations, including cost reduction, market share growth and profit increase. The most significant effect of enterprises' adoption of GSCM practices is in enhancing market share growth. The above findings suggest that the pressure or drive from environmental regulations, regional environmental and green movement activism have prompted the petroleum marketing firms in Kenya to adopt GSCM practices.

From the current study, and the studies of Seuring (2004) and Gottberg, et al. (2006), it is found that regulations and external stakeholders exert pressure on corporations to adopt GSCM practices. Furthermore, it was found that the adoption of GSCM practices can enhance the environmental and financial performance of corporations, consistent with the findings of Purba (2002) and Sarkis (2001), who emphasized the beneficial effects of the implementation of GSCM practices in improving environmental and financial performance. A corporation should not overlook long-term sustainability while pursuing short term profit. It is important to pursue economic development and at the same time consider environmental burden, thereby preserving the natural resources and environment on which the entire human race is dependent, instead of relentlessly exploiting available resources.



It is possible that when pursuing economic development, social justice has to be taken into account in order to strike the right balance between economy, environment and benefit to society. Enterprises used to be concerned only with their own profit, ignoring the most important links in their production chain: suppliers and customers.

The present study found that, in the face of the current global green issue, corporations can benefit from an entirely green supply chain by cooperating with suppliers on green production technology and exchanging green information with them, as well as taking their customers and green consumers into account in their production processes.

The conventional end-of-pipe treatment approach taken by corporations in face of environmental problems can no longer meet the demands of international environmental protection. To meet the expectations of society, pollution preventive measures should be adopted as an environmental management strategy. However, corporations in general are concerned that stressing environmental performance would add to their operational cost, accompanied by a decreasing market share and competitiveness.

Nevertheless, the present study found that the adoption of GSCM practices had a positive effect on environmental and financial performance; that is, an increase in environmental performance will be accompanied by increased corporate profit and market share. These conclusions effectively dispel the doubts of those corporations in Kenya that have not yet adopted GSCM practices.

## 5.4 Recommendations

To be efficient and effective in GSCM, collaboration among important stakeholders in the petroleum marketing firms supply chain must be strongly concerned. This 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 development.

The research strongly supported the view that to green the environment requires collective responsibility and cross-functional cooperation for environmental improvements by the petroleum marketing firms, society, and government and Non governmental organizations.

The government should speed up the process of formulation of the environmental policy whose input should include those of the petroleum industry experts, professionals from the fields of operations management, purchasing, marketing and academic institutions. There is need to propagate GSCM knowledge and encourage using environmentally friendly goods and services in Kenya to enable the petroleum industry and other manufacturers to embrace green supply chain management.

There is need to promote ecodesign by designs that extend lifetime of product, through improvement, repair, and re-use and design for recycling / design for disassembly, after end of life products that can be more recovery in the petroleum marketing firms. There is need to encourage team building and train skilled manpower for reverse logistics management in the petroleum industry.

Control hazardous substances: complying with ERC, NEMA and RoHS and other regulations, set rules for disposing petroleum waste and consider more investment in recycle plants, set a direct responsible unit to take charge of petroleum waste only which will increase reverse logistics efficiently and promote refurbishing and recycling through campaigns/ activities to raise reuse/recycle awareness in petroleum products consumption.

Introduction and enforcement of the principle of Extended Producer Responsibility (EPR) by making the manufacturers of the product responsible for the entire life-cycle

of the product and packages they produce. The EPR principle should be explored in a view to being introduced in the petroleum industry.

### **5.5 Limitations of the Study**

Cost, time and the unwillingness of some of the respondents to participate posed a major challenge during data collection. The Independent petroleum marketing firms posed the greatest challenge and to some degree affected the expected response rate. Majority of the Independents were not aware of GSCM and could not understand the research topic and hence created the need for more time and clarification. Other firms thought that they were being investigated and were hesitant to fill the questionnaires.

### **5.6 Suggestions for Further Research**

The study shows that more can be learnt about GSCM practices by accommodating more views from the stakeholders. 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 other stakeholders in the petroleum industry like the Kenya Pipeline Corporation (KPC), The Kenya Petroleum Refineries limited (KPRL), Logistics and Transport companies involved in the distribution of petroleum products and the petroleum waste management companies. The findings of the study also raise critical research questions which may include similar research on the service industry and the role of the government in the adoption of GSCM practices.

## References

- Allen, F. E. (1992). Reducing toxic waste produces quick results. *The Wall Street Journal*, New York.
- Bacallan, J. J. (2000), "Greening the supply chain", *Business and Environment*, Vol. 6 No. 5, pp. 11-12.
- Carter, C. & Rogers, D. (2008). A framework of sustainable supply chain management: moving toward new theory. *International Journal of Physical Distribution & Logistics Management*, 38 (5): 360-387.
- Carter, C.R., Kale, R., Grimm, C.M., (2000). Environmental purchasing and firm performance: An empirical investigation. *Transportation Research Part E: Logistics and Transportation Review*, 36(3), 219-228.
- Chen C.C., (2005), *incorporates green purchasing into the frame of ISO14000*, *Journal of Cleaner Production* and 3,927-933.
- Chen, Y., Lai, S., and Wen, C. (2006). The influence of green innovation performance on corporate advantage in Taiwan. *Journal of Business Ethics*, 67(4), 331-339.
- Chopra, S. and Meindl, P. (2001), *Supply Chain Management: Strategy, Planning and Operation*, Prentice-Hall Inc.
- Cruz, J.M., Matsypura, D., (2009). Supply chain networks with corporate social responsibility through integrated environmental decision-making. *International Journal of Production Research*, 47(3), 621 - 648.
- Darnall, N., Jolley, G. J., & Handfield, R. (2008). Environmental management systems & green supply chain management: Complements for sustainability? *Business Strategy & Environment*, 17(1), 30-45.
- Davies, J & Hochman S., (2007). *Greening up the Supply chain*, "http://www.supplychain.org.www.supplychain.org"
- Duber-Smith, D. C. (2005). The Green Imperative. Soap, Perfumery, and Cosmetics, 78 (8), pp. 24-26.
- Elsayed, K., and Paton, D. (2005). The impact of environmental performance on firm performance: static and dynamic panel data evidence. *Structural Change and Economic Dynamics*, 16(3), 395-412.
- EMCA (1999). *Environmental Management and Co-ordination Act*, 1999, Government of Kenya Laws.

- Energy Act (2006).Government of Kenya Laws.
- ERP (nd).The industry of green supply chain management model and content-  
*enterprise resource papers* <http://eng.hi138.com/?i46262#>
- ERC (2010). *Energy Regulatory Commission website*, [www.erc.go.ke](http://www.erc.go.ke)
- Florida International University (2008).The green supply chain forum 2008, Kovens  
Conference Center, Miami Florida, USA  
<http://rydercenter.fiu.edu/greensupplychain>
- Green, K., B. Morton, and S. New (1998). “Green purchasing and supply policies: Do  
they improve companies’ environmental performance?” *Supply Chain  
Management*. 3 (2): 89-95.
- González-Benito, J., González-Benito, Ó, 2006.The role of stakeholder pressure and  
managerial values in the implementation of environmental logistics practices.  
*International Journal of Production Research*, 44(7), 1353-1373.
- Guide, V. D. R., & Srivastava, R. (1998). Inventory buffers in recoverable  
manufacturing. *Journal of Operations Management*, 16, 551-568.
- Gungor, A., & Gupta, S. M. (1999). Issues in environmentally conscious  
manufacturing and product recovery: A survey. *Computers & Industrial  
Engineering*, 36, 811-853.
- Günther, E., Scheibe, L, (2006).The hurdle analysis. A self-evaluation tool for  
municipalities to identify, analyze and overcome hurdles to green  
procurement. *Corporate Social Responsibility and Environmental  
Management*, 13(2), 61-77.
- Handfield, R., & Nichols, JR., E. (1999). *Introduction to Supply Chain Management*,  
New Jersey: Prentice Hall.
- Hoffman, A.J., (1997). *From Heresy to Dogma: An Institutional History of Corporate  
Environmentalism*, The New Lexington Press, San Francisco.
- Hubbard, G., 2009, “Measuring Organizational Performance: Beyond the Triple  
Bottom Line”, *Business Strategy and the Environment*, 19, 177-191.
- Hokey Min and William P. Galle (2001), “Green purchasing practices of US firms”,  
*International Journal of Operations & Production Management*, Vol. 21, No.  
9, pp. 1222-1238.



- Jaffee S, Thoen R, Dolan C and Ba F, Equatorial rose. (2005): The Kenyan-European cut flower supply chain [http://wwwl.worldbank.org/wbiiep/trade\\_c\\_papers/Roses2Kenya](http://wwwl.worldbank.org/wbiiep/trade_c_papers/Roses2Kenya) supply chain.
- Jenkins, G., & Wright, D. (1998). Managing inflexible supply chains. *International Journal of Logistics Management*, 9, 2, 83.
- Jiang, R.J., Bansal, P., (2003). Seeing the need for ISO 14001. *Journal of Management Studies*, 40(4), 1047-1067.
- Jones, T.C. and Riley, D.W. (1985). Using Inventory for Competitive Advantage through Supply Chain Management. *International Journal of Physical Distribution and Materials Management*, Vol. 15, No. 5, 16-26.
- Johnson, P. F. (1998). Managing value in reverse logistics system. *Logistics and Transportation Review*, 34, 217-227.
- Joseph Sarkis (2001), "Greening supply chain management", *Greener Management International*, No. 35, pp. 21-25.
- Kalama, E., (2007) *Green marketing practices by Kenya petroleum refineries: A study of the perception on the management of oil marketing companies in Kenya.* (Unpublished MBA Project). University of Nairobi.
- Kaplan R. S., Norton D. P. (1996) *The Balanced Scorecard: Translating Strategy into Action.* Cambridge, Massachusetts: Harvard Business School Press
- Kirknainen M, Holmstrom J (2002), Wireless product identification; enabler handling efficiency, customization and information sharing, *Supply chain management International journal*, Vol.7 No.4 oo.242-252.
- Klassen, R., and McLaughlin, C. (1996). The impact of environmental management on firm performance. *Management Science*, 42(8), 1199-1214.
- Kleindorfer, P. R., Singhal, K., & Van Wassenhove, L. N. (2005). Sustainable Operations. *Management Production and Operations Management*, 14 (4), 482-492.
- Kovács, G., 2004. Framing a demand network for sustainability. *Progress in Industrial. Ecology: an International Journal*, 1(4), 397 - 410.
- Li Cheng S, Wu Xian-jin (2004). China's oil industry supply chain management of Logistics Technology.
- Lippmann, S. (1999). Supply chain environmental management: elements of success. *Corp. Environ. Strategy*, 6 (2), 75-182.

- Linton, J.D., Klassen, R., Jayaraman, V., (2007). Sustainable supply chains: *An introduction. Journal of Operations Management*, 25(6), 1075-1082
- Li Cheng S, Wu Xian-jin (2004). China's oil industry supply chain management of Logistics Technology.
- Marguglio BW (1991). *Environmental management systems*. ASQC Quality Press, New York.
- Mentzer, John T. (2001), Supply Chain Management, *Thousand Oaks*, CA: Sage Publications
- Messelbeck, J., and M. Whaley. 1999. "Greening the health care supply chain: Triggers of change, models for success." *Corporate Environmental Strategy*. 6 (1): 39-45.
- Min, H. and Galle, W. (1997), "Green purchasing strategies: trends and implications", *International Journal of Purchasing and Materials Management*, Vol. 4, pp. 10-17.
- Murphy, P.R., Poist, R.F., (2000). Green logistics strategies: An analysis of usage patterns. *Transportation Journal*, 40(2), 5-16.
- McDaniel J.S., Fiskel J., McLaughlin, S. (2000). The lean and green supply chain: a practical guide for materials Managers and supply chain managers to reduce costs and improve environmental performance. United States. Environmental Protection Agency, Washington, DC.
- Mwirigi, P. M. (2007). *Green Supply Chain Management practices by manufacturing firms in Kenya* (Unpublished MBA Project). University of Nairobi.
- Petroleum Insight (2010), *The Magazine of the Petroleum Institute of East Africa* (PIEA) Petroleum industry (2011): <http://www.trencome.com/petroleumindustry.htm>
- Perron.G.M. (2005). *Barriers to environmental Performance Improvements in Canadian SMEs*. Dalhouse University, Canada
- Purba, R., (2002). Greening the supply chain: A new initiative in South East Asia, *Int. J. Oper. Prod. Manage* 22(6), 632- 655.
- Rao, P., (2002).Greening the supply chain a new initiative in south East Asia.*Int. J. Oper. Prod. Manage*, 22 (6), 632- 655.
- Revell, A., Stokes, D., Chen, H. (2010). Small businesses and the environment: turning over a new leaf? *Business Strategy and the Environment*, 19 (5): 273-288.

- Rogers D. S., Tibben-Limbke R.S., (1998) Going backwards: reverse logistics trends and practices. Reverse logistic executive council, Available online at: <http://www.rlec.org/reverse.pdf>. Accessed 23 Nov 2007 20 E. Nikbakhsh
- Sarkis, J., (2001). Greening supply chain management, GMI 35 Autumn , Greenleaf publishing
- Sarkis, J., Zhu, Q., and Lai, K-H. (2011). "An Organizational Theoretic Review of Green Supply Chain Management Literature," *International Journal of Production Economics*, 130 (1): 1-15.
- Saunders, M., Lewis, P. & Thornhill, A. (2003). *Research Methods for Business Students*. 3<sup>rd</sup> ed. Harlow: FT/Prentice Hall
- Sidiropoulos, M., Mouzakitis, Y., Adamides, E. and Goutsos, S., 2004, "Applying Sustainable Indicators to Corporate Strategy: the Eco-balanced Scorecard", *Environmental research, engineering and management*, 1(27), 28-33.
- Simpson, D., Power, D., & Samson, D. (2007). Greening the Automotive Supply Chain: A Relationship Perspective *International Journal of Operations and Production Management*, 27 (1), 28-48.
- Shane J Schvaneveldt (2003), Environmental performance of products benchmarks and tools of measuring improvement, *Benchmarking: International journal*, Vol.10 No.2, pp.137-152.
- Sharfman, M.P., T.M. Shaft, and R.P. Anex (2009) *The road to cooperative supplychain environmental management: trust and uncertainty among proactive firms*. *Business Strategy and the Environment*, 2009. 18(1): p. 1-13.
- Sheu, J.B., Chou, Y.H., Hu, C.C., (2005). An integrated logistics operational model for green-supply chain management *Transportation Research Part E* 41, 287-313.
- Seuring , S., (2004). Integrated chain management and supply chain management comparative analysis and illustrative cases. *J. Clean. Prod.*, 12, 1059-1071.
- Speer, T.L. (1997). "Growing in the green market." *American Demographics*. 19 (8): 45-49.
- Srivastava, S. K., & Srivastava, R. K. (2006). Managing product returns for reverse logistics. *International Journal of Physical Distribution and Logistics Management*, 36, 524-546.

- TATUNG Co., (TATUNG), (2005). *Tatung Environmental Report*. Taipei, Taiwan
- Trowbridge, P. (2001). A Case Study of Green Supply-Chain Management at Advanced Micro Devices. *Greener Management International*, 35, 121-135.
- US-AEP, (1999). Supply chain environmental management lessons for leader in the electronic industry. Clean Technology. Environmental Management (CTEM) Program. US-Asia Environmental Partnership
- Walley, N., & Whitehead, B. (1994). It's not easy being green. *Harvard Business Review*, 72 (3): 46-52.
- Wycherley, I. (1999). Greening Supply Chain: The Case of the Body Shop International. *Business Strategy and the Environment*, 8 (2), 120-127.
- Yuang, A., Kielkiewicz-Yuang, A., (2001). Sustainable supply network management. *Corporate Environmental Strategy*, 8(3), 260-268.
- Zhu, Q., & Sarkis, J. (2007). The Moderating Effects of Institutional Pressures on Emergent Green Supply Chain Practices and Performance. *International Journal of Production Research*, 45 (18-19), 4333-4355
- Zhu, Q., Sarkis, J., and Lai, K. (2007). Green supply chain management: pressures, practices and performance within the Chinese automobile industry. *Journal of Cleaner Production*, 15(11/12), 1041-1052.
- Zhu, Q., Sarkis, J., Lai, K.H., (2008). Green supply chain management implications for "closing the loop". *Transportation Research Part E: Logistics and Transportation Review*, 44(1), 1-18.
- Zhu Q, Sarkis J and Geng Y (2005), Green supply chain management in China: Pressures, practice and performance, *International journal of Operations and production management*, Vol.25 No.5 pp.449-468.
- Zhu, Q AND Cote, R.P. (2004), "Integrating green supply chain management into an embryonic eco-industrial development: a case study of the Guitang Group." *Journal of cleaner production*, Vol.12. No. 8-10, pp.1025-1035
- Zsidisin, G.A., Siferd, S.P., (2001). Environmental purchasing: A framework for theory development. *European Journal of Purchasing & Supply Management*, 7(1), 61-73.

## APPENDICES

### Appendix I: Questionnaire

The following statement indicates the green supply chain management practices adopted by petroleum marketing companies in Kenya. Please indicate by circling the appropriate measure to indicate the extend to which your organization practice it

	Green Supply Chain Management practices	Practices five point likert-type scales. 1. Not considering it 2. Planning to consider it 3. Considering it Currently 4. Carrying out to some degree 5. Carrying it out fully
1.1	Company's environmental vision & mission application.	1. 2. 3. 4. 5
1.2	Commitment of GSCM from senior managers	1. 2. 3. 4. 5
1.3	Support for GSCM from mid-level managers	1. 2. 3. 4. 5
1.4	Cross-functional cooperation for environmental improvements	1. 2. 3. 4. 5
1.5	Total quality environmental management	1. 2. 3. 4. 5
1.6	Environmental compliance and auditing programs	1. 2. 3. 4. 5
1.7	Reduce energy consumption in manufacturing and buildings	1. 2. 3. 4. 5
1.8	ISO 14001 certification	1. 2. 3. 4. 5
1.9	Increase use of renewable energy sources (e.g. solar, wind)	1. 2. 3. 4. 5
1.10	Environmental Management System exist	1. 2. 3. 4. 5
1.11	Eco-labeling of Products	1. 2. 3. 4. 5
1.12	Support of regulation environment	1. 2. 3. 4. 5
2.1	Cooperation with suppliers for environmental objectives	1. 2. 3. 4. 5
2.2	Environmental audit for suppliers' internal management	1. 2. 3. 4. 5
2.3	Reduced packaging	1. 2. 3. 4. 5
2.4	Suppliers' ISO 14000 certification	1. 2. 3. 4. 5
2.5	Providing design specification to suppliers that include environmental requirements for purchased items	1. 2. 3. 4. 5
2.6	Second-tier supplier environmentally friendly practice evaluation	1. 2. 3. 4. 5

3.1	Design of products for reduced consumption of material energy	1.	2.	3.	4.	5
3.2	Design of products for reuse, recycle, recovery of material component	1.	2.	3.	4.	5
3.3	Design of products to avoid or reduce use of hazardous of products and/or their manufacturing process	1.	2.	3.	4.	5
3.4	Design of product for support regulation	1.	2.	3.	4.	5
3.5	Design for Environment practices in product development implementation	1.	2.	3.	4.	5
3.6	Design the products to be easy set up for users in the most energy saving way	1.	2.	3.	4.	5
3.7	Design usability of part particularly for extending using products, repair easy and increase efficiency	1.	2.	3.	4.	5
3.8	Design products with lengthened lifecycle and less deterioration	1.	2.	3.	4.	5
4.1	Use of pipeline for product transportation	1.	2.	3.	4.	5
4.2	Optimize transportation operations to reduce carbon footprint	1.	2.	3.	4.	5
4.3	Redesign supply chain network to reduce carbon footprint	1.	2.	3.	4.	5
4.4	Petroleum hauler companies' transport agreements with petroleum marketing firms contain green clauses.	1.	2.	3.	4.	5
5.1	Cooperation with customer for eco-design	1.	2.	3.	4.	5
5.2	Cooperation with customers for cleaner production	1.	2.	3.	4.	5
5.3	Cooperation with customers for using less energy during product transportation	1.	2.	3.	4.	5
5.4	Cooperation with customers for green packaging	1.	2.	3.	4.	5
6.1	Investment recovery (sale) of excess inventories/ materials	1.	2.	3.	4.	5
6.2	Sale of scrap and used materials	1.	2.	3.	4.	5
6.3	Recycle returned products or scrap material	1.	2.	3.	4.	5
6.4	Sale of excess capital equipment	1.	2.	3.	4.	5
B		Performance five point likert-type scale 1. Not at all				

	Green Supply Chain Management performance practices	2. A little bit 3. To some degree 4. Relatively significant 5. Carrying it out fully
1.1	Reduction of air emission	1. 2. 3. 4. 5
1.2	Reduction of waste water	1. 2. 3. 4. 5
1.3	Reduction of solid wastes	1. 2. 3. 4. 5
1.4	Eliminate, reduce, or repurpose manufacturing waste	1. 2. 3. 4. 5
1.5	Decrease of consumption for hazardous/harmful/toxic materials	1. 2. 3. 4. 5
1.6	Decrease of frequency for environmental accidents	1. 2. 3. 4. 5
1.7	Improve an enterprise's environmental situation	1. 2. 3. 4. 5
2.1	Decrease of cost for materials purchase	1. 2. 3. 4. 5
2.2	Decrease of cost for energy consumption	1. 2. 3. 4. 5
2.3	Decrease of fee for waste treatment	1. 2. 3. 4. 5
2.4	Decrease of fee for waste discharge	1. 2. 3. 4. 5
2.5	Decrease of fine for environmental accidents	1. 2. 3. 4. 5
3.1	Increase of investment	1. 2. 3. 4. 5
3.2	Increase of operational cost	1. 2. 3. 4. 5
3.3	Increase of training cost	1. 2. 3. 4. 5
3.4	Increase of costs for purchasing environmental friendly materials	1. 2. 3. 4. 5
<b>C</b>	Green Supply Chain Management driver practices	Driver five point likert-type scale 1. Not at all important 2. Not important 3. Not thinking about it 4. Important 5. Extremely important
1.1	Governmental environmental regulations	1. 2. 3. 4. 5
1.2	Regional environmental regulations	1. 2. 3. 4. 5
1.3	Regulations: RoHS	1. 2. 3. 4. 5
1.4	Regulations: REACH	1. 2. 3. 4. 5

1.5	Regulations :Eup	1.	2.	3.	4.	5
2.1	Competitors' green strategies	1.	2.	3.	4.	5
2.2	Industrial professional group activities	1.	2.	3.	4.	5
3.1	Export	1.	2.	3.	4.	5
3.2	Sales to foreign customers	1.	2.	3.	4.	5
3.3	Kenyan consumers' environmental awareness	1.	2.	3.	4.	5
34	Establishing company's green image	1.	2.	3.	4.	5
4.1	Supplier's advances in developing environmentally friendly goods	1.	2.	3.	4.	5
4.2	Environmental partnership with suppliers	1.	2.	3.	4.	5
4.3	Supplier's advances in providing environmentally friendly packages	1.	2.	3.	4.	5
4.4	Making sure that suppliers will remain in business (business continuity)	1.	2.	3.	4.	5
5.1	Green movement activism (NGOs)	1.	2.	3.	4.	5
5.2	Company own initiatives (CSR)	1.	2.	3.	4.	5
5.3	Demand (organic food & energy savers)	1.	2.	3.	4.	5
5.4	Financial institutions ( peg loans to green activities)	1.	2.	3.	4.	5

### Key

1. GSCM practices: questions about current GSCM practice adoption will be answered using a five-point scale
2. GSCM performance: questions on GSCM practices influence on performance will be answered using a five-point scale
3. GSCM pressure: questions motivating GSCM practices implementation will be answered using a five-point scale
4. Circle appropriate measure.
5. Regulations

RoHS (Restriction of Hazardous Substances)

REACH (Registration, Evaluation, Authorization and Restriction of Chemicals)

EuP (Ecodesign for Energy using Products)

GSCM Green Supply Chain Management

CSR Corporate Social Responsibility

**THANK YOU FOR YOUR PARTICIPATION**



## **Appendix II: Letter of Introduction**

**Dear Respondent,**

This questionnaire is designed to gather information on “**A survey of the adoption of Green Supply Chain Management Practices by the Petroleum marketing firms in Kenya.**” The study is being undertaken for a research project in partial fulfillment of requirements for the degree of **Master of Business Administration** from the University of Nairobi.

The information in the questionnaire will be treated with confidentiality and in no instance will your name be mentioned in this research. The information provided will not be used for any other purpose other than for this research.

Your assistance in facilitating the same will be highly appreciated.

Thanks in advance.

Yours sincerely

**Evans Isaac Obiso**

**0722 742 516**

### **Appendix III: List of Petroleum firms registered with PIEA.**

1. Total Kenya limited
2. KenolKobil limited
3. Shell Kenya Limited
4. Libya Oil Kenya limited
5. National Oil Kenya Limited
6. Gapco Kenya Limited
7. Hass Petroleum Limited
8. Galana Oil Limited
9. Oilcom Kenya Limited
10. Engen Kenya Limited
11. Bakri International limited
12. Gulf Energy Limited
13. Rivapet Petroleum Limited
14. Hashi Energy Limited
15. Dalbit Kenya Limited
16. Addax Kenya Limited
17. Trojan International Limited
18. MGS International (K) Limited
19. Fossil Kenya Limited
20. Petro Oil Kenya Limited
21. Global Petroleum Limited
22. Muloil Kenya Limited
23. Al-Leyl Kenya Limited
24. Intoil Limited
25. Kamkis Trading Limited
26. Banoda Oil Limited
27. Primefuel Regional limited
28. Jade Petroleum Limited
29. Tosha Petroleum Kenya limited