INTERNATIONAL JOURNAL OF SOCIAL Sciences and Information Technology
ISSN 2412-0294 www.ijssit.com

http://www.ijssit.com

EFFECTS OF GREEN PRODUCTION PRACTICES ON PERFORMANCE OF FIRMS IN KENYA'S ENERGY SECTOR

[1*] **Kariuki Agnes Wanjiru**
aggiekariuki5@gmail.com

[2**] **George Ochiri**
gochiri@gmail.com

[1, 2] *Jomo Kenyatta University of Agriculture and Technology, Kenya*

Purpose: *The main objective of this study was to determine effects of Green Production Practices on performance of firms in Kenya's Energy Sector*

Materials and methods*; This study adopted a descriptive research design to determine the effects of Green Supply Chain Management practices on enhancing the performance of firms in the energy sector. A descriptive research is one of the acceptable and flexible methods used by researchers in collecting original data which allowed for deeper explanation and in which information is collected without changing the environment. The population of interest in this study was the firms in Kenya's energy sector. These included electricity generation companies, transmission and distribution companies and petroleum products marketing firm's. The sample frame for this study was the Electric Power Generation Companies, Electric Power Transmission, Distribution and Supply Companies and Importers & Marketers of Petroleum Products. The list was obtained from Energy Regulatory Commission and KenGen. Purposive sampling was used to target the following officers of the target population companies: Procurement Officers, Transport and Logistics Managers, Finance Managers, Operation Managers, and Warehouse/Storage Managers who usually play a key role in supply chain operations. The data was then analyzed using descriptive statistics where percentage, mean and standard deviation were derived for easy understanding and interpretation hence drawing conclusion on the findings. Before analyzing, the data was edited, coded and then transferred into SPSS, where the researcher used bivariate correlation to analyze the data.*

Results*: The study also sought to find out the effectiveness of green production practices on the performance of firms in the energy sector. Overall, provision of information on environmentally friendly products to consumers, consideration of environmental issues in production, planning and control processes, consideration of environmental issues when selecting power production process.*

Recommendations: *Conducting Environmental Impact Assessment and follow up on the implementation of environmental impact mitigating factors when constructing facilities should be prioritized among the players in the energy sector. The National Environment Management Authority should always do a follow up on such constructions to ensure that the measures suggested to reduce effect of the facility to the environment are adhered to.*

Keywords*: Green Production, Lean production, Green recycling, Waste reduction*

1.0 INTRODUCTION

1.1 Background to the Study

This section presents a background of the study where the global, regional and local perspectives of GSCM are discussed. It then outlines the problem statement that this proposal seeks to tackle, purpose of study, specific objectives and related research questions. This chapter also seeks to justify what GSCM entails as well as outline possible limitations of the study. Green Supply Chain Management is all about delivering products and services from suppliers, manufacturers to end customers through material flow, information flow and cash flow in the context of environment. This chapter therefore seeks to understand how Green Supply Chain Management incorporates the environmental idea in each and every stage of the product and service in a Supply Chain and how these incorporation impacts on organizational performance.

In the recent past, there has been a growing worldwide concern on sustainability and environmental management. Emphasis on the adoption of environment friendly manufacturing/production activities has seen many companies embrace green supply chain management practices. The rise in pollution from the industrial sector together with greenhouse emissions to the environment has led to need of organizations realigning their supply chain so as to conserve the rare resources (Gen & Hiroshi, 2015). In the world environment, global warming is occurring at an alarming rate increasing pressure to organizations by governments and their customers to change their manufacturing habits. Consumers on the other hand have changed their purchasing habits as they are becoming sensitive to the effect the goods and services they procure have on the environment (Golinska & Andrés, 2012). It is in this regard that manufacturing companies have been forced to produce green and environmentally friendly products which led to the concept of green supply chain management.

Increasing concern on the environment has brought about a growing consensus that issues of environmental pollution from manufacturing industries should be addressed together with supply chain management and thereby leading to the adoption of Green Supply Chain Management, GSCM (Dubey & Gunasekaran, 2016). It is in this line that companies are monitoring, controlling and assessing the impact their operations have on the environment. Supply chain managers should also consider using environmental sustainability indicators while assessing the impact of their performance on the natural environment. The fact that there has been escalating deterioration of the environment in terms of increased pollution, wastes, diminishing raw materials and natural resources has led to the growing importance of green supply chain management (Sarkis & Dou, 2017).

There exist numerous definitions regarding green supply chain management which are all founded on environment management and sustainability. Basically, incorporating the green word in supply chain management shows the relationship that exists between SCM and the natural environment. Green Supply Chain Management has a very wide scope that ranges from green purchasing to reverse logistics to integrated green supply chains that flows from the supplier to the manufacturer to the customer (Emmett & Sood, 2010). Green supply chain management can be defined as integrating environmental logic and thinking into supply chain management (Hervani, 2015).

GSCM encompasses all the stages of production including product design, material sourcing, process of manufacturing, product delivery and end of product life management that is after the useful life of a product (Holbrook, 2014). Green supply chain management can also be defined as the integration of eco-friendly aspects into conventional supply chain management practices so as to make every activity of the value chain environmentally conducive (Khan & Ajmal, 2017). GSCM is aimed at minimizing the environmental footprint

of a product or a service by integrating environmental thinking in supply chain. GSCM is a supply chain that takes into account its impact on the natural environment by employing the best practices available so as to protect it. This concept is also closely linked to sustainable supply chain management. Hervani (2015) proposed that green supply chain management (GSCM) practices which include green purchasing, green production, materials management, green distribution/marketing and reverse logistics refer to the involvement of environmental thinking into the supply chain management from the extraction of raw materials to product design, manufacturing processes, delivery of the final products to the consumers and end-of life management (Sarkis & Dou 2017).

1.1.1 Global perspective of Green Supply Chain Management Practices

The world economy has been globalized dramatically since the World War II. In the automobile industry, globalization does not only mean the circulation of goods and services which is increasing in the combining of domestic market into international market but also the creation of opportunities for enterprises that tend to target domestic and international market (Sarkis & Dou, 2017). Taking these advantages, many countries have globalized their economies in order to benefit from lower costs of production. The world's manufacturing situation has shown that this trend will be mainly carried out in Asia in the next decades. The increase of industrialization and globalization in developing countries creates more opportunities for manufacturing industry but concurrently increases environmental burden (Cuthbertson & Tyssen, 2011). This is due to the fact that some countries have been considered as the gathering points of end-of life products for disposal from developed countries.

Leading manufacturers in developed countries generally have high environmental awareness and implement proactive environmental management practices such as green supply chain management (Oberlin, 2011). However, it is uncertain if smaller manufacturers in developed countries are more proactive than all manufacturers in developing countries. Research was carried out on small and medium-sized Japanese manufacturers, leading Chinese manufacturers and traditional Chinese manufacturers to determine their level of adoption of GSCM practices (Kuriyama, 2017). Statistical results show that leading Chinese manufacturers have the highest awareness of both domestic and international environmental regulations/policies, and implement all GSCM practices at the highest level. Leading Chinese manufacturers and Japanese manufacturers are aware of international environmental regulations/policies, but such awareness only motivates them to implement eco-design practices (Golinska, 2015). Traditional Chinese manufacturers have limited awareness of international environmental regulations/policies, but such awareness brings all types of GSCM practice. Large Japanese companies have made significant improvements for environmental and financial performance (Golinska, 2015). Experiences in GSCM practices among those large manufacturers can be disseminated to smaller companies in Japan as well as companies in developing countries such as China.

Solid waste in the United States has grown in the last 30 years and it is expected that this growth will continue to grow. According to the United States Environmental Protection Agency (EPA), approximately 12 billion tons of industrial waste and 208 million tons of municipal waste are generated in the U.S. each year. Industrial development has generated complex waste not only in terms of quantity but also in terms of their composition. Many customers are willing to pay for less air pollution in the USA (Emmett & Sood, 2010). They have a willingness to pay some more amounts for reduced emissions through renewable fuels (Bouchery, & Tan, 2017). The marketers and manufacturers needed to reorganize their manufacturing and business models to accomplish the consumer's environmental beliefs (Chen, 2010). With the review of previous researches, it can be easily determined that there is a developing trend where people prefer to use such products that are less

harmful for the environment. This is even if it means paying more for such products, which have less effect on the environment.

Study on companies from South Korea, shows that GSCM orientation positively influences firm performance via supply chain partners' trust and information sharing. In South Korea, GSCM involves transferring green knowledge and standardizing production and delivery processes, the success of joint efforts among supply chain partners hinges on how tightly the trust relationship with partners is woven (Sarkis & Dou, 2017). Research carried out on South Korean manufacturers shows that the implementation of GSCM practices can improve both environmental and financial performance of the firm. Environmental impact occurs at all stages of a product life cycle from resource extraction to manufacture, use, reuse, recycle, and disposal (Choi & Springer, 2015).

In Europe, GSCM has emerged as an important approach to reduce environmental risks and environmental burdens in manufacturing and disposal as well as enhance profit and competitive advantages (Choi & Springer, 2015). For over 70 percent of companies in Europe, the social aspects of a supply chain are usually given a strategic priority in their supply chain management endeavors and most of European supply chains have already harvested most of the low-hanging fruit of carbon reduction initiatives. Europe leads the path by making manufacturers responsible for the waste generated thought out and at the end of the product life cycle (Holbrook, 2014). Hence, the evaluation of performance in the industry under uncertainty is the main content of this study.

1.1.2 Regional perspective of Green Supply Chain Management Practices

In most African countries, the focus of GSCM is not only restricted to products and operations of the firm but also encompasses sourcing of materials and equipment with an emphasis on the immediate supplier to apply green efforts and on the means by which more green operations or products might be achieved (Golinska & Andres, 2012). This extends all the way to the customer, whose requirements are incorporated in the conceptualization of green supply chain and eventual disposal of the by-product after use. In Africa, there is strong evidence that Green Supply-Chain Management is still at an infancy stage in most of the countries and it is a practice that brings about sustainability in both manufacturing and construction firms (Belvedere & John, 2017). For instance, construction firms in Nigeria and South Africa have been known to lead in the adoption of Green supply chain management practices in their endeavors (Hirschinger, 2016). Here, GSCM is found to be compliant with environmental standards to bring about sustainability. In most African Countries, GSCM extends to packaging material, paper consumption, cleaning substances, water usage and noise pollution which forms part of daily logistics business and burdens the environment (Belvedere & John, 2017).

Over the past decade, the manufacturing sector in East Africa has grown rapidly. This growth has increased pressure on the environment in the form of air emissions, solid waste disposal, waste water discharges and resource depletion (United Nations Environment Programme, 2014). According to Hirschinger (2016), general increases in temperatures and decreases in rainfall have been observed. Consequently, a number of initiatives focused on sustaining atmospheric resources have been started. For example, The Kyoto Convention of 1997 and the United Nations Climate Change Conference of Copenhagen in 2009 have been key drivers in today’s practices by firms (United Nations Framework Convention on Climate Change, 2009). A number of firms are seeking environmental management systems certification such as ISO 14001 as such certification is a motivating factor for implementing GSCM practices (Lainez-Aguirre, 2015).

Oberlin (2011), noted that environmental pollution and resource depletion levels in the region is emerging as a problem and identified manufacturing industries as one of the primary sources of this problem. The manufacturing sector in the EAC region should therefore adopt GSCM practices in their manufacturing process so as to take advantage of the tangible cost & efficiency advantages as well as intangible & emotional benefits.

1.1.3 Local perspective of Green Supply Chain Management Practices

In Kenya, most of the companies are currently being driven by the green economy to going green. Expected business, environmental and customer pressure are the numerous drivers that influence firms to adopt green supply chain management practices (Aryadi, 2012). Some of the companies that have made the headway include the following; Kenya Tea Development Authority (KTDA) has adopted Green production whereby it has replaced fuel with water from Gura River to generate power used in processing tea. KTDA will thus be going green by reducing their carbon footprint as well as reducing energy costs (Belvedere & John, 2017). Safaricom through a lighting solution known as M-KOPA Solar has managed to provide quality lighting solution to thousands of people. This green project has allowed the company to reduce its carbon footprint as well as improve its customer experience. In support of green production, Mumias Sugar company embarked on using bagasse (a natural, industrial waste product in the industry), to produce biogas which powers their electricity generators (Ame, 2017).

In KenGen (one of the major key players in the energy sector), green supply chain management helps the organization to look critically into the role played by each channel member in the effort to meet customer needs and at the same time meet desired environmental standards. This is because, in Kenya, it is not enough for a firm to be 1S0 14000 certified or to have NEMA certificate for the Kenyan situations, but there should be another practice for environmental sustainability (Wang & Gupta, 2011). Being in the energy generating sector, the company causes a lot of environmental pollution in its drilling process which has increased the need to adopt green production process to reduce the impact. Also, the company needs to use green distribution that is ensure involvement of environmental thinking in green design, green packaging and environmentally friendly movement of the final product (Tan, 2017).

KenGen has been known to adopt green production practices whereby it is generating electricity from environmentally friendly sources such as wind, water, solar among others. In addition, the company has a Schools' Green Initiative Challenge where it partnered with the education ministry to roll out an environmental conservation program targeting more 60 primary schools in Mbeere North, South and Masinga areas. According to Belvedere & John (2017) it encourages pupils, teachers and non-teaching staff to participate in conservation by developing small forests and woodlots in their compounds to increase forest cover.

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

1.1.4 Energy Sector in Kenya

Kenya's energy mix is predominantly defined by three energy sources: biomass, petroleum, and hydropower for electricity. Traditional biomass use represents about 70% of the energy consumption in Kenya, while petroleum and electricity account for 21% and 9% respectively (Kant, Masiga and Veenstra, 2014). In the electricity sector, the generation mix is dominated by hydropower which makes up 49% of the total installed capacity in 2013. Fossil-fuel generation plants make up 33.5% of the total capacity while geothermal, wind and cogeneration make up the other portion of renewables in the mix (Kant, Masiga and Veenstra, 2014).

The energy sector has a number of players. According to the Institute of Economic Affairs (2015) the Ministry of Energy and Petroleum, the Energy Tribunal and the Energy Regulatory Commission are the policy making institutions in the Energy Sector. The Institute further identifies Kenya Electricity Generating Company (KenGen), Goethermal Development Corporation (GDC), and Independent Power Producers to be the producers of electric power in Kenya. Kenya Power and Lighting Company, Kenya Electricity Transmission Company and Rural Electrification Authority are the key players in the transmission and distribution of electricity.

In the petroleum sub-sector, Kenya Pipeline Company, National Oil Corporation of Kenya and private marketers of petroleum products to be the key players. The private marketers include Vivo Energy (Shell), Total Kenya, Mobil, Kenol, Kobil and other small and medium size marketers.

1.1.5 Organization Performance

Organizations that pursue green supply chain practices experience better performance and with it comes competitiveness (Rao and Holt, 2005) which consists of improved efficiency, quality and productivity improvement and cost savings (Rha, 2010). Efficiency can be measures in terms of procurement distance and the raw materials held, in-house traffic movements which affect time, use of resources such as fuel, utilization of empty trailer space and effective fleet management and utilization. Quality improvement is determined by environmentally friendly products, reduction in size and weight of products, waste management and reduction and reduction of carbon emission in course of production, transportation and utilization of product. Productivity entails the speed with which order are processed and goods dispatched without delays, increased product output as a result of reduced factory/in-house movements and cost savings measured by cost reduction benefits from suppliers, improved efficiency, achieving least total costs while minimizing carbon footprint and reduction in the overall operational costs (Feng, 2009).

1.2 Statement of the Problem

There has been a concern on greenhouse gases emissions and global warming in the recent time the world over. Environmental awareness in the 21st century has continued to gain momentum due to the effects of climate change, pollution and depletion of non-renewable natural resources and the key global challenge is how to address these issues (Douglas, 2016; UN, 2017). To protect the environment therefore, there is need for businesses to go green in order to enhance economic development that generates wealth and meets the needs of the current generation while saving the environment for future generations (Daft, 2018). Going green also has benefits which includes cushioning against the effects of climate change such as depletion of raw materials, access to affluent markets, access to special financing, good public image and approval from environmental regulatory authorities (Wanjohi et. al, 2016).

Greening the supply chain is a major concern for the world, and governments across the globe are striving to build green supply chains. Without sound green supply chain practices being implemented in the most polluting sectors such as energy generation and distribution in the developing countries, researchers are constrained in assessing which practices work best to promote well-performing firms and in proposing socially beneficial reforms (Masters, 2014). There are also dissenting views on the benefits of adopting green supply chain management practices. Some researchers like (Godstein, 2015) argue that the costs associated with adopting GSCM practices far outweigh the benefits. Such include the cost of new technologies, lower productivity, specialized staff recruitment, training and development among others. Therefore, there is no unanimity on economic usefulness of green supply chain management practices. Nasiche (2014) points out that in Kenya, use of GSCM practices has been slow resulting in lower diffusion rate. This could be attributed to inadequate information on the contribution of green public procurement practices towards firm performance.

As indicated in the reviews above, it was evident that the findings of studies conducted on the effects of green supply chain management practices were conflicting with studies from different regions providing different conclusions. In majority of organizations, managers are evaluated mainly on the basis of financial performance. There is, therefore, inadequate data that can help managers to decide on whether to adopt green procurement practices based on their relationship with performance especially in firms within the energy sector. This helps in explaining why the study of the effects of green supply chain practices on performance of firms in the energy sector in Kenya was needed. This study aimed to contribute to the knowledge gap on the effects of GSCM practices and organization performance in the energy sector.

1.3 Objectives of the Study

1.3.1 General Objective

The main objective of this study was to determine effects of Green Production Practices on performance of firms in Kenya's Energy Sector.

1.3.2 Specific Objectives

The specific objectives of this study were:

1. To establish the effects of Lean production practices on the performance of firms in Kenya's energy sector.
2. To determine the effects of Green recycling practices on the performance of firms in Kenya's energy sector.
3. To determine the effects of Waste reduction practices on the performance of firms in Kenya's energy sector.

2.0 LITERATURE REVIEW

2.1 Introduction

This section reviews literature relevant to Green Supply Chain Management and its impact on the performance of firms in the energy sector. The literature is reviewed from books, journals, academic publications, the internet, newspapers and government statistics. It also dwells on theories in support of GSCM by firms involved in generation of electricity and distribution of petroleum products by exploring practices employed by organizations and the literature is basically to support the objectives of carrying out the research.

2.2 Natural Resource-based View Theory

Scientists in the field of administration have long comprehended that upper hand relies upon the match between particular inside (hierarchical) capacities and evolving outside (natural) conditions (Andrews, 2011; Chandler, 2012; Wang & Li, 2008; Penrose, 2009). According to Hart (2015) it was only in the 1950s that a bonafide theory, known as the resource-based view of the firm, emerged, articulating the relationships among firm resources, capabilities, and competitive advantage. The match between internal and external environments according to Porters (2015) leads to competitive advantage due to cost leadership and quality differentiation.

Afterwards, it was noted that "competing for the future" is an important measure of competitive advantage. According to Hamel and Prahaland (2014), the firm must not only strategize on current/ short term profitability and competitive advantage but also the long-term ones. The asset-based view sets that upper hand can be managed just as the abilities making it are upheld by assets that are not effectively repeated by contenders (Hart, 2015).

This theory is applicable to green production practice. Recent environmental challenges facing the world have led to scrutiny of human economic activity, especially manufacturing/production. Projected population growth in the next 40 years will lead to accelerated production. According to Gore (2012), this growth might not be ecologically sustainable. Such production will stress the earth's natural systems beyond recovery (Commoner, 2012). As such, economic activity must change or risk irreversible damage to the planet's basic ecological systems. This theory also forms the basis for the green raw material variable as the natural environment is a key success factor especially in the energy and petroleum related organizations.

2.3 Green Production

Green production is defined as production process which use inputs with relatively low environmental impacts, which are highly efficient and which generate little or no waste or no pollution (Melnyk, Smith, Frost and Sullivan, 2009). This GSCM practice involves waste reduction through recycling which results to lower raw material costs, production efficiency gains, reduced environmental and occupational safety expenses and improved corporate image (Ame, 2017). It is the driver in the move towards green and low carbon economy. Many organizations view the application of green production technologies as the corner stone for their policies for economic growth (Asefeso, 2013).

Green strategies involve the degree at which the environmental issues are consolidated into the organization operation activities (Chitra, 2007). The green energy strategies involve the extent at which the provision of energy to various users considers the quality, reliable, affordability and environmental safety to various stakeholders while keenly taking care of low carbon emissions and resource efficiency for socio-economic transformation. He further suggested that green energy strategies are categorized into two i.e. environmental orientation which entails the awareness of the strategic managers on the ecological concerns in the generation of the energy and green strategy whose practices entails promotion of products and services that are considered environmentally friendly relative to others.

Geothermal strategy is used by the electric power generating companies as their main strategy in the development of electric power. The geothermal strategy has minimum impact on the environment as compared to thermal and other fossil fuels. The geothermal strategy ensures the facilities are sensitive on the environmental impacts. Before the implementation of the geothermal strategy, an environment review must always be done in order to identify the potential effect on the environment. Thus, the geothermal strategy

considers the environmental regulations in development and implementation so that it does not disturb the habitat (Orsato, 2016).

According to Schaltegger (2015), the geothermal energy generating plants are designed in a way that minimizes the potential effects on the environment. The green energy strategy under geothermal ensures that the power generating pipes are insulated to prevent thermal losses. The generating station is well fenced so as to prevent animal access, installation of containment system that prevents potential spills. The geothermal strategy minimizes the overall impacts on vegetation and wildlife species from the energy.

Wind strategy is one of the renewable energy sources for the wind is sustainable in the environment and has been harnessed for thousands of years. Initially, the wind was used in various areas, from sailing of ship, grinding of grain to pumping water from the wells. Recently, the wind energy was observed as a way of generating energy using the wind turbines, for the wind kinetic energy that is easily converted into other forms of energy drain down to the electric grid which then supplies the electricity to the consumers without interfering with the environment (Carless, 1993).

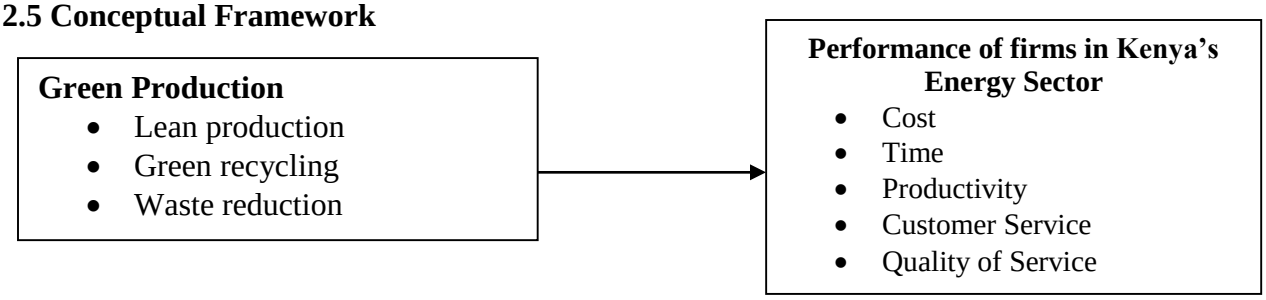
Solar energy strategy is a very large, inexhaustible source of energy source whose power from the sun intercepted by the earth is approximately 1.8*1011 MW which is many thousand times larger than the present consumption rate on the earth of all commercial energy sources, thus in principle, solar energy is considered the world long lasting sources of energy. This makes it one of the most promising of the unconventional energy strategy. In addition to its size, solar energy has two other factors in its favor. First, unlike fossil fuels and nuclear power, it is an environmentally clean source of energy. Secondly, it is free and available in adequate quantities in almost all parts of the world where people live (Sukhatmeet etal, 2017). According to Ndaba (2015), solar energy strategy is the way out of the most developing countries considering its sustainability and its environmental impact. The massive solar energy is essential in the distribution of energy in the economy. A recent investigation in Kenya and Tanzania showed that the majority of their electricity is generated from solar energy and hydropower

2.4 Organizational Performance

Production performance involves green product innovation performance which is defined as the performance of product innovation that is related to green concept of SCM. Such product innovations may include those related to conservation of energy, eliminating pollution, recycling waste and green product designs (Khan & Ajmal, 2017). Performance, more so of production companies, is achieved by valuable outcome such as higher returns. It can also be measured by the levels of productivity and this can be analyzed by a variety of methods, such as the parametric and non-parametric.

The level of output of a production organization that is able to produce using green supply chain management practices and the cost that it is able to cut by implementing GSCM practices in its production operations (Woolley, 2012). The management of any company would like to identify and eliminate the underlying causes of inefficiencies, thus helping their firms to gain competitive advantage and attain sustainable competitive advantage, or at least, withstand the challenges from the rest (Gen & Hiroshi, 2015). However, production organizations are likely to face a number of challenges when using GSCM practices to enhance their performance. These challenges include the following; various standards and regulations have to be attained in order to implement GSCM which poses a challenge since one may not be able to meet all the regulations (Grant & Wong, 2015).

2.5 Conceptual Framework



3.0 METHODOLOGY

This study adopted a descriptive research design to determine the effects of Green Supply Chain Management practices on enhancing the performance of firms in the energy sector. A descriptive research is one of the acceptable and flexible methods used by researchers in collecting original data which allowed for deeper explanation and in which information is collected without changing the environment. The population of interest in this study was the firms in Kenya's energy sector. These included electricity generation companies, transmission and distribution companies and petroleum products marketing firm's. The sample frame for this study was the Electric Power Generation Companies, Electric Power Transmission, Distribution and Supply Companies and Importers & Marketers of Petroleum Products. The list was obtained from Energy Regulatory Commission and KenGen. Purposive sampling was used to target the following officers of the target population companies: Procurement Officers, Transport and Logistics Managers, Finance Managers, Operation Managers, and Warehouse/Storage Managers who usually play a key role in supply chain operations. The data was then analyzed using descriptive statistics where percentage, mean and standard deviation were derived for easy understanding and interpretation hence drawing conclusion on the findings. Tables, graphs and figures were used to determine GSCM practices and their impact on enhancing performance of manufacturing firms in Kenya as per the objectives of the research. Before analyzing, the data was edited, coded and then transferred into SPSS, where the researcher used bivariate correlation to analyze the data.

4.0 RESEARCH FINDINGS ANALYSIS AND DISCUSSION

Introduction

This chapter presents the results of the study on the effects of green supply chain management practices on performance of firms in Kenya's energy sector. The presentation of the results has been done in sections using tables that summarized the collective reactions of the respondents. The first section dwells with analysis of study preliminaries while the second part presents the analysis of data to establish whether the study objectives were met.

4.1 Response Rate

In this study, two hundred and sixty-one (261) questionnaires were randomly distributed to sampled procurement managers, transport and logistics managers, finance managers, operations managers and warehouse/storage managers drawn from firms in Kenya's energy sector. Two hundred and twenty-three (223) questionnaires were returned giving a response rate of 85.4%.

A response rate of 30-40% is considered adequate (Saunders, Lewis and Thornhill, 2017). Sekaran, 2013 and Mugenda and Mugenda (2011) are of the view that a response rate of 30% and greater than 50% respectively

is adequate. Hager, Wilson, Pollack and Rooney (2017) also recommend 50% response rate as adequate. The response rate for this study is therefore, adequate. The table 1 presents response rate.

Table 1: Response Rate

Response	Frequency	Percentage (%)
Returned Questionnaires	223	85.4
Unreturned Questionnaires	38	14.6%
Total	261	100%

4.2 Background Information

The study sought to collect demographic information of the respondents in order to ascertain their eligibility and capacity to participate constructively in this study. The information collected included respondents' education level, designation and period of service to their organization.

4.2.1 Education Level of Respondents

Study findings in table 2 below indicate that 38.6% of the respondents had undergraduate level; of education followed by 38.1% who had Master's Degree, 22.0% had diplomas while 1.3% had PhD. Majority of respondents had the minimum academic qualifications to be Procurement, Finance, Operations, Transport & Logistics and Warehouse/Storage Managers and they, therefore, had the information on the effects of green supply chain management practices on organization performance.

Table 2 Education Level of Respondents

Education Level	Frequency	Percent
Diploma Level	49	22.0
Undergraduate	86	38.6
Master's Degree Level	85	38.1
PhD	3	1.3
Total	223	100.0

4.2.2 Designation of Respondents

Table 3 below presents the designation of respondents. The findings show that 31.8% of the respondents were Operation Managers, 31.4% were Procurement Managers, 16.1% were Finance Managers, 11.2% were Transport and Logistics Managers and 9.4% were Warehouse/Storage Managers. This shows that all the respondents were in departments that were involved in supply chain activities in their organizations. They therefore had the required expertise and information on green supply chain management practices.

Table 3 Designation of Respondents

Designation	Frequency	Percent
Procurement Manager	70	31.4
Finance Manager	36	16.1
Operations Manager	71	31.8
Transport & Logistics Manager	25	11.2
Warehouse/Storage Manager	21	9.4
Total	223	100.0

4.2.3 Period with the Organization

Data was analyzed to establish the numbers of years the respondents had worked for their organizations. As presented in table 4, 46.6% of the respondents had worked for their organizations for a period of between 3-5 years, followed by 38.1% of respondents who had worked for their organizations for a period of between 6-10 years, 6.7% had worked for their organizations for a period of between 11-15 years, 5.7% had worked for their organizations for a period of less than two (2) years while 2.7% had worked for their organizations for a period of 16 years and above. Majority of the respondents had worked for their organizations for more than 3 years. They had acquired the relevant experience and were able to express opinions on matters relating to supply chain currently and in the past.

Table 4. Respondents years with their Organizations

Years with the Organization	Frequency	Percent
Less than 2 year	13	5.8
Between 3-5 years	104	46.6
Between 6-10 years	85	38.1
Between 11 -15 years	15	6.7
16 years and above	6	2.7
Total	223	100.0

4.3 Green Production Practices and Firms' Performance

The study sought to establish the effectiveness of green production practices adopted by firms in Kenya's energy sector. The practices were rated to be ineffective at 17.0%, somehow effective at 39.5%, effective at 19.3% and very effective at 24.2%. The results implied that the green production practices adopted by the firms were effective in influencing firms' performance. These results are consistent with the findings of Ninlaw, Seskan, Tossapol, and Pilada, 2010 who held that green production enable organization to have a competitive advantage since they will incur lower raw material costs, higher production efficiency and improved corporate image. Atlas & Florida (2018) held that green production may facilitate reducing the cost for raw materials, increasing production productivity and reducing environmental costs and costs related to occupational safety. The reduction in costs improves firms' performance. The table 5 below presents the findings.

Table 5 Rating of Effectiveness of Green Production Practices

Rating	Frequency	Percent
Ineffective	38	17.0
Somehow Effective	88	39.5
Effective	43	19.3
Very Effective	54	24.2
Total	223	100.0

The study sought to find the views of respondents on whether certain green production practices influenced performance of firms in Kenya's energy sector. Provision of information on environmentally friendly products to consumers influenced firms' performance at a mean of 3.849 (SD=1.1693). This finding is in line with that of Nidumolu et al. (2016) who held that firms that provide information on their eco-friendly products to customers meet their environmental imperatives, build competitive advantage, and propel future growth. This was followed by consideration of environmental issues in production, planning and control processes at a mean

of 3.66. This implies that integrating environmental issues in production, planning and control process enables firms to alleviate any negative impact of their processes on the environment.

The study further revealed that consideration of environmental issues when selecting power production process influenced performance of firms at a mean of 3.65 (SD=1.1158), promotion of environmental consciousness among employees involved in production influenced firms performance at a mean of 3.51 (1.1345), embracing of environmentally friendly waste management practices influenced firm performance at a mean of 3.45 (SD=0.9488), maximization of production output by minimizing waste and emission influenced firm performance at a mean of 3.09 (SD=1.4771), intensification of production processes to reduce environmental impacts while lowering the costs of inputs and waste disposal influenced firms' performance at a mean of 2.66 (SD=1.2538) while prioritization of the reduction of the impact of facility construction and operation on the environment influenced firm's performance at a mean of 2.39 (SD=1.6751). These results show that, overall, a firm's effort to reduce the impact of its production processes on the environment plays a key role in improving performance. These findings are supported by the findings of Montabon et al., (2017) who established a direct link of consideration of the impact of production processes with the dimensions of organization performance such as cost, quality and flexibility. Table 6 below presents the findings.

Table 6 Green Production

Factors	Mean	Standard Deviation
Provision of information on environmentally friendly products to consumers	3.84	1.1693
Consideration of environmental issues in production, planning and control processes	3.66	1.1105
Consideration of environmental issues when selecting power production process	3.65	1.1158
Promotion of environmental consciousness among employees involved in production	3.51	1.1345
Embracing of environmentally friendly waste management practices	3.45	0.9488
Maximization of production output by minimizing waste and emission	3.09	1.4771
Intensification of production processes to reduce environmental impacts while lowering the costs of inputs and waste disposal	2.66	1.2538
Prioritization of the reduction of the impact of facility construction and operation on the environment	2.39	1.6751
Green Production	3.28	1.2356

4.4 Organization Performance

4.4.1 Quality of Service

The respondents were asked to indicate the effects of green supply chain management practices on performance of their organizations. It was found that green supply chain management practices had led to minimum disruption in provision of products and services to customers at a mean of 3.45 (SD=1.413), followed by improvement in quality of products and services at a mean of 2.89 (SD=1.386), reduction in customer complaints at a mean of 2.89 (1.386) and reduction in breakdown of critical production and service delivery equipment at a mean of 2.77 (SD=1.448).

The results are in congruence with those of Stank et al., (2013) and Zhang et al., (2013) who held that organizations that use green supply chain management practices provide high value to their customers, thus achieving high levels of customer satisfaction. The table 7 below presents the findings.

Table 7 Quality of Services offered

Factors	Mean	Std. Deviation
Reduction in minimum disruption in provision of products and services to customers	3.45	1.413
Improvement in quality of products and services	3.44	0.917
Reduction in customer complaints	2.89	1.386
Reduction in breakdown of critical production and service delivery equipment	2.77	1.448
Quality of Service	3.14	1.291

4.4.2 Margin of Cost Reduction

With regards to the overall cost reduction (reduction of procurement, production, distribution and costs associated with reverse logistics) experienced by firms in Kenya's energy sector as a result of adopting green supply chain management practices in the past three years, firms reduced cost of between 15-20 million at 50.2% in the year 2018 followed by cost reduction of between 5-10 million at 17.9%, 10-15 million at 14.8% and cost reduction of below 5 million at 11.2% in the same year. In the year 2017, firms reduced cost of between 15-20 million at 48.6% followed by cost reduction of below 5 million at 29.7%, 5-10 million at 14.4%, 20-25 million at 5.0% and 10-15 million at 2.3%.

In the year 2016, firms reduced cost of between Kshs 5-10 million at 39.5% followed by Kshs 15-20 million cost reduction at 24.2%, Kshs 10-15 million at 19.3% and below Kshs 5 million at 17.0%. The findings are in line with those of Lange P. et al., (2012) who held that efficiency and effectiveness associated with GSCM practices have important impacts on firms' strategic performance in terms of customer satisfaction, cost reduction, and improved profitability. The table 8 below presents the findings.

Table 8 Margin of Cost Reductions in Kenya Shillings

Margin of Cost Reduction in '000	2018		2017		2016	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Below 5 Million	25	11.2	66	29.7	38	17
05-10	40	17.9	32	14.4	88	39.5
10-15	33	14.8	5	2.3	43	19.3
15-20	112	50.2	108	48.6	54	24.2
20-25	13	5.8	11	5	0	0

4.5 Regression Analysis

Multiple regression analysis was used to establish the effects of green supply chain management practices (green purchasing, green production, green distribution and reverse logistics practices) on a firm's performance in Kenya's energy sector.

4.5.1 Model Summary

From the findings, the correlation coefficient (R) is 0.661 which is a positive, shows a strong relationship between green production and performance of firms in Kenya's Energy Sector. The R-Square value of 0.661 shows that green production practices accounts for 66.1% of the variation or change in the performance of firms in the energy sector in Kenya.

Table 9 Regression analysis model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.813[a]	.661	.656	.324

a. Dependent Variable: performance of firms in Kenya's Energy Sector
b. Predictors: (Constant) Lean Production, Green Recycling, Waste Reduction

$$\mathbf{Y = 1.962+0.380X_1+0.539X_2 +0.283X_3 +e}$$

Regression Coefficients

The regression equation above has established that using (Lean Production, Green Recycling and Waste Reduction practices), performance of firms in Kenya's energy sector will be 1.962 when everything else is held constant. The results show that, holding other variables constant, a unit increase in the adoption of Lean Production would lead to 0.380 increases in performance of firms in Kenya's energy sector. This variable was significant since calculated p-value (0.000) is less than 0.05 at 5% level of significance. The results support the findings of Stock, (2014) who concluded that green purchasing improves a firm's economic position, by reducing disposal and liability costs, conserving resources, and improving an organization's public image.

The results further show that holding other variables constant, a unit increase in the adoption of Green Recycling would lead to 0.539 increases in performance of firms in Kenya's energy sector.

This variable was significant since calculated p-value (0.000) was lower than 0.05 at 5% level of significance.

Waste Reduction practices, as the results indicate and when other variables are held constant, leads to 0.283 changes in performance of firms in Kenya's energy sector. This means that a unit increase in the adoption of Green Recycling practices would lead to an increase in firm performance by 0.283. This variable was significant since p-value (0.00) was less than 0.05 at 5% level of significance.

Table 10 Coefficient Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.962	.149		13.134	.000
	Lean Production	.380	.039	.593	9.826	.000
	Green Recycling	.539	.060	.660	9.060	.000
	Waste Reduction	.283	.032	.566	8.745	.000

Dependent Variable: performance of firms in Kenya's Energy Sector
Predictors: (Constant) Lean Production, Green Recycling, Waste Reduction

$$\mathbf{Y = 1.962+0.380X_1+0.539X_2 +0.283X_3 +e}$$

Y= performance of firms in Kenya's Energy Sector

β_0=constant

X1= Lean Production

X2= Green Recycling

X3= Waste Reduction

ε=Error Term

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study aimed at establishing the effects of green supply chain management practices on the performance of firms in Kenya's Energy Sector. The study investigated the effects of green purchasing practices, Lean Production practices, Green Recycling practices and Waste Reduction on the performance of firms in Kenya's energy sector. This section presents a summary of the study findings. From the findings, conclusions are drawn and from which recommendations are given so as to fill the identified gaps within the subject area. In addition, potential areas for future research are given.

5.2 Summary

This section presents the summary of the findings addressing each objective of the study as interpreted in chapter four.

5.2.2 Green Production Practices

The study also sought to find out the effectiveness of green production practices on the performance of firms in the energy sector. Overall, provision of information on environmentally friendly products to consumers, consideration of environmental issues in production, planning and control processes, consideration of environmental issues when selecting power production process, promotion of environmental consciousness among employees involved in production, embracing of environmentally friendly waste management practices and maximization of production output by minimizing waste and emission highly influenced firms performance.

Intensification of production processes to reduce environmental impacts while lowering the costs of inputs and waste disposal and prioritization of the reduction of the impact of facility construction and operation on the environment were found to have influence firm performance. The study further established that while holding other variables constant, a unit increase in the adoption of green production practices would lead to 0.867 increase in performance of firms in Kenya's energy sector.

5.3 Conclusion

The study further concluded that green production had a significant influence on performance of firms in Kenya's energy sector. Provision of information on environmentally friendly products to consumers; consideration of environmental issues in production planning and control processes; consideration of

environmental issues when selecting power production process; promoting environmental consciousness among employees involved in production; embracing environmentally friendly waste management practices; and maximizing production output by minimizing waste and emission were found to be highly influencing performance of firms in Kenya's energy sector. Intensification of production processes to reduce environmental impacts while lowering the costs of inputs and waste disposal and prioritization of the reduction of the impact of facility construction and operation on the environment least influenced firms' performance in the energy sector.

5.4 Recommendations

5.4.1 Green Production

Conducting Environmental Impact Assessment and follow up on the implementation of environmental impact mitigating factors when constructing facilities should be prioritized among the players in the energy sector. The National Environment Management Authority should always do a follow up on such constructions to ensure that the measures suggested to reduce effect of the facility to the environment are adhered to. Firms in the energy sector should, while maximizing production, minimize waste and emissions. Intensified production processes should be adopted to reduce environmental impacts while lowering the costs of inputs and waste disposal

5.5 Areas for Further Research

The main focus of this study was on the effects of green supply chain management practices on the performance of firms in Kenya's energy sector. There are other sectors such as horticulture, agriculture and transport sectors that contribute to global warming. Similar studies should be done in these sectors to establish whether same or different results will be obtained. Existing literature indicates that as a future avenue of research, there is need to undertake similar research in other sectors, government institutions and public sector organizations in Kenya and other countries in order to establish whether the explored factors can be generalized to effects of green supply chain management practices in Kenya's energy sector.

REFERENCES

Ame, (2017). Green production: Case studies in lean and sustainability. S.l.: CRC PRESS.

Aryadi, M. (2012). Hutan rakyat: Fenomenologi adaptasi budaya masyarakat.

Asefeso Mba, A. A. M. (2013). Green production (paradigm shift to sustainable capitalism). Place of publication not identified: Lulu Com.

Belvedere, V., Grando, A., & John Wiley & Sons. (2017). Sustainable operations and supply chain management. Hoboken: Wiley.

Bouchery, Y., In Corbett, C. J., In Fransoo, J. C., & In Tan, T. (2017). Sustainable Supply Chains: A Research-Based Textbook on Operations and Strategy.

Choi & Springer 2015. Sustainable fashion supply chain management: From sourcing to retailing. Cham [etc.: Springer International Publishing Switzerland.

Choi, T.-M., Cheng, T. C. E., & Springer Science+Business Media. (2015). Sustainable fashion supply chain management: From sourcing to retailing. Cham [etc.: Springer International Publishing Switzerland.

Cuthbertson, R., Cetinkaya, B., Ewer, G., Klaas-Wissing, T., Piotrowicz, W., & Tyssen, C. (2011). Sustainable Supply Chain Management [recurso electrónico]: Practical Ideas for Moving Towards Best Practice. Alemania: Springer Berlin Heidelberg.

Douglas, J. (2016). Building Adaptations, 2nd edition. Oxford: Butterworth-Heinemann.

Emmett, S., & Sood, V. (2010). Green supply chains: An action manifesto. Chichester, U.K: John Wiley & Sons.

Golinska, P. (n.d.). Logistics Operations, Supply Chain Management and Sustainability [recurso electrónico].

Golińska, P., & Andrés, R. C. (2012). Environmental issues in supply chain management: New trends and applications. Heidelberg: Springer.

Grant, D. B., Trautrims, A., & Wong, C. Y. (2015). Sustainable logistics and supply chain management.

Green, K., Zelbst, P., Meacham, J. and Bhadauria, V. (2012). Green supply chain management practices: impact on performance, Supply Chain Management. An International Journal, Vol. 17

Hirschinger, M. (2016). Essays on Supply Chain Management in Emerging Markets. Wiesbaden: Springer Gabler.

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

In Dubey, R., & In Gunasekaran, A. (2016). Strategic management of sustainable manufacturing operations.

In Khan, M., In Hussain, M., & In Ajmal, M. M. (2017). Green supply chain management for sustainable business practice.

In Piotrowicz, W., & In Cuthbertson, R. (2015). Supply chain design and management for emerging markets: Learning from countries and regions.

In Wang, J. (2014). Management science, logistics, and operations research.

Kuriyama, N. (2017). Japanese human resource management: Labour-management relations and supply chain challenges in Asia.

Lainez-Aguirre, J. M. (2015). Advances in integrated and sustainable supply chain planning: Concepts, methods, tools and solution approaches toward a platform for industrial practice. Cham: Springer.

Masters, G.M. (2014). Renewable and Efficient Electric Power Systems. New Jersey: Wiley InterScience.

Min, H. (2015). The essentials of supply chain management: New business concepts and applications.

Mugenda, O., M., & Mugenda, A. G. (2011). Research Methods: Quantitative and Qualitative Approaches. Nairobi, Acts Press

Nasiche, F., & Ngugi, G. K. (2014). Determinants of Adoption of Green Procurement in the Public Sector: A Case Study of Kenya Pipeline Company. International Journal of Social Sciences and Entrepreneurship, 1(11), 351-372.

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

Oberlin, S. A. (2011). The role of households in solid waste management in East African capital cities. S.l: s.n.

Sarkis, J., & Dou, Y. (2017). Green Supply Chain Management: A Concise Introduction. Milton: Taylor and Francis.

Saunders, M., Lewis, P. & Thornhill, A. (2013). Research Methods fo r Business Students. 3rd ed. Harlow: FT/Prentice Hall

Sekaran, U., (2013). Research Methods for Business: A Skill Building Approach. Singapore: John Willey & Sons, Inc

Sharma, L. (2012). The status of green purchasing in the five most populous U.S. states.

Taylor, M. A. P., Bonsall, P. W., & Young, W. (2017). Understanding traffic systems: Data, analysis and presentation.

Wang, H.-F., & Gupta, S. M. (2011). Green Supply Chain Management. Blacklick: McGraw-Hill Publishing.

Wanjohi, P., et al., (2016). The Moderating Effect of Adoption of Green Environment on the

Woolley, T. (2012). Low Impact Building: Housing using Renewable Materials. Hoboken: Wiley

Worthington, I. (2012). Greening business: Research, theory, and practice. Oxford: Oxford Univ. Press.

Xie, Y. and Breen, L. (2012). Greening community pharmaceutical supply chain in UK Supply Chain Management: An International Journal, 17 (1), 40–53.