

**GREEN SUPPLY CHAIN MANAGEMENT STRATEGIES AND  
ENVIRONMENTAL PERFORMANCE OF BREWING FIRMS IN KENYA**

**BY**

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## **DECLARATION**

I declare that this project is my original work and has never been presented in any other learning institution for an award of any Diploma or Degree program.

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D61/79893/2012

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

Signature..... Date.....

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## **DEDICATION**

The study is dedicated to my family here in Nairobi, Kenya and pastor Joel Osteen of Lake Wood Church, Ohio, Texas, United States of America for their advice, faith, wisdom and support that helped me renew my vision to think big and made me to discover the champion in me, courtesy of Lake Wood Church.

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## **ABSTRACT**

This research had two objectives: first, to determine the green supply chain management strategies commonly used by Kenya brewing firms and secondly to determine the relationship between green supply chain management strategies and environmental performance of Kenya brewing firms. The methodology involved a research design that used quantitative and qualitative data based on descriptive survey. The population covered in the research consisted of 41 registered Kenya brewing firms as registered by the Kenya revenue authority, 2015. This study established that the benefits experienced by the firms that implemented GSCM were that there was improvement in information systems; the use of recyclable materials was well promoted; firms experienced savings on costs due to effective utilization of available productive resources. GSCM also did much in helping with reduction of the environmental impact of business processes (Jlopleh, 2012).

Various green supply chain management strategies of Kenya brewing firms have been discussed which include compliance based strategies, risk based strategies, innovative based strategies, closed loop strategies and lean based strategies. Although various environmental performance measures tools were identified, the research choose to use measures of conformance with management system standards which concentrates on areas such as environmental performance index (EPI), measure of sustainability and measure of business value from environmental performance (GEMI, 1998). There were some limitations identified, as by further investigation it lead to some conclusion that there is little research knowledge and information published concerning the relationship between GSCM strategies and environmental performance of Kenya brewing firms. Research is also lacking on areas of GSCM strategies and environmental performance of second generation brew which involve freelance and entrepreneurs businesses, so more needs to be done on this area.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background

Worldwide, there are many stakeholders involved in many different supply chains that are connected and related to the environment in one way or the other. Thus stakeholders globally, have contributed and made a significant impact on the natural environment, and as a result, companies in different geographical regions have taken steps and placed more extensive effort to green their supply chain by introducing green strategies and practices in their organizations operations and in their supply chains. This has made it necessary to adopt environmentally thinking into the supply chain management and processes as Zhu claimed “GSCM can be regarded as an environmental innovation. By integrating the ‘green concept to the supply chain’ concept, it has created a new research agenda where the supply chain will have a direct relation to the environment” (Zhu et al. 2005), and this thus will be a mechanism that will aid in the proper management of environmental conservation especially as advancements are made in the 21<sup>st</sup> century.

In order to have sustainable development, there is need to change our way of thinking and take into consideration that environment and industrialization must go together. Hence the common notion being to promote green thinking that will involve green technology, green manufacturing, green design, green procurement, green purchases, or even green driving. They mostly encourage us to recycle, reuse and reduce to protect our environment. According to Kim, “recent environmental incidents occurring in the upstream of the supply chains of global firms caused not only financial damage to the firms but also damage to the firms’ reputation” (Kim, 2010), taking into consideration that environmental protection is taken very urgently nowadays with expected estimated standards of quality.

Various legislations have been put in place to protect the environment by encouraging use of green strategies that will cause less harm to our habitat. Organizations are also

introducing policies and measures that will enable them to execute green supply chain management strategies and that will help them comply with government regulations and international recognized standards. With the continued effects of global warming being felt worldwide, these green strategies are seen as a way forward to combating problems related to global warming. Many nations are also coming together and looking for steps and ways of creating and implementing, sustainable strategies that are environmentally friendly. Global warming has caused sabotage worldwide with very huge financial implications.

### **1.1.1 Green Supply Chain Management Strategies**

GSCM can be defined as “Integrating environment thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end-of-life management if the product after its useful life.” (Srivastava, 2007), and has recently began to be considered as a crucial tool by many companies during execution and implementation process, and is now part of goals, mission and vision that is included when strategizing company policies.

Based on empirical data that was reviewed from various researchers, various strategies have been identified that are part of green supply chain management strategies as follows; First is compliance centred strategies “which include establishment of international standard systems such as ISO 14001, use of performance standards, inclusion of purchasing contracts for suppliers to meet certain regulatory requirements” (King et al., 2005), as a common practice and to be accepted and respected by most government and private agencies, this is of very crucial importance especially with regard to quality of goods and services within firms, both locally and internationally. Secondly is lean-based strategies, “which link environmental performance with operational efficiency within the supply chain, allowing for the extension of performance

requirements into the supply chain” (Plambeck, 2007), and thus by linking the two concepts, it creates a boost with regard to goods and services optimisation within firms. Thirdly is innovation-centred strategies which “focus on developing specialised technologies, product designs, processes and strict green performance standards in order to keep up-to-date with changes in environmental regulations” (Lenox and King, 2004), which is important as progress needs to be made to create better quality products, with better environmental performance standards within firms in different sectors. Fourthly is closed-loop strategies “which involve the capture and recovery of materials for remanufacture and/or recycling” (Vlachos et al. 2007), which makes it even possible to save on cost that are incurred with regard to purchase of supplies for manufacturing within firms. Finally is risk based strategies, which are “ideal for organizations that retain minimal internal environmental management resources or has only recently begun to consider the introduction of a supply chain greening program” (Dayna and Danny, 2008), especially based on curiosity aroused by stakeholders on need to take environmental regulations and requirements matters very seriously within firms.

Some of the reasons why to use GSCM include “improved agility, positive financial performance, sustainability of resources, lowered cost, increased efficiency, product differentiation, competitive advantage, adopting to regulations, reducing risk” (Emmet and Sood, 2010), and are factors why firms are forging forward to implement and execute the GSCM strategies both locally and internationally especially in the 21<sup>st</sup> century around the globe.

### **1.1.2 Environmental Performance**

Environmental performance is “to enforce measures that provide the protection of environment factors - air, water, soil, ecosystem” (Florina, 2011), that has been made possible especially with extensive effort by governments and environmental agencies around the globe, that have taken steps to make improvements with regard to

environmental matters. Environmental performance measures are usually “divided into three main categories; First is environmental impact that includes toxicity, emissions, and energy use; Secondly is regulatory compliance that includes non-compliance status, violation fees, and number of audits; and thirdly is organizational processes that includes environmental accounting, audits, reporting, and environmental management system” (Ilinitich, 1998), and with this categorization it has enabled us to see and understand environmental performance better from various different dimensions and with better understanding it has enabled us to do more intense and better analysis that are promising to yield more positive results. “Screening and investment firms use different mixes of the above categories. For example, SAM focuses on eco-efficiency and environmental reporting along with industry-specific criteria. 3 KLD Research and Analytics Inc. analyses and selects firms based on strengths and concerns in the following categories: products and services i.e. beneficial products and services, ozone-depleting chemicals, agricultural chemicals; operations and management i.e. pollution prevention, recycling, management systems, hazardous waste, regulatory problems, substantial emissions; and climate change i.e. clean energy, revenues from coal oil and derivative products” (Waddock and Graves, 1997), evidence that environmental matters are becoming taken seriously by more and more firms across the globe day by day, with regard to understanding and experience of the implications and consequences of not doing so or what might happened if things are taken lightly.

The importance of measuring environmental performance is that it shift towards target and action driven environmental policies, create better integration of quantifiable environmental targets into national socio-economic policies, lead to support of millennium development goals process and finally they enable ability to benchmark results, identify leading edge performance and highlight best practices (Tania, 2005).

### **1.1.3 Brewing Firms In Kenya**

Operations of brewing firms in Kenya involve the production of beer, wine and spirits by firms that number more than 40. Some of them have been in existence for more than 2 decades while others are new entrants in the market. With regard to beer, East Africa breweries limited, is controlling 83 percent of the beer market (Euro monitor international, 2014), though the company is “facing challenges in maintaining competitiveness through quality, increased operation costs, especially energy related costs and sustainable end-to-end supply of raw material in order to ensure continued regional leadership in growth and most profitable share” (Kiereini, 2011), thus creating a major setback for the company even though they are known and respected to be the leaders in the game within the region. Keroche brewery limited is the only company which is giving EABL big competition currently. The firm is expanding its production capacity by more than 10 fold and plan to list in stock exchange in the next five years. Consequently, it will increase its market share to 20 percent from 5 percent (Karanja, 2015). With regard to spirits, EABL continues to lead with a volume share of 27 percent followed by UDV (united distillers vintners) Kenya limited with a volume share of 14 percent. London distillers Kenya ltd and Kenya Wine Agencies follow with total of 11 percent and 8 percent respectively (Euro monitor international, 2014). With regard to wines, Kenya wines agencies limited (KWAL) which is owned by government dominates the Kenyan local wine manufacturers“. KWAL also solely distribute distell products which are South African owned. Its local brand includes Simba cane, Kibao vodka and Yatta wine (Adetu, 2011).

The factors leading to consumption of alcohol may include improved lifestyle, adoption of foreign culture, marketing through mass media, social networks or even work related stress. Some of the several challenges which the industry has begun to face include value added taxation and deduction in tax incentives which have had a bad impact on the industry, threat of new entrants, desire to improve the health and wellbeing of communities living in Kenya, pressure to comply with environmental laws and

regulations, lack of appropriate technology to support companies and their efforts to go green, trade-off between green requirement and lean practices, failure to integrate supply chain optimization efforts with green supply chain efforts, standards, awareness, and business case development (Ryder centre for SCM, 2008).

Some of the significant impact to natural environment may include energy crisis, ecological destruction and wastage of resources from source to the end user. It has been identified as affecting the environment through emission of toxic fume, spillage of oils which do not easily break down into waste water, heavy consumption of fuel, packaging and disposal issues (Huang Feng and Cai, 2000). Due to criticism and propaganda from customers, government agencies (like national environmental management authority or national authority for the campaign against alcohol and drugs) and business competitors have forced Kenya brewing firms to comply with regulations that take environmental issues very urgently.

## **1.2 Research Problem**

As the saying goes that “necessity is the mother of invention”, so GSCM is the product of need for sustainable manufacturing and development that has environmental consideration. The concept was conceived from environmental concerns and issues that may arise from pollution in the form of noise e.g. those emitted by vehicles or machines; Water pollution e.g. oil spills emitted from cargo ships and offshore oil Wells disasters; Air pollution that includes greenhouse gasses emissions and ozone depletion; and also solid waste pollution e.g. improper disposal of waste on land or the accumulation of huge amounts of waste on seas and oceans like the Indian ocean, Atlantic ocean and Pacific ocean garbage pile which runs thousands of square miles and consists of mostly non bio degradable material i.e. plastic waste (Harrison and Hoek, 2008). Some of the practices that have evolved from GSCM may include green procurement, green manufacturing, energy efficient technology, green distribution, green logistics and reverse logistics (Ninlawan at al, 2010).

The concept has also led to measures that include informational measures that involve information, education, marketing and eco-labelling; financial measures that involve environmental taxes, emissions standards and environmental charges; and also legal measures that involve limitation on emission and noise, regulations, and environmental zones (Harrison and Hoek, 2008).

On the part of marketing and economics, it has led to innovations like the development of more efficient and cleaner engines, quieter vehicles and engines, eco-driving, improved vehicle maintenance, environmental friendly fuels (Hydrogen, Bio-fuels, ethanol), environmental friendly energy (solar vehicles), better design for vessels like the new fuel efficient and quieter Boeing 787 Dreamliner and Air Bus A380 or the use of composites like carbon fibre for construction in vessels. It has also lead to environmental approved suppliers, environmental approved items and environmental demand specifications (Harrison and Hoek, 2008).

Various research about green supply chain management have been carried out by various academicians and have led us to gain understanding on gaps in this area of study. Zhu (2005) found out that “enterprises have increased their environmental awareness due to regulatory competitive and marketing pressures and drivers, he studied green supply chain management pressure, practices and performance within the Chinese automobile industry” in which he concludes that he observed that increasing pressure from variety of directions have caused the Chinese automobiles SCM to consider and initiate implementation of green supply chain management practices to improve both their economic and environmental performance (Zhu et al., 2005).

Chung Hsiao (2008) “studied the GSCM in electronic industry in which he mentions that there are various approaches for implementing GSCM practices which have been proposed and recognized in previous literatures according to the author, but there is yet no investigation that identifies the reliability and validity of such approaches particularly in electronic industry”. From his conclusion, his findings indicated that these enterprises



would emphasize on supplier management performance in the crucial role of implementing green supply chain management (Chung Hsiao, 2008).

Zhou study on the implementation of GSCM in textile enterprises concludes that green supply chain management is a sort of modern management mode which could comprehensively consider the environmental influence and resource utilization efficiency in the whole supply chain and how to implement the green supply chain management in special industrial operation and at present has become into one of hotspot problems (Zhou, 2009). Robert and Benjamin idea of introducing green transportation costs in supply chain modelling concludes that escalating environmental concerns with prevalent transportation modes has led to an increased interest in the adoption of "green", sustainability practices in the area of supply chain management (Robert and Benjamin, 2010).

Locally, Mwirigi did a survey on GSCM practices by manufacturing firms in Kenya in which he concludes that his findings were important as they gave ways of overcoming environmental impacts which comes as a consequence of manufacturing operations since environmental impact occurs at every stage of product life cycle (Mwirigi, 2007).

Abuko studied the impact of GSC practices on the performance of oil companies in Kenya and concludes that the adoption of GSC practice positively impacts productivity, cost saving, efficiency and quality improvement (Abuko, 2011). Warner studied green supply chain management and supply responsiveness among food and beverage manufacturing firms in Nairobi, which concludes that, it established benefits experienced by firms that implement GSCM that include improvement in information systems, use of recyclable materials was promoted, cost saving by firms, and reduced environmental impact of business process and reduced risks of prosecution based on anti-environmental reasons (Jlopleh, 2012). Chege study on GSCM practices and supply chain performance of private hospitals in Nairobi, Kenya, concluded that waste management practice was the most significant as compared to other GSCM practices (Chege, 2012).

Currently it can be seen that there is research on green supply chain management and research on environmental performance but a gap is created when there is lack of enough information regarding research on the relationship between GSCM strategies and environmental performance especially when dealing with brewing firms, as this research is one of a few materials currently covering this area of empirical knowledge. There is also little research evidence on second generation brew with regard to GSCM and environmental performance. More research is therefore needed in this area, to study the relationship. This study sought to answer the following questions: What are the GSCM strategies commonly used by brewing firms in Kenya? Is there any relationship between GSCM strategies and environmental performance of brewing firms in Kenya?

### **1.3 Research Objectives**

The objectives of this study are:

1. To determine the Green Supply Chain Management Strategies commonly used by brewing firms in Kenya.
2. To establish the relationship between Green Supply Chain Management Strategies and environmental performance of brewing firms in Kenya.

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

The information on this research will be important for those interested in doing further research and a source of secondary data for academicians interested in green supply chain management and its application in the real world. Some of the key knowledge areas gained include the green supply chain management strategies, environmental performance indicators, environmental management system standards, environmental

performance index, environmental sustainability and business value of implementing GSCM in brewing firms in Kenya.

Consumers of alcohol who are conscious about the importance of green strategies will be able to learn how Kenya brewing firms are managing their firms in order to protect and conserve the environment. They will be able to identify and rate different firms and benchmark each on how best they perform with regard to compliance to regulations, environmental pollution release, resource consumption or even environmental remediation.

Firms will be able to understand the possible benefits and challenges of implementing green supply chain management in brewing firms and also get to understand how green supply chain management strategies are related to environmental performance in theory and practical.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter reviews empirical knowledge from publications on topics related to the statement of the problem. It covers theories that include resource based theory, stakeholder theory, neoclassical agency theory and principal agency theory.

### **2.2 Theoretical Review**

Resource Based Theory explains that “superior organizational performance is as a result of proper alignment of endogenous organizational design variable with exogenous context variables. It further points out three key factors that may affect the implementation of proactive environmental strategies for instance in GSCM. They include uncertainty, complexity and munificence” (Aragon-Correa and Sharma, 2003), these three factors are seen as important if proper execution of GSCM is ever going to happen and initiated properly throughout the firms. In this context, “uncertainty means the rate of change of innovation in the industry and unpredictability of the competitors or customers actions. Complexity is proliferation and diversity of factors and issues in that environment. The less the complexity, the more proactive environmental practices and vice versa (Miller and Friesen, 1983). Munificence moderates the relationship between the dynamic capability of proactive environmental strategy and competitive advantage” (Aragon-Correa and Sharma, 2003), the three work together to shape a new dynamism that stakeholders can relate well with and understand the theory from different important dimensions, thus making it applicable to many operations within the firms processes. Stakeholder Theory explains “industrial degree of environmental adoption as a response to stakeholders requirements, expectations and preferences” (Concepcion et al., 2012), that arises from experience gained from developing awareness to matters related to environmental conservation with expected beneficial response from consumers. Due to

“increased pressure from consumers, manufacturers must integrate environmental concerns into their SCM practices” (Zhu et al., 2008) as many consumers from all over the world want to buy from environmentally responsible companies, bearing in mind that environmental matters are nowadays taken very seriously especially in the 21<sup>st</sup> century.

There has been difference of opinion from one study to another, here and there, which has brought about the foundation of a constructive critical argument. By looking at the neoclassical agency theory, “the expected costs of a firm’s environmental responsibility are likely to outweigh the resulting profits and, hence, a firm’s environmental performance is expected to have a negative impact on its profitability” (Friedman, 1970), this is based on the thinking that nothing is free in the real world, no matter if it may improve the environment in one way or the other, it will still cost to implement and execute, and someone has to pay the price for it. Aupperle explain this “neoclassical rationale by arguing that firms that invest in pollution control will incur costs that outweigh the financial benefits and as a consequence, corporate environmental investments can lead to reduced profits or competitive disadvantage and may therefore result in lower profit expectations by investors” (Aupperle, 1985) as in most organization, they usually have goals and expectations that they are supposed to achieve within a certain speculated period of time, thus a conflict therefore arises when they are in sighted to think outside the box and are indulged to involve the organization with environmental issues. Various tactics are employed to try and win the consumer purchasing decision from practicing corporate social responsibility to introducing green based products and solutions, but do they really work. There are sceptics and enthusiasts who try to rival one another, but at the end of the day, only the results will determine the truth.

The principal agency theory argument related to environmental performance is that “corporate environmental responsibility can introduce an agency problem between a firm’s management and its shareholders” (Friedman, 1970), based on concerns that although the management may make decisions that are environmentally friendly, at the end it is the shareholders who will pay for it and the money is expected from their

investment in firms. Friedman asserts that “engaging in corporate environmental responsibility is symptomatic of an agency problem or a conflict between the interests of managers and shareholders. He argues that managers use corporate environmental responsibility as a means to further their own social, political, or career agendas, at the expense of shareholders” (Friedman, 1970), thinking of it from the perspective of a publicity stunt devised by the public relations department meant to entice the taste of their consumers.

Worldwide several countries have come together and passed several legislations aimed at environmental protection which include the Kyoto protocol, UN Earth summit in Rio, Earth first, Green peace, clean water act, endangered species act, just to mention a few, bearing this in mind although early studies have argued that good environmental performance imposes extra costs on firms (Walley and Whitehead, 1994) other, more recent research provides evidence to support a positive link between corporate environmental performance and corporate financial performance (Konar and Cohen, 2001). According to Derwall et al. (2005) improved environmental performance can increase corporate efficiency and thus create a competitive advantage.

## **2.3 Green Supply Chain Management Strategies**

Through investigation from secondary data, that is case studies, books and online information, the following are some of the GSCM strategies that have been identified from brewing firms in Kenya.

### **2.3.1 Compliance-Centred Strategies**

As a common concept and to be accepted and respected by most government and private agencies around the globe, compliance-centred strategies are of very crucial importance especially with regard to quality of goods and services, as “firms adopt compliant-based strategies merely in response to environmental regulations, stakeholder requirements, and

customer pressure. Compliance-based strategies include establishment of international standard systems such as ISO 14001, use of performance standards, inclusion of purchasing contracts for suppliers to meet certain regulatory requirements” (King et al., 2005), yearly it is familiar with most companies to hear that they are having auditors coming by to do some assessment of the company facilities and performance, and then the host company expect some evaluation results within a speculated period of time, thereby rating the company based on some system standards, which will tell if they have performed badly or well or if they have actually made tremendous improvements by benchmarking against previous years already evaluated.

Some of the areas where this is observed include use of ISO system, purchasing policies, adhering to local laws on alcohol consumption, insuring certification by agencies like NEMA (National environmental management authority), insuring certification by NACADA (National Authority For The Campaign Against Alcohol and Drugs), acquiring a business permit, allowing annual inspection for ISO certification.

### **2.3.2 Lean-Based Strategies**

The lean-based strategies “link environmental performance with operational efficiency within the supply chain, allowing for the extension of performance requirements into the supply chain that maximises economic performance while enhancing environmental performance through waste reduction and optimized (minimal) resource usage” (Plambeck, 2007), and thus by linking the two concepts, it creates a boost with regard to goods and services optimisation within firms thus most management departments are quickly trying to adopt its application into firms operation to save on cost and resources. Examples of practices in this area may include “Wal-Mart introducing green strategies aimed at creating zero waste and selling of products that sustain Wal-Mart’s resources and the environment” (Plambeck, 2007), application of eco-efficiency in the supply

chain, monitoring and managing amount of waste produced, use of biodegradable material in manufacturing, applying lean production in operations.

### **2.3.3 Innovation-Centred Strategies**

Innovation-centred strategies “focus on developing specialised technologies, product designs, processes and strict green performance standards in order to keep up-to-date with changes in environmental regulations” (Lenox and King, 2004), which is important as progress needs to be made to create better quality products, with better environmental performance standards within firms in different sectors. As companies around the world endeavour to reduce carbon emission into our eco-system as required by governments and environmental agencies around the world, it is imperative that they have to come up with new breed of products that are innovated to offer high standards of environmental rating.

Some of the practices in this area would include huge investment in research and development, manufacturing products that consume less of resources and energy, firms working with consumers of their products and involving them during product design, green packaging and green purchasing.

### **2.3.4 Closed-Loop Strategies**

Closed-loop strategies “involve the capture and recovery of materials for remanufacture and/or recycling” (Vlachos et al. 2007), which makes it possible to save on cost that are incurred with regard to purchase of supplies of raw material that will be used for manufacturing within firms. “Recovered materials arise from returned, post-use, or end-of-life goods. Thus, closed loop strategies tend to integrate environmental performance to the entire supply chain. Supply chains that endeavour to implement closed-loop strategies certainly need high ability to control the reverse logistics of used materials” (Mutingi, 2012), this can be effectively made possible if there is some level of effort extended by



the manufacturers, retailers and consumers in that only after the product are used can the users willingly volunteer to bring back the items to retailers, then the retailers keep them until they are collected by the manufacturers.

Some of the examples include “Hewlett Packard’s return of printer cartridges, Kodak’s take-back and remanufacture of its disposable cameras, and various auto industries’ end-of-life vehicle requirements as collaboratively agreed among the supply chain players” (Guide and Van Wassenhove, 2002), Coca-Cola and Pepsi tradition of bringing back used bottles in orders to be offered new drinks (Only take away), creating disposal points where used items can be collected back by manufacturers of the products, managing reverse flow of material, environmental packaging and distribution, engaging in waste recovery.

### **2.3.5 Risk Based Strategies**

Risk based strategies, are “ideal for organizations that retain minimal internal environmental management resources or has only recently begun to consider the introduction of a supply chain greening program” (Dayna and Danny, 2008), especially based on curiosity aroused by stakeholders on need to take environmental matters very seriously within firms, like in Kenya there are some government agencies like National Environmental Management Authority (NEMA) and National Authority For The Campaign Against Alcohol and Drugs (NACADA) which have forced brewing firms in Kenya to strictly comply with regulations that take environmental and drug abuse issues in the community very urgently.

Some of the practices in this area include always assessing and complying with ISO standards, carrying out auditing programs to determine current status and to avoid making mistakes and insuring suppliers meet all the relevant regulatory requirements.

## **2.4 Environmental Performance Measures**

As stated earlier on, the “environmental performance measures are usually divided into three main categories; first is environmental impact which includes toxicity, emissions, and energy use, secondly is regulatory compliance which includes non-compliance status, violation fees and number of audits and finally is organizational processes which includes environmental accounting, audits, reporting, and Environmental Management System” (Ilinitich, 1998), this is based on analysis and understanding developed from years of experience gained with regard to environmental management practices and conservation from experts around the globe.

Many metrics are already in use which include “lagging indicators, which measure outputs such as pounds of pollutants emitted or discharged; leading indicators, which are in-process measures of performance; environmental condition indicators, which measure the direct effect of an activity on the environment; measuring by benchmarking against other companies or average industry performance; measuring progress against principles, goals, or corporate management system standards; and development of indices to evaluate progress from year to year; Metrics can measure the business value of environmental programs or progress as well as the environmental performance of business operations” (GEMI, 1998), but with all these options available it is up to the firm’s management to choose which is the most suitable for application on their firms operations, as some of them are more detailed, advanced and reliable while others are brief and only suitable for basic generalization as they do not cover a lot of specialization.

For the case of this research, the metrics/tools that have been used concerns measure of conformance with management system standards, “this takes into consideration three areas; First is environmental performance index which involves aspect of compliance that includes notices of violation, fines, exceedances, and incidents; Environmental releases that includes releases to air, water, land and the global environment; Resource consumption that includes thermal energy, electricity, water consumption, and paper

purchases; and Environmental remediation that includes number of remediation sites and risk factors. Secondly is measure of sustainability which measures the use of raw materials, water, energy, and packaging relative to use in the base year. Thirdly is measuring the business value of environment performance which measures the business value/performance of environmental programs” (GEMI, 1998), by measuring this way it helps to cover almost all the necessary aspects that are crucial for optimized environmental performance analysis, and that may be considered to make a big impact on the overall environmental management agenda of the firms, taking also into consideration that it may aid in decision making when it comes to GSCM strategies implementation and execution to a broad extent.

## **2.5 Empirical Literature Review**

Zhu studied green supply chain management pressure, practices and performance within the Chinese automobile industry, “the methodology was based on a literature review, where four propositions are put forward. An empirical study using survey research was completed. The survey questionnaire was designed with 54 items using literature and industry expert input. An exploratory factor analysis was conducted to derive groupings of GSCM pressures, practice and performance from the survey data which included 314 responses. A categorical and descriptive nature of the results is then presented with an evaluation and comparative analysis with previous research findings” (Zhu et al., 2005), findings from Zhu (2005) were that he observed that increasing pressure from variety of directions have caused the Chinese automobiles SCM to consider and initiate implementation of green supply chain management practices to improve both their economic and environmental performance, although some of the shortcomings of this study were that the investigation and its findings were still relatively exploratory, taking it in mind that most of it covered Chinese automobile industry.

Chung Hsiao studied the “GSCM in electronic industry in which he mentions that there are various approaches for implementing GSCM practices which have been proposed and recognized in previous literatures according to the author, but there is yet no investigation that identifies the reliability and validity of such approaches particularly in electronic industry. His methodology adopted ways to improve the AHP method and to recognize consistent strategies for implementing GSCM. This study applies the FAHP (The fuzzy analytic hierarchy process) and uses triangular fuzzy numbers to express comparative judgments of decision makers. A systematic approach of FAHP to identify priority approaches for GSCM implementation was adopted based on a complex and multi-criteria environment” (Chung Hsiao, 2008), and with this in mind according to Chung (2008), his findings indicated that these enterprises would emphasize on supplier management performance in the crucial role of implementing green supply chain management, although some of the shortcomings of this study were that it focused mostly on electronic industry and green supply chain management.

Robert and Benjamin studied the idea of introducing green transportation costs in supply chain modelling. Their methodology focused on identifying and explaining how green costs could be quantified and introduced into the transportation component of common supply chain optimization models. The findings were that escalating environmental concerns with prevalent transportation modes had led to an increased interest in the adoption of "green", sustainability practices in the area of supply chain management (Robert and Benjamin, 2010), though some of the shortcomings of this study were that it focused mostly on transportation cost within the supply chain.

Abuko studied the impact of GSC practices on the performance of oil companies in Kenya. This study used a survey research design and sampled 6 respondents from each of the 5 major oil marketing firms. The findings were that the adoption of GSC practice positively impacts productivity, cost saving, efficiency and quality improvement (Abuko, 2011) although some of the shortcomings of this study were that it focused mostly on oil companies in Kenya and green supply chain.

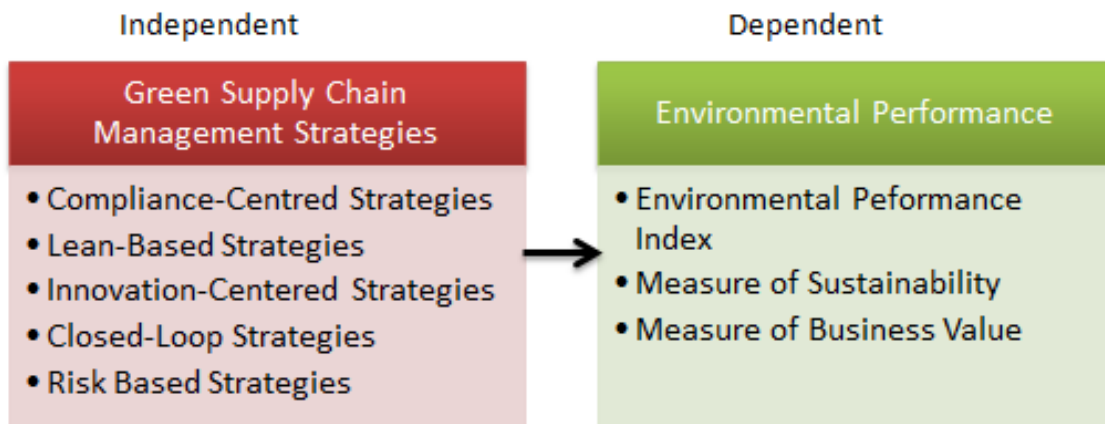
Warner studied green supply chain management and supply responsiveness among food and beverage manufacturing firms in Nairobi. This study adopted a descriptive research design studying the implementation of Green Supply Chain and Responsive Supply Chain Management among food and beverages manufacturing firms in Nairobi. A descriptive design focuses on the investigation of the elements in their current state without necessarily making any changes to them. Their findings were that, it established benefits experienced by firms that implement GSCM that include improvement in information systems, use of recyclable materials were promoted, cost saving by firms, and reduced environmental impact of business process and reduced risks of prosecution based on anti-environmental reasons (Warner, 2012), although some of the shortcomings of this study were that it focused mostly on food and beverage manufacturing firms in Nairobi and green supply chain management.

Chege studied on GSCM practices and supply chain performance of private hospitals in Nairobi, Kenya. The methodology used research design based on descriptive survey. This design was deemed appropriate as it allowed the researcher to draw conclusion on the link between GSCM practices and performance. The findings from this study were that waste management practice was the most significant as compared to other GSCM practices (Chege, 2012), although some of the shortcomings of this research were that it focused mostly on private hospitals in Nairobi, Kenya.

## 2.6 Conceptual Framework

The conceptual framework will enable us to demonstrate the proposed relationships between the dependent variable and the independent variables in the study and allows the same to be depicted diagrammatically. The dependent variable in this case is environmental performance which consists of environmental performance index, measure of sustainability and measure of business value from environmental performance. The independent variable in this case is green supply chain management strategies which comprise of compliance-centred strategies, lean-based strategies, innovation-centred strategies, closed-loop strategies, and risk based strategies.

Environmental performance index encompasses compliance aspects, environmental release aspects, resource consumption aspects and environmental remediation aspects; Measure of sustainability encompasses raw materials aspects, water consumption aspects, energy sustainability aspects and finally packaging aspect.



**Table 2.6 Conceptual model of dependent and independent variables**

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

Some of the main areas of focus which form the basis of methodology on this chapter include research design, population, sample design, data collection and data analysis.

### **3.2 Research Design**

In order to determine the GSCM strategies and environmental performance relationship, a descriptive survey design was developed that was used to collect data from the population. After data collection, various tools were used to aid with analysis of the information that was collected, which involved physical evaluation together with software and hardware computation of the data.

### **3.3 Population**

The population of study for the GSCM strategies and environmental performance consists of 41 registered brewing firms operating in Kenya. These brewing firms are based on statistics from the Kenya Revenue Authority database (KRA, 2016).

### **3.4 Sample Design.**

“Population sampling is the process of taking a subset of subjects that is representative of the entire population. The sample must have sufficient size to warrant statistical analysis. Sampling is done usually because it is impossible to test every single individual in the population. It is also done to save time, money and effort while conducting the research” (Explorable, 2016) and this makes it possible to perform research especially for individuals like students or staff in various institutions or organization, who have very limited resources or experience to manage all the way through. As a result a good sample size of brewing firms in Kenya was selected, as according to Mugenda (2003), at least (10%) of the total assessable population is regarded as an adequate sample for a study

which uses descriptive research design. The sampling method used in this case is judgemental sampling (Non-probability sampling) i.e. subjects/elements are selected on the basis of the judgement/opinion of one or more persons (i.e. selection of population items by means of “expert judgement”)

### **3.5 Data Collection**

This research was based on both secondary and primary data that contributed to the final analysis that answered the objectives. The secondary data was mainly research articles information collected online and library based on related topics of GSCM from other researchers that have been published. The primary data collected was based on a questionnaire that was developed to collect both qualitative and quantitative data from the respondents in the brewing firms. The questionnaire with three main components was developed with a systematic structure that was used to collect data in the field. These main sections were:

Part A: Bio-data

Part B: Green Supply Management Strategies

Part C: Environmental Performance

The nature of the respondents consists of volunteers from the firms, who have worked for about 1 and above years, are either both male or female, are from firms that practice green supply chain management and are 20 years and above, most suitably volunteers with some background or task assignment in the area of supply chain or logistics. The respondents were briefly explained the simple instructions that were to be followed and then given a chance to give their honest opinion on the questionnaire. They were physically handed the questionnaires. After finishing, the completed questionnaires were gathered for further analysis later on.



<u>Object</u>	<u>Data collected</u>	<u>Data Analysed</u>
Bio-data	Nominal	Statistics on gender, employment period, period the firm has practiced GSCM, age
Green supply chain management strategies	Ordinal	Statistics based on compliance-centred strategies, lean-based strategies, innovation-centred strategies, closed-loop strategies, risk based strategies.
Environmental Performance	Ordinal	Statistics based on environmental performance index, measure of sustainability, measure of business value

**Table 3.1 Summary of data collected and data analysed.**

### **3.6 Data Analysis**

The data from the field was then briefly examined for some common errors that are commonly likely to happen and then quantitative and qualitative techniques were used to analyse the data collected. Statistical measures of central tendency such as percentage, mean and standard deviation were used to analyse the data first of all. Tables, graphs and figures were used to determine and identify the nature of GSCM strategies and environmental performance of brewing firms in Kenya. Also regression analysis was used to determine the relationship between GSCM strategies and environmental performance of brewing firms in Kenya, this was made possible by tools and features offered by data analysis software that was used for this research, in our case MS Excel and SPSS spread sheet applications were most appropriate.

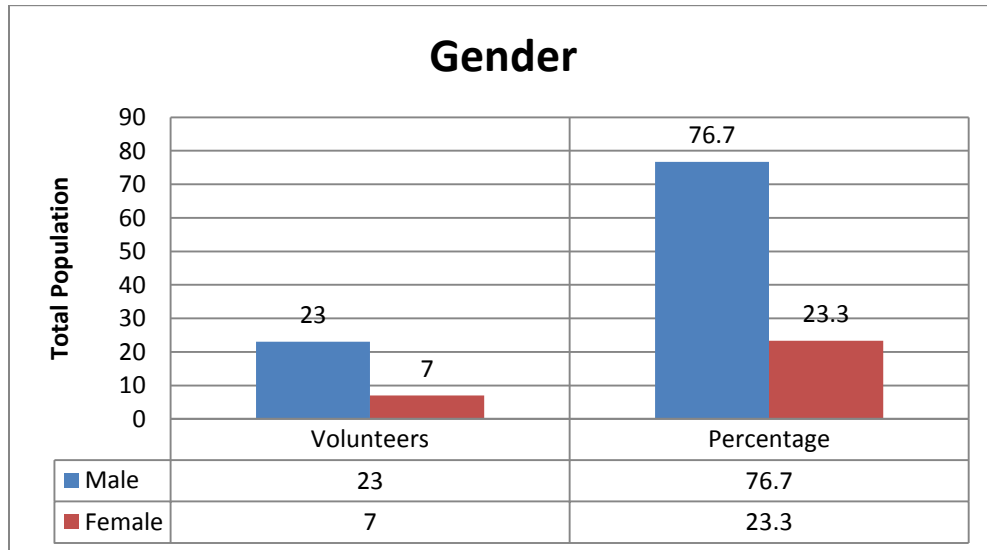
## CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSIONS

### 4.1 Introduction

This chapter covers the following areas based on data collected from the questionnaire; first is the analysis of the bio-data, secondly is analysis of the data on green supply chain management strategies, thirdly is the analysis of the data on environmental performance. Data on GSCM strategies and environmental performance will help fulfil the first objective of the research. Finally is the analysis that will be used to determine the relationship between dependent and independent variables based on regression analysis.

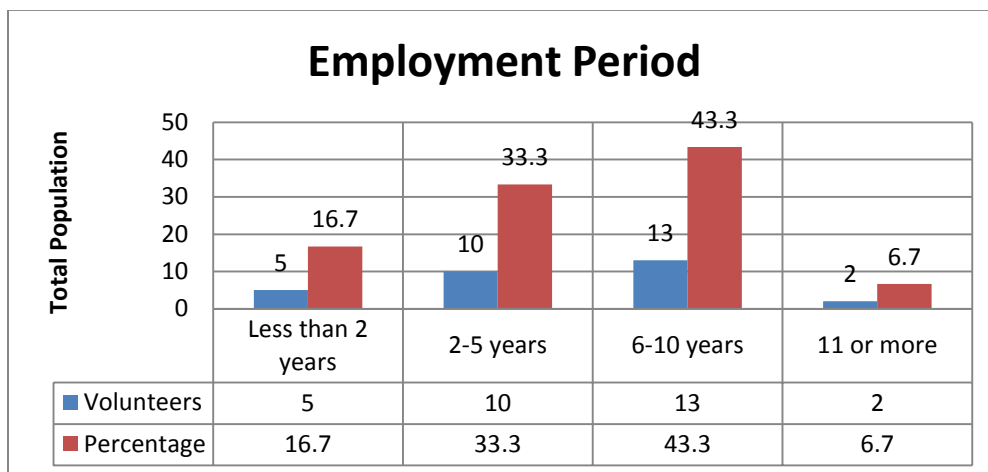
#### 4.1.1 Gender Of Respondents

According to the table below, it is clear enough that majority of those who volunteered were of male gender. The percentage of males was 76.7% and that of female was 23.3%.



**Table 4.1.1 Gender types of volunteers**

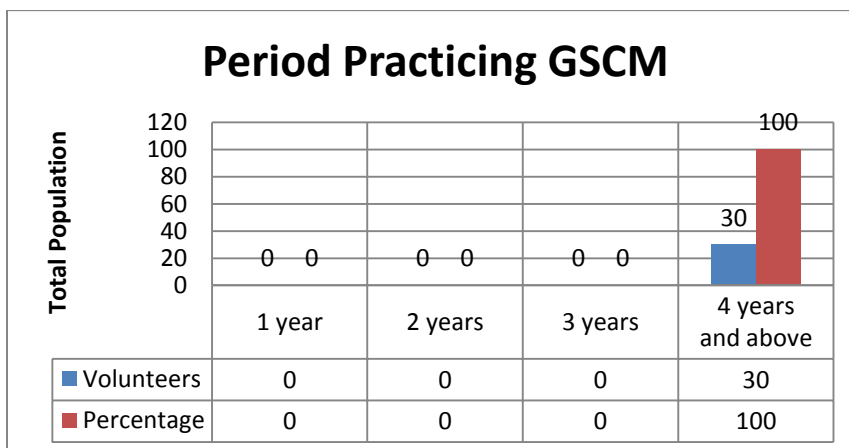
### 4.1.2 Employment Years



**Table 4.1.2 Years worked by volunteers**

According to data from the questionnaire collected on years of employment it is evident that most of the volunteers were between 6-10 years i.e. 43.3%, followed by 2-5 years i.e. 33.3%, followed by less than 2 years i.e. 16.7% and the least were 11 or more years i.e. 6.7%.

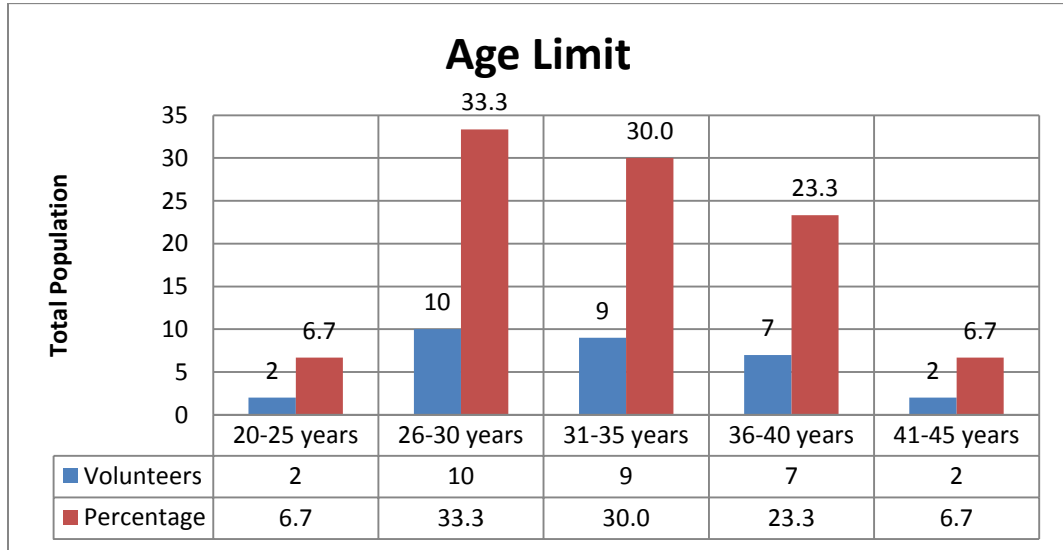
### 4.1.3 Period practicing GSCM



**Table 4.1.4 Years of practicing GSCM**

According to data collected from the questionnaire, almost all of the volunteers indicated that their firms have been practicing GSCM for more than 4 years, thus is an indication that the firms have achieved some level of experience on matters relating to GSCM.

#### 4.1.4 Age Limit



**Table 4.3 Age limit of volunteers**

According to data collected from the questionnaire, most of the volunteers were between 26-30 years i.e. 33.3%, followed by 31-35 years i.e. 30%, followed by 36-40 years i.e. 23.3%. Volunteers of age limit between 20-25 years and 41-45 years both had the same percentage of 6.7%.

## 4.2 Green Supply Chain Management Strategies

### 4.2.1 Compliance-Centred Strategies

<b>Compliance-Centred Strategies:</b>		
	<b>Mean</b>	<b>SD</b>
The firm has adopted compliance based strategies in response to environmental regulation?	<b>3.27</b>	<b>1.26</b>
The firm complies with the stakeholders requirements in its processes and products design?	<b>3.4</b>	<b>0.5</b>
The firm has adopted compliant based strategies in an effort to address the customer needs?	<b>3.7</b>	<b>1.21</b>
By obeying local laws on alcohol consumption it has made the brewing firm profitable?	<b>2.5</b>	<b>0.68</b>
How much does the firm comply with ISO certification i.e. international standard systems?	<b>3.77</b>	<b>0.97</b>
Compulsory certification by agencies like NEMA (National Environmental Management Authority) makes the firm profitable?	<b>2.23</b>	<b>1.04</b>
<b>Total Mean/SD</b>	<b>18.87</b>	<b>5.66</b>

**Table 4.2.1 Compliance-centred strategies**

Majority of the volunteers i.e. those who indicated to a large extent indicated that their firms comply with ISO certification (M=3.77, SD=0.97), their firms adopt compliant based strategies in an effort to address their customer needs (M=3.7, SD=1.21). Those who indicated to a moderate extent indicated that their firms comply with the stakeholders requirements in its processes and products design (M=3.4, SD=0.5) and their firms have adopted compliance based strategies in response to environmental regulations (M=3.27, SD=1.26). Those who indicated to the least extent indicated that by obeying local laws on alcohol consumption it has made the brewing firms profitable (M=2.5, SD=0.68) and compulsory certification by agencies like NEMA makes their firms profitable (M=2.23, SD=1.04). This concludes that majority of the organization have adopted compliance-centred strategies as part of GSCM strategies implantation.

## 4.2.2 Lean-Based Strategies

<u>Lean-Based Strategies:</u>		
	Mean	SD
Suppliers are required to satisfy operations based efficiency targets?	2.67	0.92
There are environmental benefits obtained from green performances?	2.77	1.28
Economic performance get enhanced by waste reduction and optimized resource usage?	3.43	1.22
Firm uses application of biodegradable material in manufacturing?	3.33	0.92
Firm applies lean production in its operation?	3.23	1.01
Firm monitors and manages amount of waste produced?	2.87	1.17
<b>Total Mean/SD</b>	<b>18.3</b>	<b>6.52</b>

**Table 4.2.2 Lean-based strategies**

Those that indicated to a large extent indicated that economic performance gets enhanced by waste reduction and optimized resource usage (M=3.43, SD=1.22), their firms use application of biodegradable material in manufacturing (M=3.33, SD=0.92) and their firms apply lean production in its operation (M=3.23, SD=1.01). Those who indicated to a moderate extent indicated that their firms monitor and manages amount of waste produced (M=2.87, SD=1.17), there are environmental benefits obtained from green performances (M=2.77, SD=1.28) and suppliers are required to satisfy operation based efficiency targets (M=2.67, SD=0.92). This concludes that most firms have integrated lean-based strategies as part of GSCM strategies implementation.

### 4.2.3 Innovation-Centred Strategies

<b><u>Innovation-Centred Strategies:</u></b>		
	<b>Mean</b>	<b>SD</b>
What is the level of investment in research and development?	<b>3.43</b>	<b>1.04</b>
Firm' s products are eco-designed to reduce consumption of material/energy?	<b>3.67</b>	<b>1.12</b>
There is cooperation with customers for eco-design?	<b>3.33</b>	<b>1.12</b>
There is cooperation with customers for green purchasing?	<b>3.6</b>	<b>0.93</b>
There is cooperation with customers for green packaging?	<b>2.77</b>	<b>1.28</b>
There is cooperation with customers for cleaner production?	<b>3.23</b>	<b>1.28</b>
<b>Total Mean/SD</b>	<b>20.03</b>	<b>6.77</b>

**Table 4.2.3 Innovation-centred strategies**

Those who indicated to a large extent indicated that firms products are eco-designed to reduced consumption of material/energy (M=3.67, SD=1.12), there is cooperation with customers for green purchasing (M=3.6, SD=0.93). Those who indicated to a moderate extent indicated that there is some level of investment in research and development (M=3.43, SD=1.04), there is cooperation with customers for eco-design (M=3.33, SD=1.12), and there is cooperation with customers for cleaner production (M=3.23, SD=1.28). Those who indicated to the least extent indicated that there is cooperation with customers for green purchasing (M=2.77, SD=1.28). This concludes that most firms have adopted innovation-centred strategies as part of GSCM strategies implementation.

#### 4.2.4 Closed-Loop Strategies

<b><u>Closed-Loop Strategies:</u></b>		
	<b>Mean</b>	<b>SD</b>
Firm manage reverse flow of material such as take back practices (working with sellers to return used bottles after consumption)?	<b>3.53</b>	<b>1.33</b>
Firm engages in waste recovery?	<b>3</b>	<b>0.83</b>
Firm engage in environmental packaging and distribution (Designing waste disposal containers and collection points)?	<b>3.03</b>	<b>1.13</b>
Firm engage in remanufacturing?	<b>3.37</b>	<b>0.93</b>
<b>Total Mean/SD</b>	<b>12.93</b>	<b>4.22</b>

**Table 4.2.4 Closed-loop strategies**

Those who indicated to a large extent indicated that firms manage reverse flow of material such as take back practices (M=3.53, SD=1.33) and firms engage in remanufacturing (M=3.37, SD=0.93). Those who indicated to a moderate extent indicated that firm engage in environmental packaging and distribution (M=3.03, SD=1.13) and firms engage in waste recovery (M=3, SD=0.83). This concludes that most firms have integrated closed-loop strategies as part of GSCM strategies implementation.

#### 4.2.5 Risk Based Strategies

<b><u>Risk Based Strategies:</u></b>		
	<b>Mean</b>	<b>SD</b>
Firm always comply with ISO standards annually?	<b>3.87</b>	<b>0.94</b>
Firm carry out auditing programs annually?	<b>3.43</b>	<b>0.9</b>
Firm insures suppliers meet all the relevant regulatory requirements?	<b>3.03</b>	<b>0.85</b>
What is the level of supply chain greening program?	<b>3.03</b>	<b>1.13</b>
Firm consults environmental approved suppliers?	<b>2.8</b>	<b>1.3</b>
Firm only uses environmental approved supplies and items?	<b>3.37</b>	<b>0.89</b>
<b>Total Mean/SD</b>	<b>19.53</b>	<b>6.01</b>

**Table 4.2.5 Risk based strategies**



Those who indicated to a large extent indicated that firms always comply with ISO standards annually (M=3.87, SD=0.94), firms carry out auditing programs annually (M=3.43, SD=0.9) and firms only use environmental approved supplies and items (M=3.37, SD=0.89). Those who indicated to a moderate extent indicated that firms insure suppliers meet all the relevant regulatory requirements (M=3.03, SD=0.85) and there is some level of supply chain greening program (M=3.03, SD=1.13). Those who indicated to the least extent indicate that firm consults environmental approved suppliers (M=2.8, SD=1.3). This concludes that most firms have aligned risk based strategies as part of GSCM strategies implementation.

### 4.3 Environmental Performance

#### 4.3.1 Environmental Performance Index

<b>Environmental Performance Index:</b>		
	<b>Mean</b>	<b>SD</b>
What is the level of compliance to notices of violation, fines, and incidents based on compliance-centred strategies?	<b>2.97</b>	<b>0.96</b>
What is the level of resource consumption that includes thermal energy, electricity, water consumption and water purchases with regard to lean-based strategy?	<b>1.93</b>	<b>0.91</b>
What is the level of investment in research and development with regard to innovation-centred strategies?	<b>1.87</b>	<b>0.51</b>
What is the level of take back (e.g. returning bottles back from retailers) practices with regard to closed-loop strategies?	<b>2.97</b>	<b>1.07</b>
What is the level of environmental remediation e.g. pollution acceptable by NEMA and other environmental protection agencies with regard to risk based strategies?	<b>2.63</b>	<b>1</b>
<b>Total Mean/SD</b>	<b>12.37</b>	<b>4.45</b>

**Table 4.3.1 Environmental performance index**

Those that indicated to a large extent indicated that there is some level of compliance to notices of violation, fines and incidents based on compliance-centred strategies (M=2.97, SD=0.96), there is some level of take back practices with regard to closed-loop strategies

(M=2.97, SD=1.07) and there is some level of environmental remediation with regard to risk based strategies (M=2.63, SD=1). Those that indicated to a moderate extent indicate that there is some level of resource consumption that includes thermal energy, electricity, water consumption and water purchase with regard to lean-based strategy (M=1.93, SD=0.91) and there is some level of investment in research and development with regard to innovation-centred strategies (M=1.87, SD=0.51). This concludes that great environmental performance is achieved by GSCM strategies execution in the firms.

#### 4.3.2 Measure Of Sustainability

<b>Measure of sustainability:</b>		
	<b>Mean</b>	<b>SD</b>
Impact of compliance-centred strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging?	<b>3</b>	<b>0.98</b>
Impact of lean-based strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging?	<b>2.93</b>	<b>0.78</b>
Impact of innovation-centred strategies on sustainability for past 5- 10 years with regard to raw materials, water, energy and packaging?	<b>3.1</b>	<b>0.71</b>
Impact of closed-loop strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging?	<b>2.4</b>	<b>0.72</b>
Impact of risk based strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging?	<b>2.63</b>	<b>1.03</b>
<b>Total Mean/SD</b>	<b>14.06</b>	<b>4.22</b>

**Table 4.3.2 Measure of sustainability**

Those that indicated to a large extent indicated that there is some impact in innovation-centred strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging (M=3.1, SD=0.71) and some impact in compliance-centred strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging (M=3, SD=0.98). Those that indicated to a moderate extent indicated that there is some impact in lean-based strategies on sustainability for past 5-10 years with

regard to raw materials, water, energy and packaging (M=2.93, SD=0.78) and some impact in risk based strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging (M=2.63, SD=1.03). Those that indicated to the least extent indicated that there is some impact in closed-loop strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging (M=2.4, SD=0.72). This concludes that firms are more sustainable because of GSCM strategies adoption.

### 4.3.3 Measure Of Business Value

<b>Measure Of Business Value:</b>		
	<b>Mean</b>	<b>SD</b>
Effect of compliance-centred strategies on business value?	<b>3.3</b>	<b>0.99</b>
Effect of lean-based strategies on business value?	<b>3.17</b>	<b>0.79</b>
Effect of Innovation-centred strategies on business value?	<b>3.2</b>	<b>0.76</b>
Effect of closed-loop strategies on business value?	<b>2.7</b>	<b>0.84</b>
Effect of risk based strategies on business value?	<b>3</b>	<b>1.11</b>
<b>Total Mean/SD</b>	<b>15.37</b>	<b>4.49</b>

**Table 4.3.3 Measure of business value**

Those that indicated to a large extent indicated that there is some effect in compliance-centred strategies on business value (M=3.3, SD=0.99) and some effect in innovation-centred strategies on business value (M=3.2, SD=0.76). Those that indicated to a moderate extent indicated that there is some effect in lean-based strategies on business value (M=3.17, SD=0.79) and some effect in risk based strategies on business value (M=3, SD=1.11). Those that indicated to the least extent indicated that there is some effect in closed-loop strategies on business value (M=2.7, SD=0.84). This concludes that business value is created by GSCM strategies implementation in the firms.

#### 4.4 Regression Analysis

Multiple linear regression was used to establish the relationship between the dependent (Environmental Performance) and the independent (GSCM Strategies) variables. This was made possible by comparison done between MS Excel and SPSS statistical software application results. The results are presented below.

##### 4.4.1 Coefficient Of Correlation, $R^2$

<i>Regression Statistics</i>	
Multiple R	0.864743009
R Square	0.747780472
Adjusted R Square	0.718678219
Standard Error	4.669308087
Observations	30

**Table 4.4.1 Regression statistics based on statistics software**

With regard to the R Square of 0.748 it can be determined that there is 75%, percentage of variance explained by the independent and dependent variable (i.e. If the independent variable increases, the dependent variable increases or decreases to some extent). This means that there is 75% variation in GSCM strategies explained by environmental performance and 25% by other factors not in the model. This indicates a strong relationship and thus the model is considered adequate and may be used for the estimation of environmental performance based on GSCM strategies.

##### 4.4.2 Analysis Of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1680.637	3	560.212	25.695	.000 <sup>a</sup>
	Residual	566.863	26	21.802		
	Total	2247.500	29			

**Table 4.4.2 ANOVA statistics**

With regard to ANOVA, the F test significance has been determined to be less than 0.05, thus making the data in the model significant for determination of the relationship between the dependent and the independent variables.

#### 4.4.3 Multiple Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-16.706	3.858		-4.331	.000
	Environmental_Performance_Index	4.039	1.597	.355	2.530	.018
	Measure_Of_Sustainability	3.750	1.299	.328	2.887	.008
	Measure_Of_Business_Value	3.796	1.526	.353	2.488	.020

**Table 4.4.3 Multiple regression analysis statistics**

The p-values in the model indicate that they are less than 0.05 i.e. environmental performance index = 0.18, measure of sustainability = 0.008 and measure of business value = 0.020 thus making them significant in the model. The t statistics indicate values greater than 2 i.e. environmental performance index = 2.530, measure of sustainability = 2.887 and measure of business value = 2.488. When the t statistics values are more than 2 or less than -2, then it is considered significant at the 95% level with regard to corresponding p-values which are less than 0.05. The regression model used is given below:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$$

Y = GSCM Strategies

$\alpha$  = Constant

X1 = Environmental Performance Index (EPI), X2 = Measure of Sustainability (MS),

X3 = Measure of Business Value (MBV)

$\beta_i$  = Sensitivity of GSCM Strategies to the independent variable

$\varepsilon$  = Error term

$$Y = -16.706 + 0.018\beta_1 + 0.008\beta_2 + 0.020\beta_3 + \varepsilon$$

$$Y = -16.706 + 0.018(\text{EPI}) + 0.008(\text{MS}) + 0.020(\text{MBV}) + \varepsilon$$

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

### **5.1 Introduction**

This final chapter will give us the summary of findings, conclusions, recommendations, limitations and suggestions for further research

### **5.2 Summary of findings**

Based on the questions that were answered on the questionnaire, starting with green supply chain management strategies, it is evident that with regard to compliance-centred strategies, those that indicated to a large extent indicated that their firms comply with ISO certification and also their firms adopt compliant based strategies in an effort to address their customer needs. With regard to lean-based strategies, those that indicated to a large extent indicated that economic performance gets enhanced by waste reduction and optimized resource usage, their firms use application of biodegradable material in manufacturing and also their firms apply lean production in their operation. With regard to innovation-centred strategies, those that indicated to a large extent indicated that their firm's products are eco-designed to reduced consumption of material/energy and there is cooperation with customers for green purchasing. With regard to closed-loop strategies, those that indicated to a large extent indicated that their firms manage reverse flow of material such as take back practices and their firms engage in remanufacturing. With regard to risk based strategies, those that indicated to a large extent indicated that their firms always comply with ISO standards annually, their firms carry out auditing programs annually and finally their firms only use environmental approved supplies and items.

Moving to environmental performance with regard to environmental performance index, those that indicated to a large extent indicated that there is some level of compliance to notices of violation, fines and incidents based on compliance-centred strategies, there is some level of take back practices with regard to closed-loop strategies and also there is some level of environmental remediation with regard to risk based strategies. Continuing to measure of sustainability, those that indicated to a large extent indicated that there is some impact in innovation-centred strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging and also some impact in compliance-centred strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging. Finally, continuing to measure of business value, those that indicated to a large extent indicated that there is some effect in compliance-centred strategies on business value and also some effect in innovation-centred strategies on business value.

The regression analysis indicated that the most significant factor that influenced environmental performance was environmental performance index as it had the highest positive coefficient (4.039), followed by measure of business value (3.796) and then measure of sustainability (3.750). All of them had t statistics values greater than 2 and corresponding p-values less than 0.05.

### **5.3 Conclusions**

Based on the means and standard deviation that were collected and analysed from the questionnaires, it is evident that the volunteers have been able to identify that the firms do have GSCM strategies that they follow (i.e. compliance-centred strategies, lean-based strategies, innovation-centred strategies, closed-loop strategies and risk-based strategies) and it is also evident that they practice these strategies to some large or small extent depending on the firm's management goals, mission and vision. This answers the first

objective of the research which was to determine the Green Supply Chain Management strategies commonly used by brewing firms in Kenya.

When it comes to determining the relationship between the dependent and independent variable, it has been confirmed based on the data analysis that there is a positive relationship. This was possible by confirming that the F test significance in ANOVA results indicates significant, the R Square indicates 0.748 i.e. 75% variance, the t statistics values are greater than 2 while corresponding p-values are less than 0.05, thus significant. This fulfils the second objective which was to establish the relationship between Green Supply Chain Management Strategies and Environmental Performance of brewing firms in Kenya.

#### **5.4 Recommendations**

With regard to the findings of this study, it is recommended that the implementation of GSCM strategies should be executed among brewing firms in Kenya because there are benefits that are achieved from such implementation. Some of the benefits realized include, improved agility, sustainability of resources, lowered cost, increased efficiency, product differentiation and competitive advantage, improved quality and products, and finally is adapting to regulation and reducing risks.

Action needs to be taken by the relevant firms and authorities to address the challenges that are impacting the implementation of GSCM. Some of the key issues that should be addressed were identified as, lack of appropriate technology and business processes needed, trade-off between green requirements and lean practices, failure to integrate supply chain optimization efforts with green supply chain efforts, communication planning and finally is difficulties in tracing of carbon footprint due to global sourcing.



## **5.5 Limitations of study**

Various challenges were met when conducting the research that included the fact that the firms ordinarily do not want to give information due to client confidentiality and companies have trade secrets and would like to keep their strategies as confidential as possible because they would use them to gain competitive advantage. Therefore the survey volunteers were not very willing to disclose all their strategies in some cases or give details of how they have implemented their responses.

The questionnaire for collecting data was using the likert scale system which may have had biases of the volunteers who filled the questionnaire, reflected in the results. This might therefore lead to results being dependent upon the attitudes of the volunteers of the firms that responded.

The time available for this study was limited as some of the volunteers were very cautious about the amount of time they were willing to give to fill the questionnaires, as they had duties to perform and were against being distracted or when available were keen on taking a small amount of their rest break to participate in the survey. The other challenge was on accessing some volunteers in some departments of management during the time of study which lead the researcher to having to conduct the survey with only the department members who were available to give the necessary details.

## **5.6 Suggestions for further research**

The study has determined the GSCM strategies and environmental performance of brewing firms in Kenya, however there is still the existence of second generation brewers in Kenya, where there is still very little research covered on. Some of the challenges of covering research in this area are that the entrepreneurs carrying out this business are operating illegally without licences from the city council, NEMA, NACADA, KEBS or

even KRA. Their businesses are done in secret because of fears of being arrested or held accountable for such establishments by law enforcers. The managers or even consumers are reluctant to participate in any surveys due to certain misconceptions that the surveyors may be law enforcers out to catch them, thus making it difficult to conduct research in this area. However it is still important to cover research on secondary generation brew.

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## APPENDIX

### APPENDIX 1: BREWING FIRMS IN KENYA AS REGISTERED BY KRA IN THE YEAR 2015 (KRA, 2015).

1. Africa Spirits Limited	15. Tihan Limited	29. Stesodor Company Limited
2. Crywan Enterprises Limited	16. Kenlab Supplies Limited	30. Grand Breweries Limited
3. Crystal World Agencies Limited	17. Kedsta Investments	31. Vinepack Limited
4. Jovin K. Limited	18. Kenya Wine Agencies Ltd	32. Kenya Breweries Limited
5. Julijo Investments	19. Continental Beverages Ltd	33. Lakers East Africa Limited
6. Lumat Company Limited	20. Advance Limited	34. Tona Miller Limited
7. Lyniber Supplies Limited	21. Fai Amarillo Limited	35. Marchi East Africa Limited
8. Metro Distillers E.A. Limited	22. Telleny Beverages Limited	36. Crown Beverages Limited
9. Moonwalk Investment Ltd	23. Cannate Breweries Limited	37. Rift Valley Brewing Co.
10. Sherehe Industries Limited	24. MDI Limited	38. Miti Brewers and Distillers
11. Tana Investments Limited	25. Eagle classic	39. Grand Beverages Ltd
12. Zheng Hong Kenya Limited	26. Mashwa Breweries	40. Tylex E.A. Brewers Ltd
13. London Distillers (K) Ltd	27. Merchant Pinewood Limited	41. Keroche breweries limited
14. Bisept Limited	28. Roskin Agencies	

# QUESTIONNAIRE

RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

**Green supply chain management strategies and environmental performance of brewing firms in Kenya.**

1. Bio-data. 2. GSCM strategies. 3. Environmental performance.

**(\*\*Please put an [X] mark inside the box where appropriate with the parameters listed)**

**Part 1: Bio-data**

Gender: Male [ ] Female [ ]

Employment period:

a). Less than 2 years [ ] b). 2-5 years [ ] c). 6-10 years [ ] d). 11-More [ ]

Period the firm has practiced green supply chain management:

a). Considering it currently.

b). 1 years [ ] c). 2 years [ ] d). 3 years [ ] e). More than 4 years [ ]

What is your age limit:

1. 20-24 years [ ] 2. 25-29 years [ ] 3. 30-34 years [ ] 4. 35-39 years [ ]

5. 40-44 years [ ] 6. 45 and above [ ]

**(\*\*Please put an [X] mark inside the box where appropriate with the parameters listed)**

**PART 2: GREEN SUPPLY CHAIN MANAGEMENT STRATEGIES**

**Q1: To what extent has your firm used the following compliance based strategies?**

<b><u>Compliance-Centred Strategies:</u></b>	Very small extent	Small extent	Medium extent	Great extent	Very great extent
	1[X]	2[X]	3[X]	4[X]	5[X]
The firm has adopted compliance based strategies in response to environmental regulation?	[ ]	[ ]	[ ]	[ ]	[ ]
The firm complies with the stakeholders requirements in its processes and products design?	[ ]	[ ]	[ ]	[ ]	[ ]
The firm has adopted compliant based strategies in an effort to address the customer needs?	[ ]	[ ]	[ ]	[ ]	[ ]



By obeying local laws on alcohol consumption it has made the brewing firm profitable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How much does the firm comply with ISO certification i.e. international standard systems?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Compulsory certification by agencies like NEMA (National Environmental Management Authority) makes the firm profitable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Q2: To what extent has the firm aligned lean-based strategies in orders to ensure operation efficiency?**

<u>Lean-Based Strategies:</u>	Very small extent	Small extent	Medium extent	Great extent	Very great extent
	1[X]	2[X]	3[X]	4[X]	5[X]
Suppliers are required to satisfy operations based efficiency targets?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are environmental benefits obtained from green performances?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Economic performance get enhanced by waste reduction and optimized resource usage?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm uses application of biodegradable material in manufacturing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm applies lean production in its operation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm monitors and manages amount of waste produced?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Q3: To what extent does the firm practice innovation-centred strategies to improve its goods, services and also relations with consumers?**

<u>Innovation-Centred Strategies:</u>	Very small extent	Small extent	Medium extent	Great extent	Very great extent
	1[X]	2[X]	3[X]	4[X]	5[X]
What is the level of investment in research and development?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm' s products are eco-designed to reduce consumption of material/energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is cooperation with customers for eco-design?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is cooperation with customers for green purchasing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is cooperation with customers for green packaging?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

There is cooperation with customers for cleaner production?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Q4: To what extent has your firm integrated closed-loop strategy with its stakeholders?

<u>Closed-Loop Strategies:</u>	Very small extent	Small extent	Medium extent	Great extent	Very great extent
	1[X]	2[X]	3[X]	4[X]	5[X]
Firm manage reverse flow of material such as take back practices (working with sellers to return used bottles after consumption)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm engages in waste recovery?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm engage in environmental packaging and distribution (Designing waste disposal containers and collection points)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm engage in remanufacturing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q5: To what extent has your firm adopted risk based strategies in its management of operations?

<u>Risk Based Strategies:</u>	Very small extent	Small extent	Medium extent	Great extent	Very great extent
	1[X]	2[X]	3[X]	4[X]	5[X]
Firm always comply with ISO standards annually?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm carry out auditing programs annually?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm insures suppliers meet all the relevant regulatory requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
What is the level of supply chain greening program?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm consults environmental approved suppliers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firm only uses environmental approved supplies and items?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**PART 3: ENVIRONMENTAL PERFORMANCE.**

**Q1: To what extent have GSCM strategies been implemented in order to enhance environmental performance?**

<b><u>Environmental Performance Index:</u></b>	Very small extent	Small extent	Medium extent	Great extent	Very great extent
	1[X]	2[X]	3[X]	4[X]	5[X]
What is the level of compliance to notices of violation, fines, and incidents based on compliance-centred strategies?	[ ]	[ ]	[ ]	[ ]	[ ]
What is the level of resource consumption that includes thermal energy, electricity, water consumption and water purchases with regard to lean-based strategy?	[ ]	[ ]	[ ]	[ ]	[ ]
What is the level of investment in research and development with regard to innovation-centred strategies?	[ ]	[ ]	[ ]	[ ]	[ ]
What is the level of take back (e.g. returning bottles back from retailers) practices with regard to closed-loop strategies?	[ ]	[ ]	[ ]	[ ]	[ ]
What is the level of environmental remediation e.g. pollution acceptable by NEMA and other environmental protection agencies with regard to risk based strategies?	[ ]	[ ]	[ ]	[ ]	[ ]

**Q2: To what extent have GSCM strategies made the firm sustainable with regard to resource utilization?**

<b><u>Measure of sustainability:</u></b>	Very small extent	Small extent	Medium extent	Great extent	Very great extent
	1[X]	2[X]	3[X]	4[X]	5[X]
Impact of compliance-centred strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging?	[ ]	[ ]	[ ]	[ ]	[ ]
Impact of lean-based strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging?	[ ]	[ ]	[ ]	[ ]	[ ]
Impact of innovation-centred strategies on sustainability for past 5- 10 years with regard to raw materials, water, energy and packaging?	[ ]	[ ]	[ ]	[ ]	[ ]
Impact of closed-loop strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging?	[ ]	[ ]	[ ]	[ ]	[ ]
Impact of risk based strategies on sustainability for past 5-10 years with regard to raw materials, water, energy and packaging?	[ ]	[ ]	[ ]	[ ]	[ ]

**Q3: To what extent has the firm created value by implementing GSCM strategies in the firm?**

<b><u>Measure Of Business Value:</u></b>	Very small extent	Small extent	Medium extent	Great extent	Very great extent
	1[X]	2[X]	3[X]	4[X]	5[X]
Effect of compliance-centred strategies on business value?	[ ]	[ ]	[ ]	[ ]	[ ]
Effect of lean-based strategies on business value?	[ ]	[ ]	[ ]	[ ]	[ ]
Effect of Innovation-centred strategies on business value?	[ ]	[ ]	[ ]	[ ]	[ ]

Effect of closed-loop strategies on business value?	[ ]	[ ]	[ ]	[ ]	[ ]
Effect of risk based strategies on business value?	[ ]	[ ]	[ ]	[ ]	[ ]

\*\*Please make an estimate if exact values not currently available:

<b>FIRMS ENVIRONMENTAL PERFORMANCE ESTIMATES.</b>			
<b>Performance Indicator:</b>	<b>Unit in %</b>	<b>2014</b>	<b>2015</b>
<b>A: Environmental performance index:</b>	<b>%</b>		
Level of greenhouse gasses emissions	%		
	%		
Compliance to laws and standards	%		
	%		
<b>B: Measure of sustainability:</b>	<b>%</b>		
Sustainability of raw materials	%		
	%		
Water saving	%		
	%		
Energy saving	%		
	%		
<b>C: Measure the business value of environmental performance:</b>	<b>%</b>		
Firm profitability	%		
	%		
Cost savings	%		
	%		
Level of capital and expenditure	%		
	%		