FACTORS AFFECTING ENVIRONMENTAL BEST PRACTICE COMPLIANCE AMONG RETAIL FUEL SERVICE STATIONS IN THIKA EAST SUB-COUNTY-KENYA

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DECLARATION

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

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DEDICATION

This research is dedicated to our late father Mr. James Mwangi Maguru, for his inspiration to further excel in my studies and being the best role model and to my family for their moral support and encouragement, whose generosity and joy is my pride.

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ABSTRACT

Environmental best practice in the oil industry remains a top priority in Kenya. Protecting the environment in the oil industry requires advanced technology, research; and new ways of operating the fuel stations. The safety of self, the public, and facilities are key in any retail fuel service station and the workforce/management strives to have zero fatal incidences and accidents. The research sought to determine the factors affecting environmental best practice compliance among retail fuel service stations within Thika East Sub-County. To achieve this objective, the study was guided by the following specific research objectives; the effect of factors especially the influence of capital adequacy, influence of skills competence and technological development on environmental best practice compliance status.

Primary data used questionnaires, field observations of the facilities and interviews were done at times by telephone when the respondents needed clarifications. Secondary data was acquired through reviews of several Acts to help assess the level of compliance in relation to legislation, data from journals, project reports, maps, library books and the internet were used to generate data for the study. The study conducted a census of the 19 retail fuel service stations within the Thika East Sub-County. The study questionnaires were delivered to the retail fuel service stations by hand to the identified respondents. Data was coded using SPSS. The researcher employed both quantitative and qualitative techniques of analyzing the data including content analysis and descriptive statistics. The data was analyzed and used to draw inferences and conclusions for this study.

The key findings of this research indicate that capital is very essential of which 49% of firms have affirmed to this and stated that the financial resources were available to the management of the fuel stations to initiate the required EBP compliance. The findings further indicated that the firms had employed skilled competent employee to manage the oil product. On technology the study found out that 79% of respondents stated that the firms enhance EBP positively by use of recommended piping systems, automated dispensers and ATG system. This prevents and minimizes fuel leakages and hence ground, air and water pollution.

It is recommended for best practice that fuel service stations need to allocate and avail more finances to invest in Environmental Best Practice (EBP). The leadership of the oil marketing companies should lead from the front in giving environmental activities top priority instead of waiting for the relevant compliance agencies to enforce E.B.P. and to avoid short cuts rushing to comply. There is also need to make it an environmental habit to keep monitoring and evaluating all their facilities.

The management should also employ qualified staff to enhance what the quality marshals or supervisors do. The staff should be assigned environmental responsibility and authority within their areas of control and must be competent to perform duties effectively. The study also recommends that technological development to be added to workforce capacity. Further research should be done on different mechanisms that can be employed to manage hazardous waste within Thika East sub-county because of its rapidly expanding and increased level of industrialization. The research should also show the strengths of the firms' cooperate social responsibility.

TABLE OF CONTENTS

DECLARATION ..... Error! Bookmark not defined.
DEDICATION ..... **iii**
ACKNOWLEDGEMENT ..... **iv**
ABSTRACT ..... **v**
TABLE OF CONTENTS ..... **vii**
LIST OF FIGURES ..... **x**
LIST OF TABLES ..... **xi**
ACRONYMS AND ABBREVIATIONS ..... **xii**
CHAPTER ONE **1**
INTRODUCTION **1**
1.1 Background of the study 1
1.1.1 The Petroleum Industry in Kenya 5
1.2 Statement of the Problem 5
1.3 Hypotheses 7
1.4 Objectives of the Study 8
1.4.1 Overall objective 8
1.4.2 Specific Objectives 8
1.5 Justification and Significance of the Study 8
1.6 Scope of the Study 9
1.6.1 Geographical Scope 10
1.6.2 Academic Scope and Limitations of the Study 10
1.7 Definition of Concepts 11
CHAPTER TWO **12**
LITERATURE REVIEW **12**
2.0 Introduction 12
2.1 Theoretical Framework 12
2.1.1 Ecological Modernization Theory 12
2.1.2 Resource Based View Theory 13
2.2 Conceptual Framework 13
2.3 Environmental Management in the oil industry 16

2.4 Best Practice Compliance Framework 17
2.5 Underground Fuel Leakages 22
2.6 Environmental Changes 23
2.6.1 Influence of capital adequacy on environmental best practice compliance 24
2.6.2 The influence of skills competence on environmental best practice compliance 25
2.6.3 The influence of technological development on environmental best practice compliance 27
CHAPTER THREE 30
METHODOLOGY 30
3.1 Study Population and Scope 30
3.2 Location of the Study 30
3.2.1 Position, size and population 30
3.2.2 Thika East Sub-County 31
3.2.3 Physiographic and natural conditions of Kiambu County 32
3.3 Fuel stations in the study area 33
3.4 Research Design 33
3.4.1 Sampling and Sampling Procedures 34
3.4.2 Data Collection 34
CHAPTER FOUR 36
RESULTS AND DISCUSSION 36
4.1 Introduction 36
4.2 Fuel Stations 36
4.2.1 Number of Years respondents had worked in the stations 36
4.2.2 Operation Period of the Stations 37
4.2.3 State of the Environment of the Fuel Stations 37
4.2.4 Petroleum products sold at the fuel stations 38
4.3 Services Offered 39
4.3.1 Capital adequacy on environmental best practice compliance 40
4.3.2 Capital adequacy affects environmental best practice compliance 41
4.4 Skills competence 42
4.4.1 Skills competence on environmental best practice compliance 42

4.4.2 Skills competence effects on environmental best practice compliance 43
4.5 Effects of Technological Development on Environmental Best Practice Compliance44
CHAPTER FIVE: 48
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.. 48
5.1 Introduction 48
5.2 Summary of Findings 48
5.3 Conclusion 50
5.4 Recommendation 50
REFERENCES 52
APPENDIX I: QUESTIONNAIRE 55
APPENDIX II: AUTOMATIC TANK DIPPING SYSTEM PRINT OUT 56
APPENDIX III: RELATED LEGAL REQUIREMENT 57
APPENDIX IV: ENVIRONMENTAL MANAGEMENT STANDARDS 58

LIST OF FIGURES

Figure 2.1 Conceptual Framework Adapted Classic Deterrent Model 15
Figure 3.1: Thika East Sub-County 31
Figure 4.1: State of the environment of the fuel station 38
Figure 4.2: Petroleum products sold at the fuel station 39
Figure 4. 3:Capital adequacy affects environmental best practice compliance 42
Figure 4.4: Skills competence effects on environmental best practice compliance 43
Figure 4.5: Extent to which capital adequacy affect best practice compliance 44

LIST OF TABLES

Table 4.1Number of Years respondents had worked in the stations 36
Table 4. 2: Operation Period of the Station.....37
Table 4.3:Services Offered.....39
Table 4.4: Capital Adequacy on Environmental Best Practice Compliance.....40
Table 4. 5: Skills competence on environmental best practice compliance.....42
Table 4. 6: Technological development effects on environmental best practice compliance.....44
Table 4.7:Chi-Square Tests for Capital adequacy and environmental best practice compliance..45
Table 4. 8: Skills Competence and Environmental Best Practice Compliance 45
Table 4. 9: Chi-Square Tests for Skills Competence and Environmental Best Practice Compliance 46
Table 4.10:Cross Tabulation on Technological Development and Environmental Best Practice Compliance 46
Table 4.11:Chi-Square Tests for Technological Development and Environmental Best Practice Compliance 47

ACRONYMS AND ABBREVIATIONS

ATGS	Automatic Tank Gauging System
EA	Environmental Audit
EBP	Environmental Best Practices
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMS	Environmental Management System
EPA	Environmental Protection Agency
ERC	Energy Regulatory Commission
GI	Galvanized Iron
GOK	Government of Kenya
ISC	Influence of Skills Competence
ISO	International Standard Organization
KEBS	Kenya Bureau of Standards
LPG	Liquefied Petroleum Gas
NEMA	National Environment Management Authority
RBV	Resource Based View
SOE	State of Environment
SPSS	Statistical Package for Social Sciences
SWOT	Strengths, weakness, opportunities and threats
UNEP	United Nations Environment Programme
UPPP	Underground Plastic Polymer Pipes
UST	Underground Storage Tank

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The oil sector plays a wide and vital role in the world today. It is an important energy source as well as the petroleum products and its by-products serve as feedstock for a number of consumer goods in the textile, pharmaceutical, fertilizer and petrochemical industry. If not handled well the larger oil industry may trigger main hazards for the environment and may impact the air, water and ground negatively plus all living organisms. The retail fuel service station business and industry depend on the environment as a resource, functionality and eventually waste disposal and with that have a critical role in supporting the world to achieve sustainable development (Redmond, 1991).

Kenya remembers with nostalgia 25th March, 2012 when the then President of Kenya, Mwai Kibaki broke the exciting news of an oil discovery at Ngamia-1 by Tullow Oil. While presiding over the opening ceremony of the 3rd Eastern Africa Oil, Gas and Energy Week, Senior Superintendent Geologist, Ministry of Energy, Kenya Mr. Hudson Andambi described the Ngamia- 1 discovery in Turkana; quote “A source of strength and hope for the country. Investors exploring for oil must comply with best practice guidelines governing them and the same should trickle down to the retail fuel service investors.

For a retail fuel service station business, focus should be on implementing environmental management with ample opportunities to develop techniques and technologies that reduce harmful environmental impacts as well as meet customer expectations consistently and in the most cost effective way. This will ultimately allow everyone to live within the means of the environment and thus sustain life now and in the future.

The polluter pays principle states that the business involved in a polluting activity is not only responsible for the cost of preventing pollution, but also the clean-up cost in the event of an incident. Recently, advertisements in the print media regarding fuel stations having to close down for a short time in order to carry out repairs to comply with NEMA requirements.

According to Wanjiku (2008) some other benefits of the implementation of environmental management tools within fuel stations include; reduced environmental risks(the higher the risk, the higher the insurance premium or the less likely a bank is to invest);cost savings, through process efficiency resulting in increased profitability and competitiveness; the ability to anticipate liability and increased environmental awareness and safety in the workplace.

There are quite a number of environmental issues within a retail fuel service station like the risk of leaks from USTs, spills of fuels, liquid effluents (fuel delivery, dispensing and automobile repair areas, storm water runoff from fuel delivery, as well as from automobile cleaning activities). Wanjiku (2008) asserts that waste management whose sources are waste from sediment traps and interceptors, contaminated soils, waste lubricating oils, oily rags from automobile repairs, equipment from replacement of metal covers and solvents for cleaning purposes; there is also air pollution from evaporative losses of volatile organic compounds of fuel products from storage mainly during bulk deliveries and during dispensing operations; and lastly, but not least occupational health and safety issues such as contact with fuels and inhalation of fuel vapours among the employees as well as the risk of fire and explosions.

All economies of the world's industry are well influenced by petroleum itself. It also affects the world market prices. In its narrow commercial sense, petroleum is usually restricted to the liquid deposits known as crude oil, the gaseous ones being known as natural gas and the solid ones as bitumen or asphalt. The crude oil and natural gas are the raw materials of the petroleum industry. Generally, the petroleum and petrochemical industries in Kenya keep the society supplied with energy and organic chemicals and like any other chemical industry they have great impact on the environment. Every home has a product or by-product of petroleum and hence must guard against the long-term and indirect consequences if handling and disposal procedure guidelines are not followed (Morrow and Rondinelli, 2002; Zutishi and Sohal, 2004).

Environment here include the immediate area affected by the operation of the given petroleum installation, the atmosphere into which off-gases and vapour are emitted, water bodies into which liquid effluents are discharged and the people in the neighborhood who might be subjected to noise, odours and other pollutants emanating from the operations. A retail fuel station is the most

common oil products marketing place to an ordinary person in the streets. The major oil companies sell products through these stations under their own brand. Over 95% of the fuel stations are operated by independent businessmen and women under a franchise of the oil marketing companies under whose brand name the station operates, but not by employees or staff employed directly by the oil marketing company. The balance of 5% may be under temporary direct operation by the company or a directly appointed caretaker for some reasons. The main petroleum products sold at the retail fuel service station include domestic kerosene, diesel, petrol, lubricating oils and greases and liquefied petroleum gas (LPG).

The Government of Kenya has set environmental conservation monitoring guidelines with the aim of promoting sound environmental management standards and ensures that environmental management is followed at all stages of development, through best practices, governed by the National Environment Management Authority (NEMA). In the year 2003, the Government of Kenya published legal obligations relating to compliance with environmental standards and legislative requirements covering all existing enterprises including firms, industries, warehouses, factories, fuel stations, power stations, quarries, mines and any ongoing projects specified under the second schedule of the Environmental Management and Coordination Act (EMCA). The first environmental tool to be considered is environmental impact assessment (EIA). This is a systematic process that examines the environmental consequences of development actions in advance (Glasson et al, 2005) and is conducted prior to the construction of the fuel service station (ideally at the project design stage) in order to identify and mitigate significant environmental impacts at construction, operation and decommissioning.

After the fuel station has been built an environmental audit is carried out either within two years after completion of the project or one year after the facility becomes operational- whichever comes sooner. An EA is a tool that evaluates how well environmental organization, management and equipment are performing in conserving the environment. The audit involves a common methodology of investigating and checking existing conditions (practices, procedures, processes and systems) against predetermined criteria (technical specifications, operating instructions, standards, regulations polices and performance objectives). An environmental management system (EMS) is the framework for a fuel station to improve its environmental performance in

the short and long term. Although improvements during operation can be made without an EMS, the structure of a system approach allows the fuel station to consistently meet its target and integrate environmental issues into its business decisions. According to Wanjiku (2008) the EA tools set up by each enterprise to assess the environmental risks periodically, and expose them for remedial action through a commitment plan must be registered and filed with NEMA. Up to date, the compliance level in the above mentioned industrial sectors is still very low, specifically the retail fuel service stations owned and managed by independent investors.

An analysis on progress reports done by NEMA in December 2003 concluded that the fuel stations in the entire country that had achieved 100% compliance were less than 15%. This resulted to the petroleum products marketing companies and independent dealers being put on notice by NEMA to remedy the situation failure to which the facilities would be closed down (NEMA, 2003). In January 2004 NEMA published a notice for all petroleum and petrochemical products storage and marketing facilities owners to conduct an initial EA for all their respective facilities in accordance with the published Environmental Standards, the applicable laws and regulations in Kenya and best international practices using an environmental auditor chosen from a pool of consultants trained and certified by NEMA (NEMA, 2004).

This was to enable the facility investor evaluate the status of their site facilities and establish whether any petroleum products had been released to the environment and if so to what extent and propose mitigation measures to address the non-conformances and prepare monitoring plans with regard to the continuity of the facilities operation. The initial report was to be submitted and registered with NEMA, jointly by the owner and the consultant. Subsequently NEMA analyzed the report, for the sites submitted, picking out and assessing the magnitude of non-compliance and advised the respective owners on whether the facility would be required to stop operations and shut down immediately or would be allowed to operate with an improvement order to address the non-compliance.

The law outlines that the owners would be required to carry out annual follow-up audits on all the facilities to monitor progress of implementation of the non conformance, correction plan and the assessment reports filed with NEMA who would analyze and give an opinion on results and

advice on the way forward. NEMA is mandated to carry out independent random audits to ascertain integrity of assessment reports submitted by the owners through the approved consultants. It is on record that some fuel service stations have never submitted the initial audit report either due to obvious state of adverse no-compliance or due to inadequate financial resources.

It is the role of professionals such as environmental specialists, engineers, physical planners and so on, together with the regulatory bodies to ensure that environmental issues are taken into consideration before it is too late. They need to reassure the public, investors and developers that environmental legislation and NEMA requirements are not punitive, but guidelines to help conserve the environment. Improving the environmental performance of fuel stations is important as they are part of the business society that can potentially contribute to sustainable development through improved environmental performance, resulting in significant economic benefits in the long and short term (Wanjiku 2008).

1.1.1 The Petroleum Industry in Kenya

Key Environmental Issues to be addressed by the study in the fuel stations include the risk of leaks and spills of fuels from USTs and pipes, use of ATGS and use of automated dispensers. ERA in the context of fuel stations considers the impact on the environment caused by fuel leakages. Each project of the USTs, ATGS and automated fuel dispensers should be followed through to completion in full compliance with applicable regulations and standards. Liquid effluent from storm water runoff, from fuel delivery, and car washing activities; waste management(sources from sediment traps, interceptors, used oil waste lubricating oil, piping and solid waste from packaging materials, occupational health and safety issues among the workers together with the risk of fire and explosions.

1.2 Statement of the Problem

Environmental Management (EM) is one of the broader scopes of management. It is the management of the environment in order to achieve suitable habitation by man and business practices in the environment. In 1999 EMCA was enacted by the parliament as the main environmental document in Kenya with the aim of streamlining environmental protection

activities through coordination of all activities pertaining to the environment. One of the institutions created under this Act was the National Environment Management and Management Authority (NEMA). The mandate of NEMA is to coordinate environmental lead agencies, environmental planning, environmental impact assessment, environmental audit and regulation, enforcement and compliance and education. The Authority is also required to undertake environmental auditing of all activities relating to the environment. The Authority requires all establishments listed in its 2nd schedule to submit annual environmental audits by December. These audits are supposed to be carried out by experts registered by NEMA.

Petroleum products need to be handled with care owing to their high flammability. The whole process of handling petroleum products need to be done in a manner friendly to the environment. While gasoline offers a great advantage by powering cars and buses, it is composed of four chemicals that are toxic to humans – benzene, toluene, ethyl benzene, and xylene. When pumping gasoline into vehicles, the vapors escape into the atmosphere and can get into people's lungs when they breathe and also be deposited on their skin. Gasoline also evaporates very quickly and pollutes the atmosphere. Certain chemicals called volatile organic compounds (such as benzene) react with sunlight and form smog in urban areas. Moreover, spills of gasoline can contaminate water supplies. These among other negative effects of petroleum products call for proper management and compliance of best practice among all persons handling petroleum products.

Several scholars and researchers have reviewed the subject of environmental best practice compliance. For example, Mwangi (2008) did a study on the status and challenges of the environmental audit process in Kenya. This study established that most proponents carry out audits for compliance purposes only, accounting for the large number of audits submitted towards the end of the year so as to beat the December deadline. Also, it was found that more than 80% of the audit capacity in terms of lead experts, Firms of expert and associate experts are based in Nairobi.

Shah (2008) did a study on environmental audit of educational institutions. According to the study, the environmental audit was undertaken to show the areas of strengths and weaknesses,

how well schools follow legislative regulations related to the environment, how it would help solve environmental problems in the school and its environs, disposal of waste techniques, potential environmental management constraints and the focus of the future audits. The study established that the schools had been trying to comply with environmental laws and legislations but there have been lapses in many areas. Nyandika (2007) examined environmental problems associated with tea factories in Kenya. The study found out that the underlying causes of environmental problems in the tea industry in Kenya are mainly the over utilization of primary resource base such as forest products and water, inadequate use of appropriate technologies, weak enforcement of environmental laws and insufficient support towards technology change. From the above discussion, it is evident that limited research has been conducted on resources affecting environmental best practice compliance among retail fuel stations especially within Thika East Sub-County. This study will therefore seek to fill this research gap by assessing the resources affecting environmental best practice compliance among retail fuel stations in Thika East Sub-County.

The principal research questions for the study were as follows:

(i) How does capital adequacy affect environmental best practice compliance among retail fuel stations in Thika East Sub-County?
(ii) What is the influence of skills competence on environmental best practice compliance among retail fuel stations in Thika East Sub-County?
(iii) How does technological development influence environmental best practice compliance among retail fuel stations in Thika East Sub-County?

1.3 Hypotheses

The study was based on the following hypothesis:

H_0: Capital adequacy does not affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

H_1: Capital adequacy affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

H_0: Skills competence does not affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

H_1: Skills competence does affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

H_0: Technological development does not affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

H_1: Technological development affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

1.4 Objectives of the Study

1.4.1 Overall objective

The objective of this study was to determine the factors affecting environmental best practice compliance among retail fuel stations in Thika East Sub-County.

1.4.2 Specific Objectives

To achieve the overall objective, this study was guided by the following specific research objectives:

(i) To determine the influence of capital adequacy on environmental best practice compliance among retail fuel stations in Thika East Sub-County.
(ii) To establish the influence of skills competence on environmental best practice compliance among retail fuel stations in Thika East Sub-County.
(iii) To determine the influence of technological development on environmental best practice compliance among retail fuel stations in Thika East Sub-County.

1.5 Justification and Significance of the Study

This study is important to several stakeholders. Key among these are future scholars and researchers in the field of environmental management as it will extend the existing literature on

best practice compliance besides suggesting areas for future research where they could research on. In addition, the findings of this study will act as source of reference for future scholars.

The findings of this study would be also be valuable to owners and managers of fuel stations within Thika East Sub- County and the Country at large as it would inform them on the effects of social economic factors in the quest to compliance to best practice. Due to high cost linked with environmental liabilities, the public must be aware of environmental legislations and regulations as petroleum products are considered hazardous with the potential of degrading the environment if used under conditions that are inappropriate.

Due to high cost linked to environmental liabilities huge budgetary allocations should be channeled to recruiting staff on compliance. The findings of this study would also be valuable to policy makers especially the Energy Regulatory Commission and the entire Ministry of Energy as it would inform on the effect of resources affecting entrepreneurs' compliance to best environmental practice. By doing this, it would inform future policy development and enforcement efforts to ensure full best practice compliance.

Compliance with safety environment best practice is weak as the stake holders in the oil industry are not given proper advice from safety and health professionals or they do not understand legislation on safety, have inadequate skills or competence to enhance compliance. The findings will provide the Kenya government with proactive initiatives aimed at raising awareness on the need to harmonize the regulatory institutions to avoid duplication and to make the services such as licensing, verification and certification more accessible and friendly.

1.6 Scope of the Study

The research was conducted within Thika East Sub-County in Kiambu County. The sub-county comprises both urban and rural setting. The study was limited by a number of factors such as geographical location, logistic and academic requirements.

1.6.1 Geographical Scope

The study was confined to Thika East sub-county formerly Thika Municipality which is an urban centre with the addition of two county assembly wards of Gatuanyaga and Ngoliba.

1.6.2 Academic Scope and Limitations of the Study

During the research, the firms felt that this was an investigative issue and the researcher was from their oil marketing competitors and also a potential investor and therefore refused to give data on some aspects of compliance and verification of certificates. This however did not affect the outcome of the study. Most of the managers felt that the study was scientific in nature and quality, therefore delegated the work of fuel-in the questionnaires to the quality supervisors.

The researcher encountered limitations dealing with some owners and managers due to their incompetence to respond effectively to compliance status and this is why the researcher opted for the supervisors to respond to the questionnaires. Assessing audit reports and records for verification of information given in questionnaires on length of time the station has been in operation to confirm the compliance level was a challenge. Assurance for confidentiality of information given by the managers who were not the owners was a challenge in data collection. Expansion of storage facilities at the oil marketing terminals should be expanded to curb fuel shortages.

This was a huddle especially with some oil marketing companies when they misunderstood the purpose of the visit. Some thought the researcher was an enforcement compliance officer while others thought the researcher was a competitor on a mission to spy. Restrictions were put especially regarding photography as most of the oil marketing companies have a policy that none of their facilities should be photographed. This is the reason why there are no photographs. All the same permission was granted without restrictions after the managers were convinced that the work was meant only for academic purpose.

The researcher faced the problem of inadequate documentation on the compliance status of the retail fuel stations. This meant much time was spent searching for secondary data sources on the subject. The environmental audit reports were difficult to trace as they had not being filed with

the relevant regulatory bodies. The name of the station on the actual ground was not what was filed with the regulatory institutions. Without documentation it may have indicated that the retail fuel service stations had never being involved in any environmental or self audit which may not be the case. The researcher had to consult with the management of the fuel stations to peruse through their records to verify compliance

1.7 Definition of Concepts

Competence: Is the ability to consistently carry out tasks to a designated standard that demonstrates knowledge, experience and skills. It is a standardized requirement for an individual to properly perform a specific task.

Compliance: A situation in which an agency fully meets the requirements of law, regulations, court orders and rules which mandates main discrimination and affirmative action.

Environment: Environment means the physical surroundings of human beings including water, land, atmosphere, sound, odour, the biological factors of animals and plants and the social factors of aesthetics which includes both the natural and built environment (ISO 14001, 2004).

Environmental audits: Auditing done annually to safeguard environment.

Environmental management: Managing the environment sustainably.

Refurbishment: Oil firms going through changes.

Skills: This is the ability to execute a job; employment skills like technical skills involve working with physical objects and processes, interpersonal skills needed to operate as a member of a team, to lead others and to communicate effectively, decision making skills and techniques for solving problems.

Sustainability: To safeguard the future.

Underground storage tank: Is a tank and any connected underground piping that has at least 10% of its combined volume underground.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter summarizes the information from other researchers who have carried out their research in the same field of study. The literature review will focus on the factors affecting environmental best practice compliance among retail fuel stations in Thika East Sub-County. It also shows literature that has been reviewed on the research problem and concepts under study affecting compliance of retail fuel stations to environmental best practice. Summary on gaps that the study sought to fill have been captured together with the conceptual framework for the research.

2.1 Theoretical Framework

2.1.1 Ecological Modernization Theory

This study is founded on the ecological modernization theory. Ecological modernization is employed as a notion for depicting prevailing discourses of environmental policy. Early formulations of ecological modernization were constructed around a projective theory intended to inspire rigorous technological innovation capable of achieving extremely ambitious improvements in energy and materials efficiencies. The major figure associated with the political-discursive and social-constructionist perspective on ecological modernization (Hajer, 1995).

For Hajer (1995), ecological modernization is not so much a prediction of strong tendencies to industrial ecological progress as it is a category for describing the dominant discourses of the environmental policy arenas. In addition to Hajer's constructionism being in stark contrast with the objectivism of the core literature in ecological modernization, Hajer's view is that ecological-modernization is environmental protection. Ecological modernization is often used as a synonym for strategic environmental management, industrial ecology eco-restructuring, among others (Ayes, 1998). Ecological modernization has tended to give primary emphasis to environmental improvements in the private sector, particularly in relation to manufacturing industry and

associated sectors. Murphy (1997), for example, refers to state policies that make possible the internalization of environmental externalities as being instances of ecological modernization.

2.1.2 Resource Based View Theory

The resource-based view theory of the firm (RBV) involves the use of different combinations of a firms' rare and valuable resource; that is external and internal environment, as a prerequisite for the achievement of competitive advantage (Wernerfelt, 1984). The unique use of a firm's resources, such as competencies, assets, know-how, and capabilities, can lead to a specific combination of these that is difficult for others to imitate, and thus leading the firm to achieve competitive and strategic advantages.

Major concern in RBV is focused on the ability of the firm to maintain a combination of resources that cannot be possessed or built up in a similar manner by competitors. Further this theory provides us with the base to understand that the sustainability strength of competitive advantage depends on the ability of competitors to use identical or similar resources that make the same implications on a firm's performance. This ability of a firm to avoid imitation of their resources should be analyzed in depth to understand the sustainability strength of a competitive advantage. This theory provides the understanding that certain unique existing resources will result in superior performance and ultimately build a competitive advantage. Sustainability of such an advantage will be determined by the ability of competitors to imitate such resources. However, the existing resources of a firm may not be adequate to facilitate the future market requirement, due to volatility of the contemporary markets. According to Parker and Castleman (2009), the RBV theory seems relevant to e-business related research, as it does address tangible and intangible resources, including e-business tools. This theory is relevant in the factors affecting the factors affecting environmental best practice compliance among retail fuel stations in Thika East Sub-County.

2.2 Conceptual Framework

The main aim of the study was to get the level of compliance to environmental best practice and to identify likely determinants of the compliance. By looking at the literature review that indicates that multinationals are more compliant than the individual independent fuel stations.

The spending by independent oil retailers, mainly indigenous Kenyans who took advantage of the liberalization of the retail oil marketing is less compared to the bigger player even from the perspective of the physical size of the stations. And because of factors associated with less access to financing, independent dealers limit their low budget to buying alternative, cheaper and inferior petroleum equipment not mainly from the main dealers. The researcher considered the following variables. The study identified the dependent variable to be Environmental best practice compliance while the independent variables were identified as technological development and application, skills competence both management and employee and capital adequacy. The intervening and monitoring variables were the government, through institutions such as the Energy Regulatory Commission (ERC), NEMA and Kenya Bureau of Standards (KEBS) who intervene by conducting environmental impact assessment, monitor compliance, setting regulations, setting standards, licensing, enforcement of regulations, educating on compliance and setting regulations. The Local Government Act, Cap 265 part XIV, Section 201(1) gives local authorities power to make by-laws that are desirable for the checking of health, safety and well being of the inhabitants of the area or any part thereof. Petroleum rules of 1947 states that before one stores petroleum in an underground tank one should obtain a license from the licensing authority.

Considering the legal charges, verification and certification fees and licenses, plus the required installations, the managers find it demanding to comply with best practice taking into account the small profit margins they get. Training and equipping the employees with skills to handle petroleum products, maintenance and repair of equipment like ATGS come at a cost and in some cases the station management is tempted to make short cuts below what is of best practice to save on costs. Cost of installing digital dispensers comes at a cost and some stations to cut on costs buy inferior ones that compromise on EBP. The importance of risk evaluation and determination can be understood easily by viewing that many companies make it a part of their environmental policy. This is the responsibility of company to conduct its operational activities in a manner that minimize environmental risks, protect health and safety of employees, contractors, customers and community at large. Figure 2.1 shows schematic drawing showing variable relationship of the independent, intervening and monitoring and dependent variables.

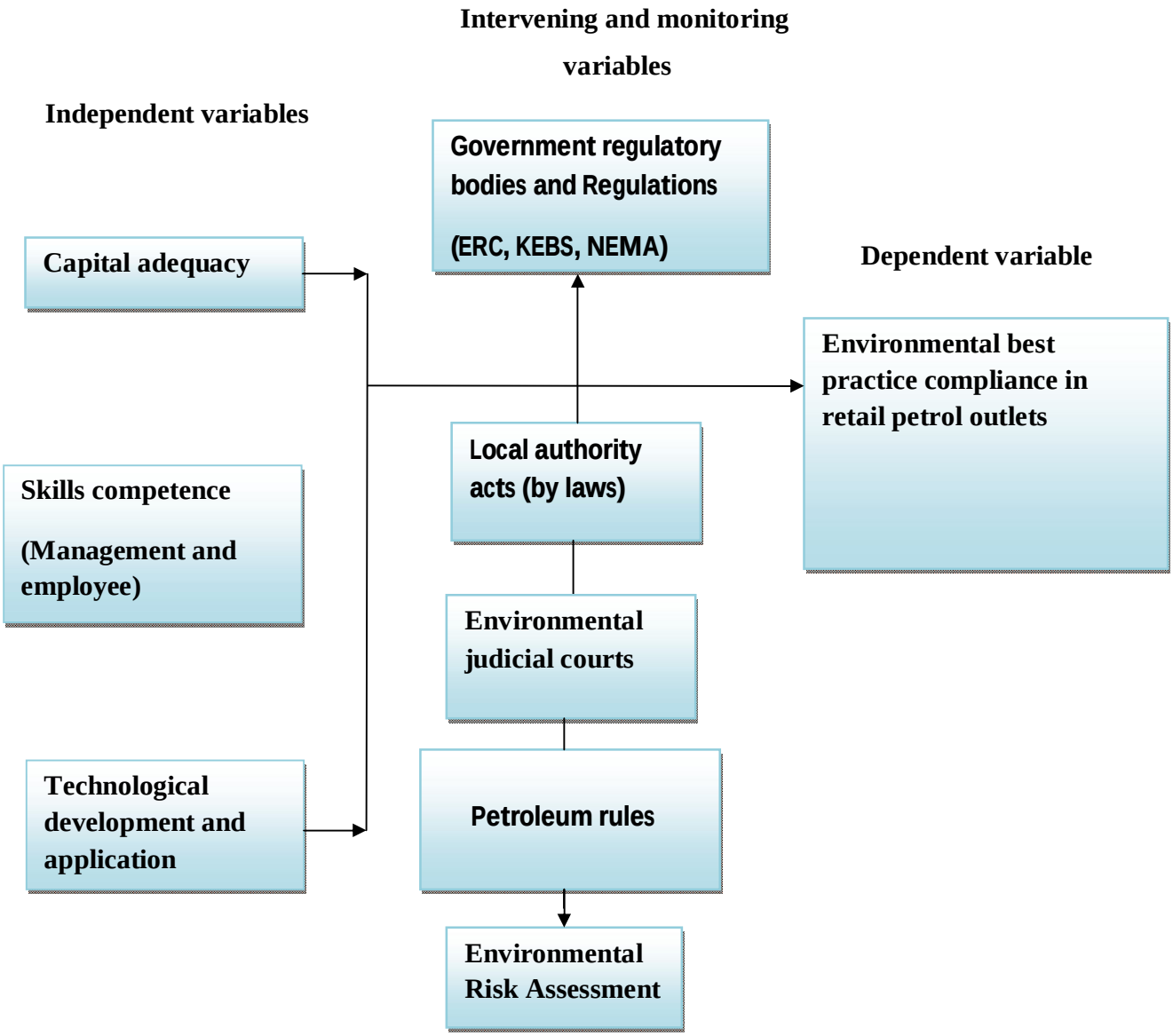


Figure 2.1 Conceptual Framework Adapted Classic Deterrent Model (Researcher 2014)

Some of the indicators of EBP are a welcoming good physical condition of the fuel station premises, adequate basic environmental management infrastructure within the fuel station facilities like functional oil interceptor, effective drainage and good housekeeping, meeting licensing criteria, clear understanding of and adherence to, the roles, responsibilities and authorities for annual self audit reports with NEMA within specific audit time frame, petroleum product handling skills, hazardous waste disposal skills, equipment maintenance skills, a registered pre-construction environmental impact assessment report, approved emergency

response plan and documented evidence of procedures for key operations at the fuel station to include conformity with the regulatory standards. Figure 2.1 shows the inter linkages between the three main variables.

The researcher adapted the classic deterrence model (Thornton*et al*., 2005) Traditional enforcement techniques like government monitoring and inspections as well as penalties for identified violations are associated with the rationalist theory (Malloy, 2003). In contrast with the rationalist theory, the normative theory of compliance presumes that the regulated community usually seeks to comply with the law, but that its ability to do so may be hindered some factors like lack of awareness, expertise or resources, or the absence of adequate incentives. Craigie*et al.*,(2009a). Companies are seen as law-abiding actors, "struggling in good faith to comply with complicated laws and regulations", with compliance driven by not by the threat of legal sanctions, but by the company's "drive to obey the law" (Malloy, 2003).

2.3 Environmental Management in the oil industry

According to Haveman (1992) careless handling of petroleum products like, from gaseous emission, waste water discharge mainly oils, greases, solid waste from used oil rags, noise and smells may have negative impacts on the environment. The petroleum products are considered hazardous because of their nature which ignites easily and hence cause hazards like fire while others are reactive and require special storage and handling because they tend to be unstable to shock, sparks or heat resulting in generation of toxic fumes and explosion fires. If improperly managed they releases poison in sufficient quantities to cause direct health effect through inhalation, skin absorption and ingestion or potentially toxic accumulation in the environment and consequently the food chain (Haveman, 1992).

With the increasing cost linked with environmental liabilities, oil products are of a special concern to the world's environmentalists and the population. If handled under conditions that are inappropriate they may cause environmental degradation. A major release or spill of products can be environmentally catastrophic, especially to marine or aquatic ecosystems (Greenstein, 2001). Because of different pollutions mainly air and water identified before the 1970s in the petroleum and petrochemical industries it gave rise in developing effluent and emission control

technology. This technology was usually applied from the very initial stages in the construction of new installation with the aim that pollution from them was kept to a minimum.

Progress led to include potential long term effect on human health, the living organisms and the world's climate. The precautions resulting to improved measures for protecting both workers in the industries and users of their products against possible health hazards. Around 1970s, new antipollution laws specific to the oil industry began to come into force in many countries, such laws made emission and discharges from petroleum and petrochemical installations, subject to permission from regulatory authorities, who frequently required the application of new control technology for existing installations as well as for new ones (*ibid*).

This led to what is known as the environmental impact assessment regulatory guidelines in many countries before the approval for construction of say a new fuel service station that looks into issues of possible adverse effects on cultural values, negative impacts and increased risk of accidents affecting local community. Another important development in many countries during the 1970s was increased public awareness and participation, through mandatory consultative procedures in making decisions about the fuel stations project. As a result of these developments, the petroleum and petrochemical industries now have to comply with a multitude of regulations aimed at protecting the health and safety of employees, the local population, customers and other people handling their products as well as with regulations aimed at protecting air water and soil against pollution (Redmond, 1991).

2.4 Best Practice Compliance Framework

The petroleum industry includes the global processes of exploration, extraction, refining, transporting (often by oil tankers and pipelines), and marketing petroleum products. There are different legislations governing petroleum operations in different countries. For example in the UK, the Petroleum Act 1998 vests that all rights to the nation's petroleum resources in the Crown, but the government can grant licenses that confer exclusive rights to search and bore for and get' petroleum. Each of these confers such rights over a limited area and for a limited period. In the United States the Energy Policy is determined by federal, state and local entities which address issues of energy production, distribution, and consumption, such as building codes and gas mileage standards.

Locally, Petroleum operations in Kenya are governed by several policies and legal frameworks including Petroleum Products Environmental Management Policy, 2003, Petroleum Act, Cap 116, The Physical Planning Act, chapter Cap 286; The Occupation Safety and Health Act, 2007; Energy Act 2006; Environmental Management and Coordination Act, 1999. Petroleum Act, Cap 116 is the primary legislation that regulates petroleum operations. A key aspect under this piece of legislation is the requirement for a petroleum project proponent to acquire an annual permit to store petroleum products in bulk and to display it conspicuously at the petroleum dispensing site. The Physical Planning Act, chapter 286 was promulgated for the preparation and implementation of physical development plans and for connected purpose, under this Act, project proponents are required a certificate of compliance indicating that the proposed development is in alignment with the physical development plan of the Government of Kenya. Due to the haphazard building of many petroleum dispensing sites in Kenya since 1994, the certificate of compliance is important for any petroleum dispensing investor.

The Petroleum Products Environmental Policy was enacted by the Government of Kenya in 2003 as a contribution towards implementation of the global accelerated environmental management initiative driven by UNEP to address the emerging global warming threat. The policy reinforces compliance to environmental standards and outlines procedures for environmental assessment to ensure that development options under consideration are environmentally sound and sustainable and that any environmental consequences are recognized early and taken into account in all projects design and subsequent operations. A concern has grown worldwide about environmental degradation and the threat it poses to human well being and economic development and many industrial and developing nations have realized the urgent need to incorporate environmental assessment procedures into their decision making processes (Petroleum Products Environmental Management Policy, 2003).

The policy section on petroleum retailing, installation and operation, deals with the distribution and sale of petroleum products (oil, diesel, petrol, and allied retail business) mainly at fuel stations. Through the policy, new fuel retail stations are to be planned and built well while existing stations run and eventually decommissioned in an environmentally compatible manner. A set of guidelines, operational standards and procedures have been provided to achieve this goal

(*ibid*). The guideline also includes contingency procedures to be followed in the case of environmentally detrimental accidents. It is important that strict environmental management be practiced in the operational running of a fuel station.

The Policy comprises a system of procedures, reporting and recording which should be applied to each fuel station throughout its development from conceptual planning through to eventual decommissioning. The policy requires every oil marketing company to conduct its business in such a way so as to give proper regard to the conservation of the environment by observing best service practice guidelines and codes of practice. Each must ensure that its products and operations meet the appropriate health, safety and environmental standards; assess the environmental impact of any potential new products or operation; and establish proper procedures to minimize the harm arising from any incident or other accidents (*ibid*).

The Petroleum Act Cap 116 is the primary legislation in Kenya that regulates petroleum operations. This Act whose commencement date is August 31st 1948 is fairly old and was last revised in 1972. The subsidiary legislation opened to the Main body of the Act known as the Petroleum rules stipulate the licensing requirement for a piece of legislation is the requirement for a petroleum installation. A key aspect under this piece of legislation is the requirement for a petroleum project proponent to acquire an annual permit to store petroleum products in bulk and to display it conspicuously at the petroleum dispensing site. According to the petroleum act Cap 116, the minister has the power to make all the decisions regarding petroleum and its classifications. In matters of storage, no person shall store petroleum except in accordance with a license issued by the Licensing Authority in one of the forms set out in the Schedule to these Rules. However no license shall be necessary for the keeping of Class A petroleum not exceeding forty-four gallons if contained in securely stoppered receptacles of glass or stoneware not exceeding one quart in capacity or in air-tight metal containers not exceeding forty-four gallons in capacity, each such receptacle and container being distinctly marked with the nature of the contents and the words highly inflammable and asphyxiate; not to be used in the proximity of fire or in an unventilated room. On transportation, no vehicle on which petroleum is carried shall carry, other goods of an inflammable nature; passengers; and that no vehicle containing more than sixty-five gallons of petroleum shall remain stationary for more than thirty minutes within one hundred yards of any building.

According to the Environmental Management and Coordination Act, 1999, Section 78 provides for the establishment of quality standards and any person who emits any substance which causes air pollution in contravention of emission standards shall be guilty of an offence and liable to imprisonment. Section 72 provides that any person who, discharges or applies poison toxic, noxicous or obstructing matter, radioactive waste or other pollutants or permits any person to dump or discharge such matter into aquatic environment in contravention of water pollution control standards shall be guilty of an offence. Section 74 provides that every owner or operator of a trade or industrial undertaking shall discharge effluent or other pollutants originating from the trade or industrial undertaking only into existing sewerage systems and relevant local authority operating a sewerage system or owner or operator of any trade or industrial undertaking shall discharge any effluents or other discharge license if the holder fails to comply with any condition specified in the license. Section 91 provides the classification of hazardous wastes that is hazardous, corrosive, toxic, carcinogenic, flammable explosive radioactive waste; such waste shall not be imported or transported within the country without a permit.

Section 94 subsection 1 (a) of the Water Act, 2002 states that no person shall willfully obstruct, interfere, divert or obstruct water from any water course or any other water resource, or negligently allow any such obstruction interference, diversion or abstraction; or throw or convey or cause or permit to be thrown or conveyed any rubbish, dirt, refuse, effluent or other offensive or unwholesome matter or thing into or near to any water resource in such a manner as to cause or likely to cause, pollution of the water resource.

The Physical Planning Act ensures that all development projects go through a compliance approval process. Section 29 provides that each local authority shall have the power to prohibit or control the sue and development of land buildings in interests of proper and orderly development of its area; to formulate by-laws to regulate zoning in respect of use and density of development and to reserve and maintain all the land planned for open spaces, parks urban forests and green belts. Section 30 states that no person shall carry out development within the area of local authority without a development permission granted by the local by the local authority.

Section 118 of the Public Health Act provides on sanitation and hygiene. These include any dwelling or premises or part thereof which is or are of such construction or in such a state or so

situated or so dirty as to be dangerous to health; any street, road or part thereof, any stream, pool, ditch, gutter, water course, sink, water tank, waste pipe, drain, sewer, refuse pit, dustbin, garbage receptacles in such a way or situated or constructed to be offensive or to be injurious or dangerous to health; any noxious matter or waste water flowing or discharged from any premises; any accumulation or deposit of reuse or any accumulation of stones, timber or other materials; and any dwelling or premises which is so overloaded among other provisions.

The Local Government Act gives local authority power to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health safety and well being of the inhabitants of its area or any part thereof. The petroleum rules, 1947 provide that before are stores petroleum in an underground kerbside tank, he/she should obtain a license from a licensing authority

The Environmental Management and Coordination (Waste Management) Regulations, 2006 outlines the following guidelines to the waste generator: Part II, Rule No. 5 on segregation of waste. Part II Rule No 6 on ways of minimizing waste generated by improving production, conserving raw materials and energy, eliminating the use of toxic raw materials and recycling and so on. Part II Rule No 7 on waste transportation license by lead agency and transporters responsibilities. This was used to gauge the environmental status of the fuel stations.

The Energy Act was enacted in 2006 section 4 of the Act established the energy regulatory commission (ERC) The ERC is a single sector regulatory agency with responsibility for economic and technical regulation of electric power, renewable energy and downstream petroleum sub-sectors, including tariff setting and review. Licensing, enforcement, dispute settlement and approval of power purchase.

2.4 Retail fuel Stations

The general challenges that face fuel stations environmental best practice compliance is with issue such as strenuous financial resources, lack of technological support (for case of independent investors), lack of effective industry regulatory authorities and poor infrastructure (Mintzberg, 1979; Roth et al., 1991).

Prior research in environmental management was reviewed to identify the different element of environmental best practice compliance, consistent with the elements of an effective environmental management system five key aspects were identified as drivers of the compliance status; resource allocation for environmental programs, operations management, design and construction standards, facilities integration with supporting infrastructure and public education and participation. While several studies have examined the ISO 14001 and ISO 190 11, standards, they have mainly focused on different aspects of the fuel stations business, competitiveness and especially on their determinants (Morrow and Rondinelli, 2002; Zutishi and Sohal, A 2004). In order to develop common industry views on environmental conservation issues in fuel station and to collect relevant information on emissions, discharges, hazards and effectiveness and cost of control measures in the refining and marketing of oil products in Kenya, the PIEA was established as a national coordinating association. The organization provides an important industry input for legislative machinery aimed at achieving workable regulation that ensure protection of the public and the environment in a cost-effective manner. With environmental technologies continuously evolving and a wide array of possible solutions for reducing pollution, the ministry of energy should urgently focus on creating an environment that fosters innovation, acting as an advantage for companies that have been moving away from end-of-pipe solution towards pollution prevention initiatives.

The practice has been for authorities to adopt a relative approach where companies that have experienced major environmental crisis have indeed been required to ensure swift and coordinated actions, while the compliance legislation remains loosely enforced in the industry

2.5 Underground Fuel Leakages

Key issues under the study dealt with fuel leakages from underground tanks. According to Minnesota Pollution Control Agency (2008) in the US, the law requires UST systems to have leak detection. One of the programs is to have an ATG so that it performs leak detection properly. This is monitored daily and with a well installed and maintained ATG system it provides tank inventory information, tank leak testing as well as piping leak testing. ATG systems are permanently installed in USTs. A probe is inserted into the tank that measures the

product level and temperatures. An ATG monitor and microprocessor are installed in a room to record probe readings (*ibid*).

The monitor is programmed and has a display to show the required data and has the capacity to print out inventory and test data. An ATG may have four or more probes connected to one monitor to monitor a number of tanks. ATGs may also be wired to monitor electronic line leak detectors. ATGs automatically measures, the product level, water level in the tank, hence replacing the use of a dip stick to perform this function. It also records deliveries, sales, and temperature readings and for a period of time like a month it will be able to determine if a changing product level may be due to a leak. Some ATGs perform continuous statistical leak detection by being programmed to take inventory readings for a month whenever there is no pumping activity. This determines if the tank is tight or leaking. These have benefits as they require minimum operator involvement, cause few interruptions and can provide many automated leak detection results. Training must be done to operate and maintain the system (*ibid*).

For the modern USTs they have spill and overfill protection that must be in working order. Leak detection results for piping are important for record purposes. Corrosion protection is mandatory any section will be in contact with the soil. These USTs are rested on underground chambers on continuous concrete. The UPPPs are flexible plastic piping that is easier to install. They are a double wall plastic based system with an inner barrier liner with a layer of reinforcement to provide strength and an outer cover to prevent spillage, but instead the fuel goes back to the tank (*ibid*).

2.6 Environmental Changes

The environmental changes that are taking place in the modern business environments have made many corporate leaders to strive to re-align their strategies to match the pace of technological advancement, changing economic, political and socio-cultural environment. As a result, most of managerial time in business firms is directed toward coping with uncertainties induced by environment dynamics. Firms need to co-evolve with their environment (Teece, 2007), which makes continuous adaptation to changes within a firm's environment a basic prerequisite for effective strategic management (Chakravarthy and Lorange, 1984). According to

Thompson and Strickland (1993), it is necessary for any organization to utilize environmental scanning techniques as earlier pointed out by Aguilar (1967) in order to predict such changes. The scanning process involves studying and interpreting economic, political, technological, and socio-cultural events with an aim of establishing trends which can affect the industry.

To scholars and strategy experts, environmental scanning is perceived to play a vital role in the strategic management process in the sense that it enables the management to become aware of environmental dynamics that pose new opportunities and threats to the organization. Through SWOT analysis and industry analysis, organizations are able to carry out the process of environmental analysis. By analyzing their external environments, organizations are able to forecast changes that are likely to have far reaching consequences to their overall performances.

For any organization to be effective and successful, it will be important for it to respond appropriately (Hofer and Schendler, 1978) to changes that are occurring within the environment in which they are operating, and this calls for the need of an organization to reconfigure its strategic response strategies to adapt to the prevailing or emerging environmental changes. Wheelen and Hunger (1990) note that firms will respond differently to the same environmental changes whereby they tend to use different strategies in reaction to these situations.

2.6.1 Influence of capital adequacy on environmental best practice compliance

The petroleum industry in Kenya has gained experience with the cost of routine pollution control and waste disposal operation, accident responses and remedial cleanup activities and have instituted operating procedures to include frequent inspections of tanks and pipeline from leakage which is an expensive exercise. This hence increases the site maintenance expenses and is after a contentious element of compliance by the specific fuel station. The regulatory requirement is for each fuel station to carry out an initial EIA and formulate a remedial action plan. In most cases the action plan is such that it can only be implemented over a period of time, on priority basis. It is also stipulated that, based on the initial EIA, fuel station considered to be potentially hazardous to the environment in terms of for example the age of tanks condition of soil and proximity to electrified systems, fresh water covers or bodies and basements will be compelled to either commence immediately remedial on all no-complying aspects of the standard

or lease to carry out any operational activities with immediate effect both of these options have adverse financial resource implication and in a number of cases results to very radical short-term business decisions by the dealer or oil marketing company. The regulation requires that the fuel station undertake, and maintain records, training in safety and spill response for all station personnel. The fuel station should also have an emergency response plan, development with the local government authorities and maintain emergency fire equipment adequate to handle any fire incidences in proportion to the size of the fuel station.

All firms of various kinds and with different organization structures operate within an environment of the country or location where their business activities are undertaken. In its entirety, an environment contains factors that influence the function of an organization. These functions include but are not limited to production, marketing, quality management systems, and customer services orientation. Frishammar (2006) put forth that the adaptive perspective of the environment-organization relationship assumes that organizations can adapt to changes within their environment by taking and implementing decisions that can alter their strategy, structure and processes.

Smith and Grimm (1997) asserts that by adapting an organization's strategy under conditions of major environmental changes is likely to raise both its chances of survival as well as its financial performance potential, with firms responding timely to environmental change being able to outperform those with longer reaction times. Furthermore, managerial perceptions of environmental risks and opportunities, organizational capabilities and the availability of slack resources have influences on managers' decision-making, which in turn determines the range and levels of corporate responses (Bannered, 2001) when faced with environmental changes.
Pearce et al., (2010) argue that the economic forces have an influence on the firm's operations, and hence each firm must consider economic trends in the segment that is likely to affect its industry. Organisations will respond to changes in interest rates, inflation rates, monetary policies, consumption levels, as well as integration of regional markets.

2.6.2 The influence of skills competence on environmental best practice compliance

Environmental sustainability skill needs will emerge in an incremental way and at different rates from industry to industry. The drivers for each industry are different and priorities for change

will vary accordingly. Those sectors affected by compliance requirements will be primary instigators for new developments in technology and work practices. Workforce skill requirements to support environmental sustainability objectives must be carefully assessed to determine the need for new skills and the appropriateness of existing skills. It is important that skill development adds to workforce capacity in a meaningful way and does not add unnecessarily to the burden faced by enterprises in meeting the new focus of environmental sustainability. The ISCs are concerned that a 'blanket' or fixed process that treats each industry in a similar fashion, or results in a standardized process of incorporating environmental sustainability skills into training packages, would work against these important principles and be highly detrimental to achieving the skill outcomes that industry needs.

There is extensive evidence of work completed and current initiatives to ensure that training packages support workforce development in environmental sustainability. In line with the principles outlined above, the ISCs have been actively engaging their stakeholders to determine how training packages can best serve industry in this agenda. The responses are as varied and diverse as the industries themselves. There are a significant number of skills currently being used that will support environmental sustainability. In general, the majority of skills will not be entirely new. Many units of competency and qualifications already cover these skills adequately as they are; others are being revised to add specific and relevant skill or knowledge to actively incorporate or strengthen components such as waste management and efficient use of resources. ISC research has identified a range of new skills that have or are emerging as a result of environmental sustainability drivers.

For industries, emissions monitoring, auditing and reporting skills are high on the list as are design and development strategies to improve energy efficiencies and design technology improvements. Risk management and environmental market research are also important new areas. Work is underway to define the new skills and knowledge requirements for these. For those affected by government initiatives, there is an immediate call for specific technical skills.

Environmental sustainability is an evolving field of expertise. This means that trainers and assessors will need access to ongoing professional development to ensure they are up to date

with the changes. In many circumstances this will be within the capacity of trainers, especially where new practices are an extension of established skills. However for many areas, especially those at higher levels or in new areas such as sustainable design, emissions auditing, or renewable energy, this will pose a serious capacity challenge. This is not only in accessing the necessary skill and knowledge but also in the ongoing investment required in research and updating of teaching resources. Environmental sustainability outcomes are also likely to require trainers to engage a range of delivery techniques to ensure that key learning's are achieved. Experiential learning, action research, project based learning and other learner-directed processes will be required to navigate a domain that in many cases is relatively unknown. This will be part of fostering a climate of innovation and problem solving, central practices to achieving environmental sustainable outcomes. However these are techniques that may need to be improved for many trainers and represent an area where professional development is required.

2.6.3 The influence of technological development on environmental best practice compliance

Technology has been defined as artificial things and more particularly modern machines artificial things that require engineering knowledge for their design and production, and perform large amounts of operations by themselves (Shenkar and Zeira, 1997). Having control (influence) over service delivery does not necessarily imply that technology is used for firms control purposes. Yet, a number of authors (Kumar and Seth, 1998) suggest that influencing the service delivery of a firm's management positions may represent a crucial strategic control mechanism for a firm parent, implying that such control may be the main driver behind the decisions concerning the strategic staffing of a firm. The modern business environment dictates that all firm's business activities should be technologically driven in order to have a competitive edge in the industry. Technological development to an organization is seen as path to better results given the quality of processes and procedures that are enhanced by this environmental force.

As appreciated by scholars like (Koontz, 2001), technological change is one of those forces that do have a great influence on the organizations performance. Technological change being a dominant driver of competition is likely to erode the competitive advantage of one firm over the other in the same industry. Additionally, technological innovation can change the nature of

opportunities and threats by altering the product lifecycles, increasing speed of distribution as well as the demand of such product in the market.

A technology standard is a model, specification, or design that has a dominant market position in the industry for its product class (Hariharan, 1990). A technology standard may be picked by committees or regulatory bodies, or it can emerge from a competitive battle in the marketplace. The latter is termed a *de facto* standard. Compatibility, for example, is the *de facto* standard in the personal computer industry (Hergert, 1987). The competitive battle refers to the nature of competition between firms in competing (different) networks while firms in the same network are expected to exhibit mutualism before the emergence of a standard.

The competitive stakes have become higher and higher, because the situation is influenced by positive feedback loops only. This competition is bound to have undesired outcomes for all parties involved, because it may lead to exhaustion, and even total breakdown of the conflicting parties, as well as depletion of natural resources used in the production process. Though some parties (Venkatraman and Ramanujam, 1986) appear to be aware of the deadly nature of this process, there are as yet no signs that de-escalation is imminent on a global scale. So, survival of the fittest or, as Morgan (1986) suggests, the best fitting still appears to be the name of the game. Only the game is no longer about strong or clever specific adaptations to certain more or less stable environmental demands (Cummings and Cooper, 1979). What counts now is the pace at which players (individual entrepreneurs, organizations, industries, and nations) are able to adapt to a continuously changing environment that demands a highly flexible approach, based upon a developmental process that matches the environmental one.

The analysis of global competition in a high technology setting is assuming increasing importance in running of today's business (Douglas and Craig, 1989). Competition for structuring a high-tech industry often centers around the establishment of a technology standard, that is, a model, technical specification, process/procedure, or design that has a dominant market position in the industry for its product class (Hariharan, 1990). During the construction and installation of metering pumps and dispensers, all metering pumps and dispensers are constructed, certified and installed in accordance with the required standard. Any metering pumps or dispensers intended for liquids other than petrol are, if located within 6m of equipment

for petrol, conform to the same standard. In addition to the construction standards, metering pumps and dispensers at unattended retail fuel stations include a limiting device designed to prevent a continuous outflow of petrol of more than 50 litres (the limiting device should be additional to any money, token or credit card pre-set device) (The East African, 2013)

According to The East African, (2013), metering pumps and dispensers are usually securely mounted on islands or plinths raised above the surface of the surrounding forecourt or otherwise securely fixed with adequate protection against damage from vehicles. Any island should be constructed of concrete kith and impact-resistant kerb. A firm competing in or planning to enter a global industry where alternative technologies compete needs to understand the nature of the relationship between technology standards and competition, as well as how this relationship might change once a standard is established.

CHAPTER THREE
METHODOLOGY

3.1 Study Population and Scope

Mugenda and Mugenda (1999) define population as an entire group of individuals, events or objects having a common observable characteristic. It is the total number of subjects of interest to the researcher (Oso and Onnen, 2008). The study was done by a complete survey of all the 19 retail fuel stations within Thika East Sub-County. This was done by the researcher visiting the retail fuel service stations and giving the questionnaires to the station Managers/owners where possible for response.

3.2 Location of the Study

The study assessed the retail fuel service stations along the Thika-Nairobi highway, Thika's central business district and the Thika-Garissa road.

3.2.1 Position, size and population

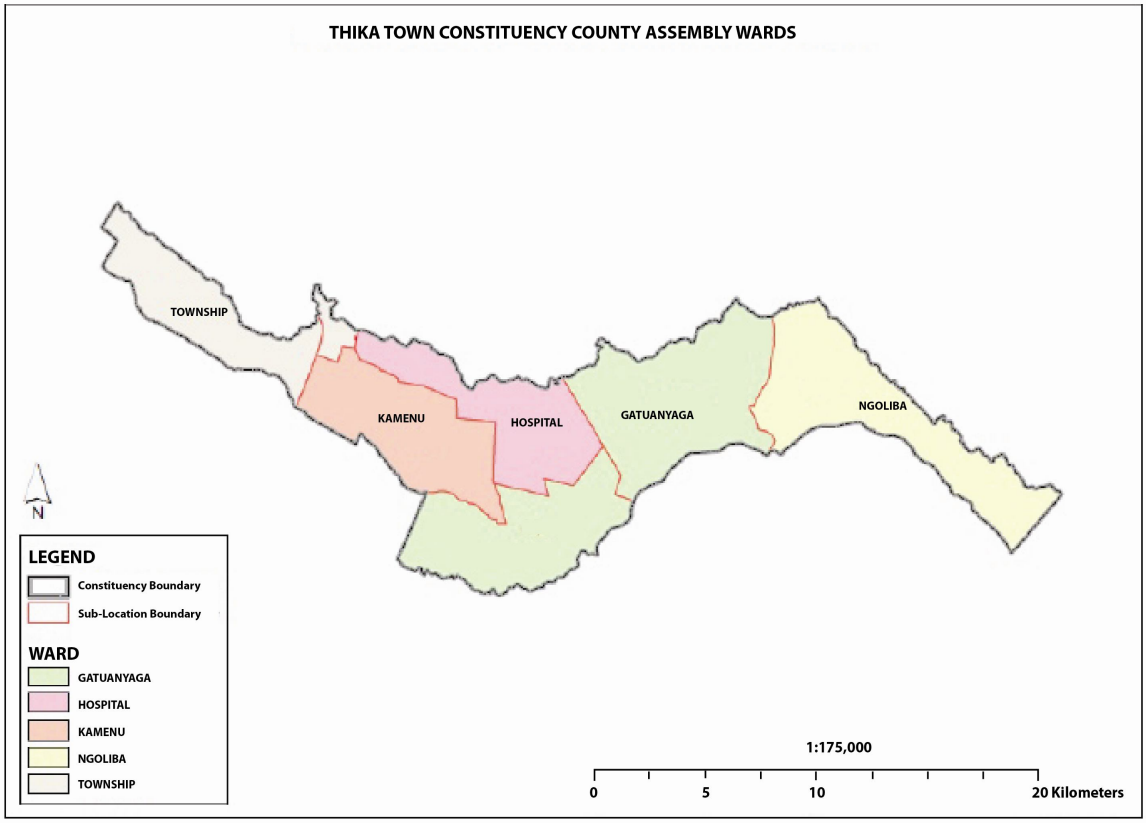
Kiambu County is one of the 47 counties in the Republic of Kenya. It is located in the central region and covers a total area of 2,543.5Km^2 according to the 2009 Kenya Population census. Kiambu County borders Nairobi and Kajiado counties to the south, Machakos to the East, Murang'a to the North and North East, Nyandarua to the North West, and Nakuru to the West. The county lies between latitudes 00 25' and 10° 20' South of the Equator and Longitude 36° 31' and 37° 15' East. The county hosts eleven constituencies of which Thika town is one. Thika town constituency has a population of 165,342 persons. Other constituencies are Gatundu South, Gatundu North, Juja, Ruiru, Githunguri, Kiambaa, Kabete, Kikuyu, Limuru and Lari.

According to the 2009 population and housing census, Thika town had a population of 165,342. The high population in the sub-county can be attributed to the proximity to Nairobi. There has been much improvement in the roads subsector with the example of the Thika-Nairobi highway. Most people work in Nairobi and reside in the sub-county. In addition, industrial development attracts more labour force. Several industries in Thika town include Bidco Oil Industries, Capwell Industry, Thika Motor Vehicle Dealers, Devki Steel Mills, Macadamia Nuts, Thika Pharmaceutical Manufactures and Broadway Bakeries. Thika is home to tourist attractions like

the Chania Falls, Thika Falls and agri-tourism such as Delmonte pineapple plantation. Thika East Sub-County forms the gateway for different routes to; Oldonyo Sabuk National Park, the Fourteen Falls, Matuu, Mwingi, Mbeere, Masinga and Garissa among others.

3.2.2 Thika East Sub-County

Thika East-Sub-County is in Kiambu County, one of the 47 Counties in the Republic of Kenya. Kiambu County borders Nairobi and Kajiado counties to the South, Machakos to the East, Murang'a to the North and North East, Nyandarua to the North West, and Nakuru to the West. Thika East Sub-County has five county assembly wards namely; Hospital, Kamenu, Township, Gatuanyaga and Ngoliba as shown on Figure 3.1. The fuel stations were distributed among Township, Hospital and Kamenu County assembly wards. Ngoliba had one fuel station while Gatuanyaga had none during the time of data collection.



Source: (IEBC, 2014)

Figure 3.1: Thika East Sub-County

3.2.3 Physiographic and natural conditions of Kiambu County

Kiambu County is divided into four broad topographical zones - upper highlands, lower highlands, upper midlands and lower midland zone. The upper highland zone is found in Lari constituency and is an extension of the Aberdare Ranges that lies at an altitude of 1,800-2550 meters above sea level. It is dominated by highly dissected ranges and it is very wet, steep and important as a catchment area. The lower highland zone is mostly found in Limuru and some parts of Gatundu North, Gatundu South, Githunguri and Kabete constituencies. The area is characterized by hills plateaus and high-elevation plains. The area lies between 1,500-1800 meters above sea level and is generally a tea and dairy zone though some activities like maize, horticultural crops and sheep farming are also practiced.

The upper midland zone lies between 1,300-1500 meters above sea level and it covers mostly parts of Juja and other constituencies with the exception of Lari. The landscape comprises of volcanic middle level uplands. The lower midland zone partly covers Thika Town (Gatuanyaga), Limuru and Kikuyu constituencies. The area lies between 1,200-1,360 meters above sea level. The soils in the midland zone are dissected and are easily eroded. Other physical features include steep slopes and valleys, which are unsuitable for cultivation. Some parts are also covered by forest.

The county is covered by three broad categories of soils which are: high level upland soils, plateau soils and volcanic footbridges soils. These soils are of varying fertility levels with soils from high-level uplands, which are from volcanic rocks, being very fertile. Their fertility is conducive for livestock keeping and growth of various cash and food crops such as tea, coffee, horticultural products, pyrethrum, vegetables, maize, beans, peas and potatoes. These soils are mostly found in the highlands in Gatundu South, Gatundu North, Githunguri, Kiambu, Kiambaa, Lari, Kikuyu, Kabete and Limuru constituencies. Low fertility soils are mainly found in the middle zone and the eastern part of the county which form part of the semi-arid areas. The soils are sandy or clay and can support drought resistant crops such as beans and sunflower as well as ranching. These soils are mostly found in parts of Juja, Thika Town, Ruiru, Kabete, Limuru, Gatundu North and Gatundu South Constituencies.

Most parts of the county are covered by soils from volcanic footbridges. These are well drained with moderate fertility. They are red to dark brown friable clays, which are suited for cash crops like coffee and tea. However, parts of Thika Town, Ruiru, Juja and Lari constituencies are covered by shallow soils, which are poorly drained and these are characterized by low rainfall, which severely limits agricultural development. However, these areas are suitable for ranching and growth of drought resistant crops.

3.3 Fuel stations in the study area

There were 19 fuel stations in Thika East Sub-County. The main oil marketing brands available included Total, Kenol-Kobil, Vivo Energy, Oil Libya, National Oil, Galana, Engen, Trojan among others These fuel stations propel the economy of the town by availing petroleum energy used by public transport vehicles, cooking in homes and industries. Having several huge industries presents a ready market for their products. This is shown in Table 3.1.

Table 3.1: Retail Service Stations in Thika East Sub-County 2013

Location	Number of fuel stations
Thika-Nairobi Highway	1
ThikaGarissa Road	10
Thika Central Business District	8
TOTAL	**19**

Source: (Researcher, 2014)

3.4 Research Design

The researcher applied a cross-sectional design because it cuts across all the petroleum oil stations across the sub-county. The design was chosen because the objective of the study required an in-depth understanding of the factors affecting environmental best practice compliance among retail fuel service stations in Thika East Sub-County. Yin, (1994) said that to refer to a work as a case study might mean that its method is qualitative, small-N and that the research is ethnographic, clinical, participant-observation, or otherwise “in the field”.

According to Yin (2003) a case study design should be considered when: the focus of the study is to answer ‘how’ and ‘why’ questions, you cannot manipulate the behavior of those involved in the study, you want to cover contextual conditions because you believe they are relevant to the phenomenon under study, or the boundaries are not clear between the phenomenon and context.

3.4.1 Sampling and Sampling Procedures

A sample is part of the target (or accessible) population that has been procedurally selected to represent it (Oso and Onnen, 2008). The study did not have a sample size since the study conducted a census. Hence the researcher collected data on all the 19 retail fuel stations within Thika East Sub-County. The study conducted a census survey since all members of the population were included in the study.

3.4.2 Data Collection

3.4.2.1 Survey Instruments

A questionnaire with both closed and open ended questions was given to managers/owners of retail fuel service stations for fuel in and where need be the researcher had an interview highlighting the various issues that needed clarifications. Some managers opted to have the quality marshal supervisors fill them. All the questionnaires were completed and handed to the researcher. From the interviews the researcher was able to obtain vital information about the past, present state and future plans regarding compliance status.

3.4.2.2 Primary Data

Primary data was collected using a questionnaire from the fuel station managers. Study generated data by use of questionnaires and the station observations. Questionnaires comprised the main instrument of data collection because it has the advantage of collecting data simultaneously (Gay, 1992). Questionnaires comprised both closed and open-ended questions. Different approaches and methods were applied to determine the environmental conditions of the retail fuel stations.

The researcher used direct observation to capture the station's physical environmental status, review of records, and perusal of the relevant statutory requirements. These were undertaken to understand the organizational setting, operational procedures, environmental condition, petroleum product handling awareness, and effluent disposal procedures. The researcher was also able to assess the level of capital adequacy of the station to meet compliance of best practice.

A review of relevant station documents and records enabled the researcher to determine the level of compliance with the relevant laws and regulations. Through the review of records and observations, the researcher was able to ascertain the present and past performance of the fuel stations.

3.4.2.3 Secondary Data

Secondary data sources from publications, unpublished materials were used. Some of these sources included government publications and NEMA reports. The study also included review of different Acts, to give a view of the legal situation on compliance status. Other secondary sources included maps, library books, diagrams from various sources, verification certificates, receipts and records on certification certificates were used. The Compliance Legislation Acts used in the study includes: Complimentary Legislations and Acts in Kenya: In Kenya, the National Environmental management standards are an extract of the global standards, Environmental Management and Coordination Act 1999, Water Act 2002, Kenya Gazette Supplement No. 107, Physical Planning Act, the Public Health Act, Cap 242, the Local Government Act, Cap 265 and the Petroleum Act, Cap 116.

3.4.2.4 Methods of Data Analysis

Kothari (1985) puts emphasis on the need to prepare data for analysis, some sub-processes like editing. Field data was edited and then analyzed using both the descriptive statistics such as frequencies, percentages, standard deviation among others. According to the guidance of Nicholas (1991) on data presentation graphs, tables and pie charts were found to be useful in this study. The Statistical Package for Social Sciences (SPSS) was used to analyze most primary data. As a result descriptive analysis and tabulation were used to report the findings of the study.

To measure the state of the fuel stations was measured using the cleanness of the fuel stations, availability of warning signs, availability of dust bins, the condition of the drainage systems and the overall state of the fuel station. The ones that were above 90% all were rated as excellent, the ones at 75% were rated to be very good, at 50% were rated to be good. The analysed data will be presented in tables and figures.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results and discussion of the study as set out in the research objective and methodology. The study findings and discussions are presented on the factors affecting environmental best practice compliance among retail fuel service stations in Thika East Sub-county**.**

4.2 Fuel Stations

The fuel stations were located in three broad locations namely along the Thika-Nairobi highway, Thika-Garissa road and within the central busines district. The ones within the town were small in size, while the relatively new ones were on Garisa road and theThika-Nairobi highway. They were also more spacious. They comprised of the following oil companies: Total, Kenol-Kobil, Vivo Energy, Oil Libya, National Oil, Galana, Engen, Trojan among others.

4.2.1 Number of Years respondents had worked in the stations

The study sought to find out the number of years that the respondent had worked in the Station. The findings are presented in Table 5.1.

Table 4.1: Number of years respondents had worked in the stations

Age	**Frequency**	**%**
Less than one year	5	26
1-5 years	10	53
6-10 years	3	16
Over 15 years	1	5
Total	**19**	**100**

Source: Researcher, 2014

Table 4.1 shows majority (53%) of the respondents indicated that they had worked in for between 1-5 years indicating a low turnover of the managers or the supervisors, followed by 26% of the respondents who indicated that they had worked for less than one year indicating also a low turnover in the management of the fuel stations. 16% had worked for between 6-10 years while only 5% had worked for over 15 years. The findings imply that the managers have served

for a length of time in the respective fuel stations and therefore they were well conversant with issues regarding environmental best practice compliance among retail fuel stations and the risks of non compliance and had acquired and gained a positive culture of compliance.

4.2.2 Operation Period of the Stations

The study sought to find out the number of years the operation station has being in operation. The findings are presented in Table 4.2.

Table 4. 2: Operation Period of the Stations

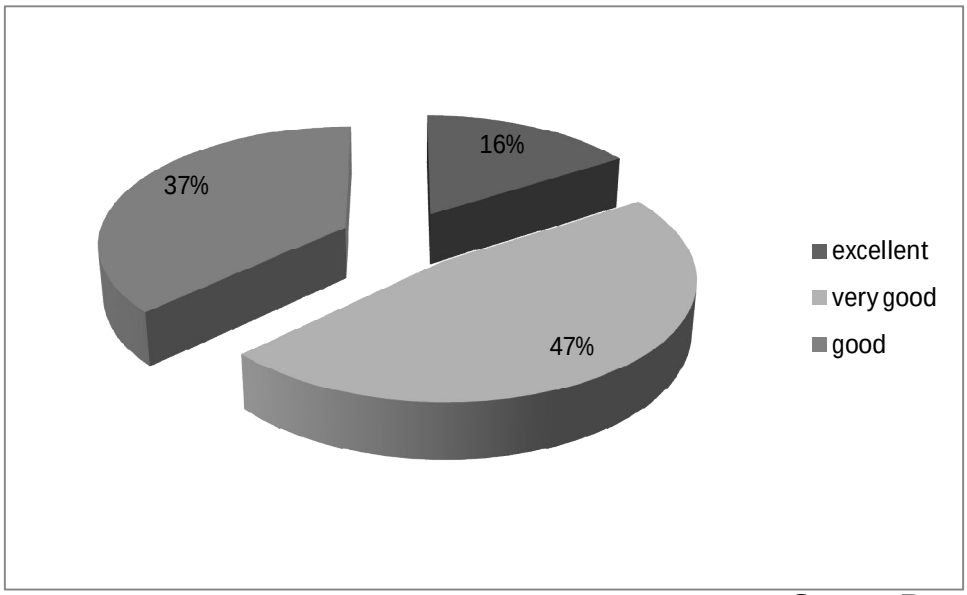
	Frequency	**%**
Less than one year	3	16%
1-5 years	10	53%
6-10 years	6	32%
Total	**19**	**100%**

Source: Researcher, 2014

From the findings, most 53% of the respondents indicated that the fuel stations have being in operational for between 1-5 years, 32% of the respondents indicated that they have been in operational for between 6-10 years whereas 16% indicated that the fuel stations have been in operational for between less than one year. The findings show that most of the stations are old hence difficult and expensive to attain full EBP compliance status, as the USTs age, corrode, pipes leak through corrosion holes and metal covers chip among other hazards.

4.2.3 State of the Environment of the Fuel Stations

The study sought to find out the state of the environment of the fuel stations. The findings are presented in Figure 4.1.and Table 4.3. Figure 4.1 shows that majority -47% of the firms have excellent environment at the fuel stations.



Source: Researcher, 2014

Figure 4. 1: State of the environment of the fuel stations

Table 4.3: State of the Environment of the Fuel Stations

	Frequency	**%**
Excellent	3	16
Very good	9	47
Good	7	37
Total	**19**	**100**

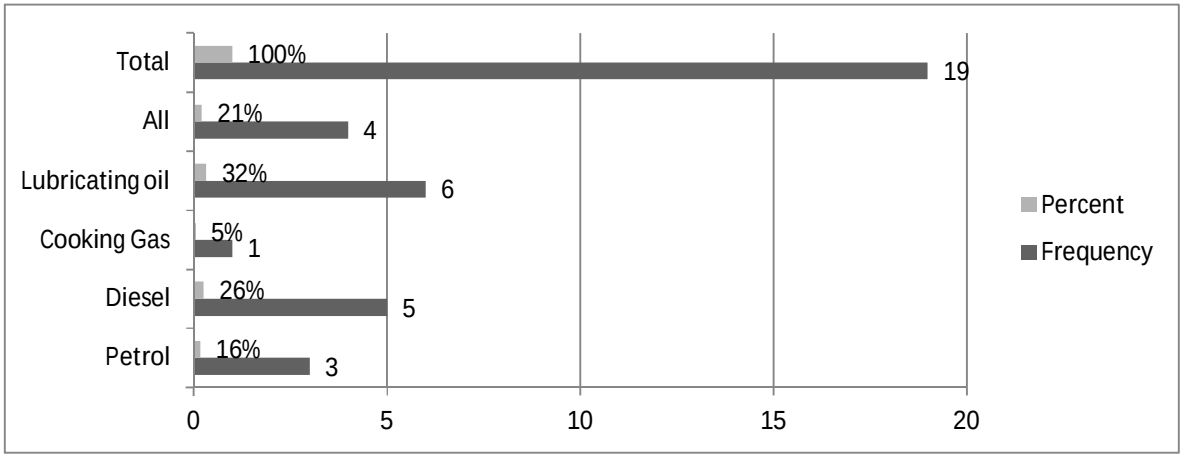
Source: Researcher, 2014

From the findings, most 47% of the respondents indicated that the state of the environment of the fuel station of the station was very good, 37% of the respondents indicated that it was good and 16% of the respondents indicated that it was excellent which showed that the owners/managers had put in effort and capital investment had been made to make them look welcoming and inviting. This indicates the respondents were aware of what constitutes best practice on the state of the environment and what needs to be done to reach the compliance status.

4.2.4 Petroleum products sold at the fuel stations

The study sought to find out the petroleum products sold at the fuel stations. The findings are presented in Figure 4.2.

Figure 4. 2: Petroleum products sold at the fuel stations



Source: Researcher, 2014

Figure 4.2 shows the findings. 16% of the respondents indicated that petrol was sold in their fuel station, 26% of the respondents indicated that diesel was sold in their fuel station, 5% of the respondents indicated that cooking gas was sold in their fuel station, 32% of the respondents indicated that lubricated oil was sold in their fuel station and 21% of the respondents indicated that all product were sold in their fuel station. The findings imply that the fuel stations observe various compliance practices relating to the other petroleum products that are sold in the fuel stations.

4.3 Services Offered

The study sought to find out the services offered at the fuel stations. The findings are presented in Table 4.3.

Table 4.3: Services Offered

	Frequency	%
Tyres repair Services	19	100
Car cleaning Services	17	89
Battery repairs and charging	3	16
Fast food services	3	16
Refreshment /Groceries shop	2	11
Motor Spares and accessories	11	58

Source: Researcher, 2014

From the findings, most, 89% of the respondents indicated that the station offered Car cleaning Services, 16% of the respondents indicated that the station offered battery repairs and charging and fast food services each, 11% of the respondents indicated that the station had a refreshment /groceries shop while of the respondents indicated that the station offered motor spares and accessories. For any service to be allowed to operate, one must comply with the set standards of the different Acts, hence adding to the number of areas of compliance levels plus added costs. Only the core services should be allowed to operate.

4.3.1 Capital adequacy on environmental best practice compliance

The study computed the mean and standard deviation to find out the effect of financial adequacy on compliance with EBP the respondents indicate the extent to which they agreed with each as shown on Table 4.4. The findings were interpreted using the scale 1-2.5 means disagree, 2.6-3.4 neutral while 3.5-5 agree.

Table 4.4: Capital Adequacy on Environmental Best Practice Compliance

	Mean	Std. Dev
The management has enough finance resources to initiate the required regulation.	2.0000	.00000
The management avails resources to initiate the required regulations	3.7442	1.49751
The station has enough finances to invest in an E.B.P compliance fuel station	2.9532	1.4988
The management has finances to install improved underground tanks	3.5814	.42917
The investor has funds for a state of arts car wash	1.0000	.00000
The investor has enough funds to employ qualified staff.	3.7442	1.49751

Source: Researcher, 2014

On whether the management has enough finance resources to initiate the required regulation and to what extent does capital adequacy affect environmental best practice compliance the respondents agreed as shown by mean score of 2.0000. Majority indicated that they had the financial capability.

Asked if the management avails resources to initiate the required remedial actions the respondents agreed as shown by mean score of 3.7442. However more capital resources need to be pumped into environmental compliance status. Some stations had been fenced off during data collection in order to undertake some form of remedial changes like replacing old underground storage tanks and cleaning the interceptor supervised by a consultant. The aim was to implement

and improve the environmental activities and status of the station. On whether the station has enough finances to invest in an E.B.P compliance fuel station the respondents agreed as shown by mean score of 2.9532. None of the fuel stations was found to be wholly compliant as the owners/managers considered availing funds on E.B.P as an extra cost and not part of normal fuel station business.

Asked if the company has finances to install improved underground tanks the respondents agreed as shown by mean score of 3.5814. This is to reduce underground fuel leakage although few had and were in the process of replacing the old ones. Only Vivo Energy brands of oil companies had already initiated the installation of the improved USTs in several of their retail outlets in the Sub-County. This could be due to their global environmental legal requirements making them to comply. They are re-branded company, previously trading as Kenya Shell.

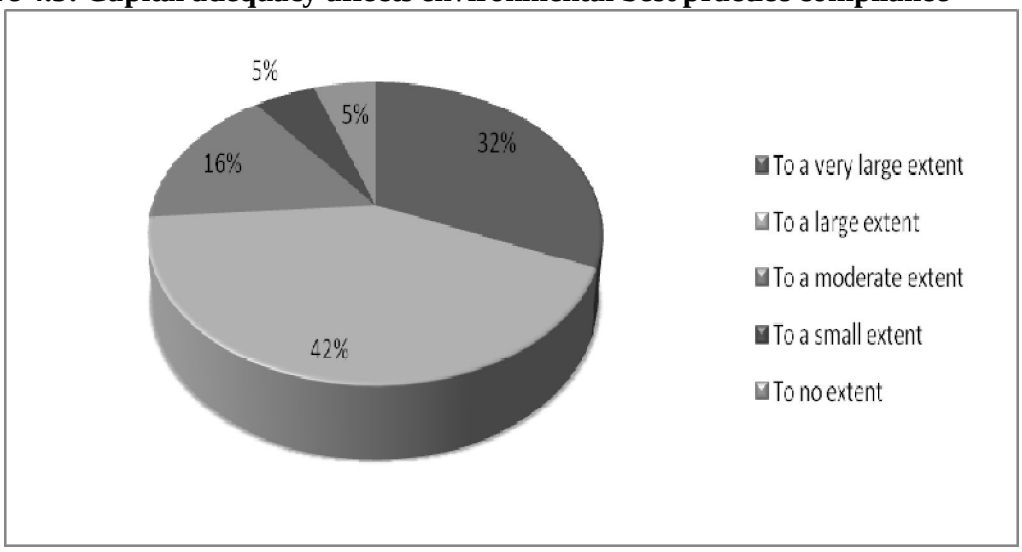
On whether the station has funds for a state of arts car wash the respondents agreed as shown by mean score of 1.0000.The licensing guidelines must be followed as well as being aware of the Sub-County's by-laws and regulations dealing with disposal of waste water and safe detergents.

On if the station has enough funds to employ qualified staff the respondents agreed as shown by mean score of 3.7442. This would help in B.E.P compliance. It is also the responsibility of the management to train the employees on handling petroleum products as this factor affects compliance. According to the findings it implied that the financial resources were available to the management of the fuel stations to initiate the required EBP compliance.

4.3.2 Capital adequacy affects environmental best practice compliance

The study sought to find out the extent to which capital adequacy affects environmental best practice compliance. This is shown in Figure 4.3.

Figure 4.3: Capital adequacy affects environmental best practice compliance



Source: Researcher, 2014

The findings indicated that 42% of the respondents agreed to a large extent while 5% agreed to no extent. Resources should be availed to improve environmental programmes. According to US Environmental Protection Agency no investor would like to risk with clean-up costs of potential soil and groundwater contamination.

4.4 Skills competence

4.4.1 Skills competence on environmental best practice compliance

The study computed the mean and standard deviation to find out the effect of skills competence on compliance with EBP the respondents indicate the extent to which they agreed with each. This is shown in Table 4.5.

Table 4. 5: Skills competence on environmental best practice compliance

	Mean	Std. Dev
The management has employed skilled competent employee to manage the oil product.	2.8372	.99834
The station employees advice the management on the requirements on E.B.P compliance	2.0000	.00000
The station staff have contributed positively to compliance to E.B.P	2.4186	.49917
The fuel station is responsible for financing education of staff	2.6372	.89828

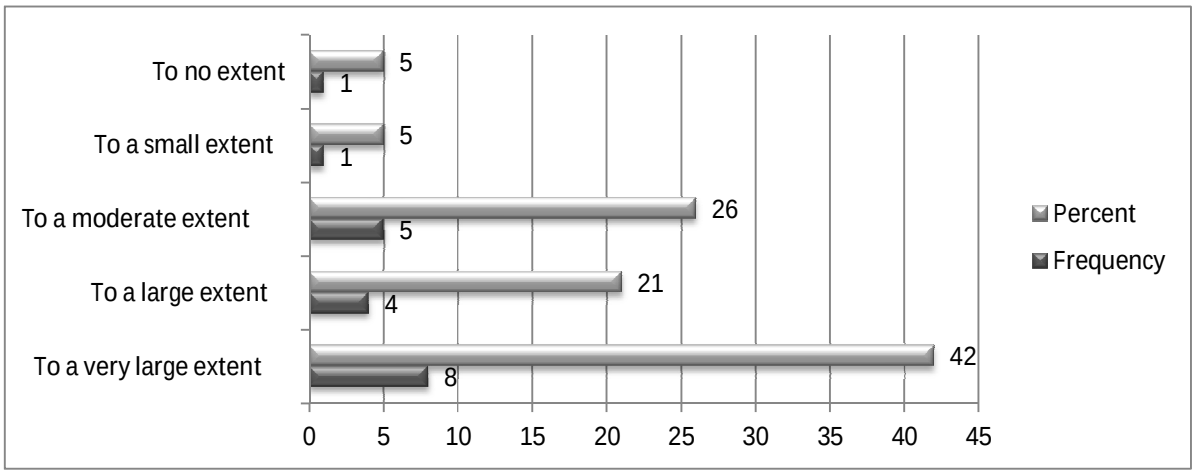
Source: Researcher, 2014.

Asked if the firm has employed skilled competent employee to manage the oil product the respondents agreed as shown by mean score of 2.8372. On the station employees advising the management on the requirements on E.B.P compliance the respondents agreed as shown by mean score of 2.0000. On whether the company staff have contributed positively to compliance to E.B.P the respondents agreed as shown by mean score of 2.4186. Finally on if the fuel station is responsible for financing education of staff the respondents agreed as shown by mean score of 2.6372. They should be trained to handle emergencies like leaks or explosions. These findings implied that the fuel station management had made some efforts to ensure the employees also had skills to handle petroleum products and were aware of disposal procedures to ensure EBP.

4.4.2 Skills competence effects on environmental best practice compliance

The study sought to find out the extent to which skills competence affects environmental best practice compliance. This is shown in Figure 4.4.

Figure 4. 4: Skills competence effects on environmental best practice compliance



Source: Researcher, 2014.

The findings indicated that 42% of the respondents agreed to a very large extent while 2% of the respondents agreed to no extent. The skills are a necessity to be able to handle equipment in the station like fire fighting tools, skills in handling petroleum products that are hazardous, maintenance and repair of dispensing pumps and gauges and be able to detect and monitor any leakages. Skilled personnel raise E.B.P compliance levels hence the best minds and best technologies reduce environmental risk.

4.5 Effects of Technological Development on Environmental Best Practice Compliance

The study sought to find out the extent to which technological development affects environmental best practice compliance shown in Table 4.6. Technological development considered in this study included adoption of the Automatic tank gauging system, installation of UPPP and automation of the dispensing machine.

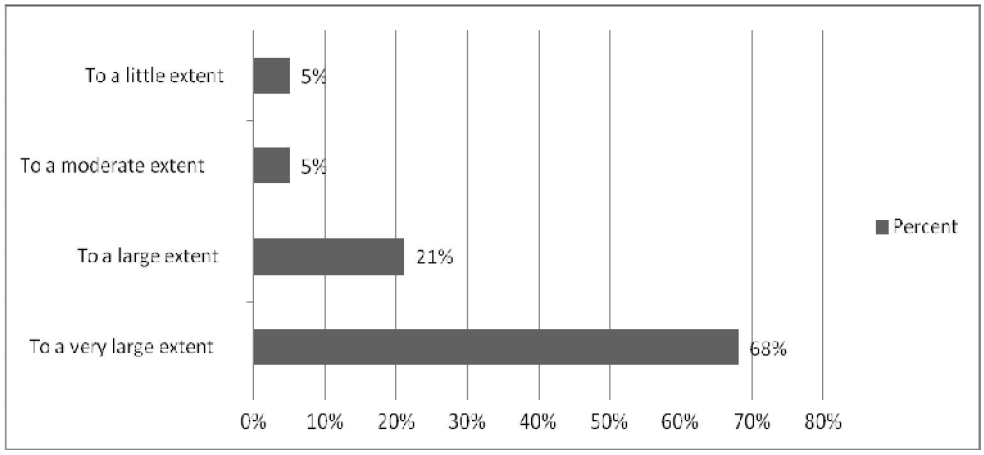
Table 4. 6: Technological development effects on environmental best practice compliance

	Frequency	Percent
To a very large extent	11	58%
To a large extent	4	21%
To a moderate extent	3	16%
To a small extent	1	5%
To no extent	0	0%
Total	**19**	**100%**

Source: Researcher, 2014

The findings indicated that 58% of the respondents agreed to a very large extent while none agreed to no extent. Brands like Vivo have adapted well to technology, embracing inventory management system as shown in Appendix II and no longer use GI pipes but use the UPPPs. These are double walled and placed inside a sleeve. All leaks collect in the outer pipes and back to the tank hence no spillage as it gets back to the tanks and is environmentally friendly.

Figure 4.5: Extent to which capital adequacy affect best practice compliance



Source: Researcher, 2014.

The contingency Figure 4.5 shows that 68% respondents stated to a very great extent while 5% stated to a little extent. The findings imply that adequate capital greatly influences best practice compliance by the retail fuel service stations hence reducing the level of environmental pollution shown on Table 4.7.

Table 4.7:Chi-Square Tests for Capital adequacy and environmental best practice compliance

	Value	DF (degree of freedom)	P-Value
Chi-square	7.83	3	0.023

Source: Researcher, 2014.

The calculated Pearson Chi-Square value is 7.83. The associated P-Value is 0.023. This value is more than 0.05 (5% level of significance) indicating that there is evidence against the null hypotheses and therefore we fail to accept it. The findings imply that 'capital adequacy affects best practice compliance and therefore the higher the level of capital, the lower the levels of environmental pollution since adequate capital enable the retail fuel service stations engage in best practice compliance.

Hypothesis 2: Skills Competence

Ho: Skills competence does not affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

H_1: Skills competence does affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

The null hypothesis indicates that both variables – Skills competence and environmental best practice compliance are independent of each other.

Table 4.8: Skills Competence and Environmental Best Practice Compliance

	Frequency	%
Very great extent	7	37
Great extent	8	42
Moderate extent	3	16
Little extent	1	5
Total	**19**	**100**

Source: Researcher, 2014.

The contingency Table 4.8 shows that 42% of the respondents reported that skill competence while 5% said to a little extent.

Table 4.9: Chi-Square Tests for Skills Competence and Environmental Best Practice Compliance

	Value	DF	P-Value
Chi-Square	8.536	3	0.0873

Source: Researcher, 2014.

The Pearson Chi-square Value was 8.536 and the associated P-value was 0.0373. This value is less than 0.05 indicating that there is evidence against the null hypotheses and therefore we fail to accept it. The findings in Table 4.9 show that skills competence affects environmental best practice compliance among the retail fuel service stations.

Hypothesis 3: Technological Development

Ho: Technological development does not affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

H_1: Technological development affect environmental best practice compliance among retail fuel stations in Thika East Sub County.

The null hypotheses indicate that both variables – technological development and environmental best practice compliance are independent of each other.

Table 4.10 shows that 68% of the respondents said technological development affects environmental best practice compliance to a very great extent while those who said to a moderate extent were represented by 11%.

Table 4.10: Cross tabulation on technological development and environmental best practice compliance

	Frequency	%
Very great extent	13	68
Great extent	4	21
Moderate extent	2	11
Total	**19**	**100**

Source: Researcher, 2014.

Table 4.11: Chi-square tests for technological development and environmental best practice compliance

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.845	2	.044

Source: Researcher, 2014.

The Pearson Chi-square value was 7.8 and the associated P- value was 0.044. This value is less than 0.05 indicating that there is evidence against the null hypotheses and therefore we fail to accept it. A conclusion can therefore be drawn that technological development affects Environmental Best Practice Compliance positively as shown in table 4.11. A checklist, for compliance by the US Protection Agency requires operators of USTs to have an overfill protection, leak detection which is part of technology, corrosion protection and financial adequacy for liability. Hence technology enhances EBP positively by use of recommended piping systems, automated dispensers and ATG system. This prevents and minimizes fuel leakages and hence ground, air and water pollution.

CHAPTER FIVE:

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presented the summary of key data findings, conclusion drawn from the findings in previous chapter and recommendation made thereto.

5.2 Summary of Findings

The study was conducted within Thika East Sub-County, where the fuel station managers /owners were targeted. From the analysis several findings were made. Majority (53%) of the respondents indicated that they had worked in for between 1-5 years indicating a low turnover of the managers. From the findings, most 47% of the respondents indicated that the state of the environment of the fuel station of the station was very good, 37% of the respondents indicated that it was good and 16% of the respondents indicated that it was excellent which showed that the owners/managers had put in effort and capital investment had been made to make them look welcoming and inviting. 16% of the respondents indicated that petrol was sold in their fuel station, 26% of the respondents indicated that diesel was sold in their fuel station, 5% of the respondents indicated that cooking gas was sold in their fuel station, 32% of the respondents indicated that lubricated oil was sold in their fuel station and 21% of the respondents indicated that all product were sold in their fuel station.

From the findings, most, 89% of the respondents indicated that the station offered car cleaning services, 16% of the respondents indicated that the station offered battery repairs and charging and fast food services each, 11% of the respondents indicated that the station had a refreshment /groceries shop while of the respondents indicated that the station offered motor spares and accessories. On whether the management has enough finance resources to initiate the required regulation and to what extent does capital adequacy affect environmental best practice compliance the respondents agreed as shown by mean score of 2.0000. Majority indicated that they had the financial capability.

Asked if the management avails resources to initiate the required remedial actions the respondents agreed as shown by mean score of 3.7442. On whether the station has enough

finances to invest in an E.B.P compliance fuel station the respondents agreed as shown by mean score of 2.9532. None of the fuel stations was found to be wholly compliant as the owners/managers considered availing funds on E.B.P as an extra cost and not part of normal fuel station business. On whether the station has funds for a state of arts car wash the respondents agreed as shown by mean score of 1.0000. The licensing guidelines must be followed as well as being aware of the Sub-County's by-laws and regulations dealing with disposal of waste water and safe detergents.

The study established that the extent to which capital adequacy affects environmental best practice compliance where 32% of the respondents agreed to a very large extent, 42% of the respondents agreed to a large extent, 16% of the respondents agreed to a moderate extent, 5% of the respondents agreed to a to a small extent and 5% of the respondents agreed to no extent. Asked if the firm has employed skilled competent employee to manage the oil product the respondents agreed as shown by mean score of 2.8372. On if the station employees advice the management on the requirements on E.B.P compliance the respondents agreed as shown by mean score of 2.0000.On whether the company staff have contributed positively to compliance to E.B.P the respondents agreed as shown by mean score of 2.4186.

On the extent to which skills competence affects environmental best practice compliance the findings indicated that 42% of the respondents agreed to a very large extent, 34% of the respondents agreed to a large extent, 20% of the respondents agreed to a moderate extent, 2 % of the respondents agreed to a to a small extent and 2% of the respondents agreed to no extent.

The findings indicated that 42% of the respondents agreed to a very large extent, 21% of the respondents agreed to a large extent, 10% of the respondents agreed to a moderate extent,2 % of the respondents agreed to a to a small extent and 2% of the respondents agreed to no extent. The skills are a necessity to be able to handle equipment in the station like fire fighting tools, skills in handling petroleum products that are hazardous, maintenance and repair of dispensing pumps and gauges and be able to detect and monitor any leakages. Skilled personnel raise E.B.P compliance levels hence the best minds and best technologies reduce environmental risk.

5.3 Conclusion

From the findings the study concludes that the management had the required financial resources, but did not avail such to initiate or improve E.B.P. However it was established from the study that only Vivo Energy oil retail stations that had been able to install and use the ATG inventory management system.

The study further concludes that the overall compliance of the fuel stations is influenced by the added cost to meet the new laws on the recommended designs of USTs, UPPPs installations and the specified automated digital dispensers the old technology using pumps. In this regards, not all the fuel stations had complied with the best practice as they still maintained the old ways of doing things.

Finally the study concluded that the technological developments have got a high impact on the fuel stations compliance to EBP. The study revealed that the fuel station management had limitation in accessing enough financial resources and availing them to EBP to purchase modern equipment to meet the recommended specification standards like USTs, UPPPs and digital dispensers. The management can be forced to source for financial resources before acquiring approval for the remodeling of the above while the regulatory authorities should ensure availability of standard equipment and technical resources to ensure smooth process as well as to reduce barriers to non compliance.

5.4 Recommendation

From the discussions and conclusions in this chapter, the study recommends that the fuel stations need to allocate enough finances to invest in E.B.P compliance, and the approach made by the enforcement agencies on compliance should be of teamwork and partnership rather than of policing in order to hasten the compliance process.

The study also recommends that workforce skills requirements to support environmental sustainability objectives must be carefully assessed to determine the need for new skills and the appropriateness of existing skills.

In addition the study recommends that the environmental enforcement officers should also undertake the training and briefing of the workers instead of leaving the responsibility wholly to the owners/managers as it is an expensive venture. This could be done during prime time news. A partnership should be developed so that the management takes the duty of reinforcing on the training given by NEMA and other enforcement agencies.

Finally the study recommends that it is important for technological development to be added to workforce capacity to be able to develop a solution that is effective and one that protects the environment of any negative impacts and also safety of self, customers, public and premises facilities are paramount aiming at having zero casualties. It should also be added to the policies so that it can be implemented.

The study proposes further research in the following area: Research in comparative study of environmental impact of collective fuel stations between urban and rural in a given region instead of a single fuel station. This will help enable generalization of the findings to the whole population. This study further suggests that future research be done on the different mechanisms that can be employed to manage hazardous waste within Thika East Sub-County because of its rapidly expanding and increased levels of industrialization

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APPENDIX I: QUESTIONNAIRE

Section A: Personal Information

1. How long have you being in the fuel station
   Less than 1 year [ ] 1-5 years [ ] 6-10 years [ ] Over 15 year [ ]
2. How long have this fuel station being in operation.
   Less than 1 year [ ] 1-5 years [ ] 6-10 years [ ] Over 15 year [ ]
3. What is the general appearance of the fuel station?
   Very Good [ ] Good [ ] Poor [ ] Very Poor [ ]

Section B: Capital adequacy on environmental best practice compliance

4. Below are statements on the effect of financial adequacy on compliance with EBP please indicate the extent to which you agree with each Use a 5- point scale, where,1= Not at all 2= Little extent 3= Moderate extent 4= Great extent 5= Very great extent Please tick as appropriate.

	RESPONSE RATINGS				
	1	2	3	4	5
The management has enough finance resources to initiate the required regulation.					
The management avails resources to initiate the required regulations					
The company has enough finances to invest in an E.B.P compliance petrol station					
The company has finances to install underground tanks.					
The company has funds for a state of arts car wash.					
The company has enough funds to employ qualified staff.					

5. To what extent does capital adequacy affect environmental best practice compliance?
   To a very large extent [ ]
   To a large extent [ ]
   To a moderate extent [ ]
   To a small extent [ ]
   To no extent [ ]

Section C: Skills competence on environmental best practice compliance

Below are statements on the effect of skills competence on compliance with EBP please indicate the extent to which you agree with each Use a 5- point scale, where,1= Not at all 2= Little extent 3= Moderate extent 4= Great extent 5= Very great extent Please tick as appropriate.

	RESPONSE RATINGS				
	1	2	3	4	5
The firm has employed skilled competent employee to manage the oil product.					
The company employee advice the management on the requirements on E.B.P compliance					
The company staff have contributed positively to compliance to E.B.P					
The fuel station is responsible for financing education of staff					

6. To what extent does skills competence affect environmental best practice compliance?

To a very large extent [ ] To a large extent [ ]
To a moderate extent [ ] To a small extent [ ]
To no extent [ ]

Section D: Technological development on environmental best practice compliance

7. Below are statements on the technological development competence on compliance with EBP please indicate the extent to which you agree with each Use a 5- point scale, where,1= Not at all 2= Little extent 3= Moderate extent 4= Great extent 5= Very great extent Please tick as appropriate.

	RESPONSE RATINGS				
	1	2	3	4	5
The equipments used in the fuel station are of high					
Technological development to what extent.					

8. To what extent does the technological development affect environmental best practice compliance?

To a very large extent [ ] To a large extent [ ]
To a moderate extent [ ] To a small extent [ ]
To no extent [ ]

APPENDIX II: AUTOMATIC TANK DIPPING SYSTEM PRINT OUT

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SHELL COMMERCIAL THK
QUINTET ENTP LTD
P.O BOX 1752 THIKA
020-21928

OCT 27, 2013 7:57 AM

SYSTEM STATUS REPORT

T 2:LOW PRODUCT ALARM
T 2:INVALID FUEL LEVEL
T 2:DELIVERY NEEDED
T 4:LOW PRODUCT ALARM
T 4:DELIVERY NEEDED
L10:FUEL ALARM

INVENTORY REPORT

T 1:DIESEL DX3
VOLUME = 20115 LITERS
ULLAGE = 9886 LITERS
90% ULLAGE = 6886 LITERS
TC VOLUME = 19953 LITERS
HEIGHT = 1426.4 MM
WATER VOL = 0 LITERS
WATER = 0.0 MM
TEMP = 25.4 DEG C

T 2:SUPER UX1
T 2:INVALID FUEL LEVEL
VOL INVALID 763 LITERS
ULLAGE = 12735 LITERS
90% ULLAGE = 11385 LITERS
TC VOLUME = 753 LITERS
HGT INVALID 97.26 MM
WATER VOL = 0 LITERS
WATER = 0.0 MM
TEMP = 26.2 DEG C

T 3:DIESEL DX2
VOLUME = 6067 LITERS
ULLAGE = 7432 LITERS
90% ULLAGE = 6082 LITERS
TC VOLUME = 6015 LITERS
HEIGHT = 750.4 MM
WATER VOL = 0 LITERS
WATER = 0.0 MM
TEMP = 26.2 DEG C

T 4:SUPER UX2
VOLUME = 816 LITERS
ULLAGE = 12682 LITERS
90% ULLAGE = 11332 LITERS
TC VOLUME = 805 LITERS
HEIGHT = 104.5 MM
WATER VOL = 0 LITERS
WATER = 0.0 MM
TEMP = 26.3 DEG C

T 5:DIESEL DX1
VOLUME = 7270 LITERS
ULLAGE = 6229 LITERS
90% ULLAGE = 4879 LITERS
TC VOLUME = 6680 LITERS
HEIGHT = 881.7 MM
WATER VOL = 0 LITERS
WATER = 0.0 MM
TEMP = 25.5 DEG C

* * * * * END * * * * *
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APPENDIX III: RELATED LEGAL REQUIREMENT

SAFETY FIRST

TOTAL

TOTAL KENYA LIMITED
SERVICE STATION HSEQ RELATED LEGAL REQUIREMENTS
COMPLIANCE REVIEW - 2012

S/n	Applicable Legislation	Requirement	Date of Last Review	Date of Next Review	Comments
1.	Environment Management and Coordination Act, 1999 No. 8 of 1999	Annual Environmental Audit.			•
2.	L.N. 101: Environment (Impact Assessment and Audit) Regulations 2003	Environmental Impact Assessment For all new projects.			•
3.	L.N. 120: Environment Management and Coordination (Water Quality) Regulations 2006	Annual Effluent Discharge Licenses & Annual Water Quality Analysis			•
4.	L.N. 121: Environment Management and Coordination (Waste Management) Regulations 2006	Company appointed to collect all the Waste & Used Oil to be licensed accordingly by NEMA			•
5.	The Energy Act, 2006 No. 12 of 2006	Licensing of the station by the Energy Regulatory Commission			•
6.	The Physical Planning Act, Chapter 286 of 1996	Certificate of compliance for all new projects			•
7.	The Occupational Safety and Health Act, 2007 No. 15 of 2007	Annual Registration of the station as a Work Place			•
		Annual Occupational Safety and Health Audit			•
		Annual inspection of Air Receivers (compressor)			•

Version 01: Feb 2012

Page 1 of 2

		Annual calibration of Monitoring Equipment e.g. Dispensing Pumps, LPG Weighing Scale and Air Gauges			•
8.	L.N. 59: The Factories and Other Places of Work (Fire Risk Reduction) Rules 2007	Annual Inspection by the Fire Department			•
		Annual Fire Safety Audit			•
9.	L.N. 24: The Factories and Other Places of Work (Medical Examination) Rules 2005	Annual Medical Examinations for all staff			
10.	The Weights & Measures Act, CAP 513	Annual calibration of Monitoring Equipment e.g. Dispensing Pumps, LPG Weighing Scale and Air Gauges			•

APPENDIX IV: ENVIRONMENTAL MANAGEMENT STANDARDS

The Government adopted standards and compliance measures that are in line with the provisions of the two international environmental management standards namely ISO 14001, 2004 (the environmental compliance) the provisions under these standards are that every organization shall establish implement and maintain procedures to:

(i) Identify the environmental aspects of its activities, products and services within the defined scope of the environmental management system that it can control and those that it can influence taking into account planned or new developments, or new or modified activities, products and services and determine those aspects that have or can have significant impact (s) on the environmental (i.e. significant environmental aspects). The organization shell ensures that the significant environmental aspects are taken into account in establishing, implementing and maintaining its environmental management system.

(ii) Identify and have access to the applicable legal requirements and other requirements to which the organization subscribes related to its environmental aspects and determine how the requirements apply to its environmental aspects.

(iii) Ensure the availability of resource essentials to establish, implement, maintain and improve the environmental management system. Resources include human resources and specialized skills, organizational infrastructure, technology and financial resources.

(iv) Ensure any person(s) performing task for it or on its behalf have the potential to cause a significant environmental impact(s) identified by the organization is (are) competent an basis of appropriate education, training or experience and shall retain associated record.

(v) Ensure the environmental management system documentation include the environmental policy, objectives and targets; and records as determined by the organization to be to be necessary to ensure the effective planning, operation and control of processes that relate to its significant environmental aspects.

(vi) Identify and plan those operations that are associated with the identified significant environmental aspects consistent with its environmental policy objects and targets, in order to ensure that they are carried out under specified conditions, by establishing implementing and maintaining a documented procedures to control situation where their absence could lead to deviation from the environmental aspects of goods and services

used by the organization and communicating applicable procedures and requirements to suppliers, including contractors.

(vii) Identify potential emergency situation and potential accidents that can have impacts on the environment and how it will respond to them.

(viii) Monitor and measure on a regular basis, the key characteristics of its operations that can have a significant environmental impact. The procedure shall include the documenting of information to monitor performance, applicable operational controls and conforming with the organization environmental objectives and targets.

(ix) Periodically evaluate compliance with applicable legal requirements and any other requirements it subscribes, consistent with its commitment to compliance. The organization shall keep records of the results of the periodic evaluation.

(x) Deal with actual and potential no-conformity and for taking corrective action and preventive action.

(xi) Carry out regular audits of the environmental management system (ISO 14001) and environmental compliance (ISO 19011)