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**NATURE AND IMPACT OF UNLEADED  
PREMIUM PETROLEUM CAMPAIGNS IN  
KENYA**

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REG NO : K/50/P/7409/03

UNIVERSITY OF NAIROBI  
EAST AFRICANA COLLECTION

A RESEARCH PROJECT PRESENTED IN PARTIAL  
FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD  
OF MASTER OF ARTS DEGREE IN COMMUNICATION  
STUDIES OF THE UNIVERSITY OF NAIROBI'S SCHOOL OF  
JOURNALISM.

**OCTOBER 2007**

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**DECLARATION**

I, Teresia M. Igiria, do hereby declare that this thesis is my original work and has not been submitted for consideration of award of any degree at any other university.

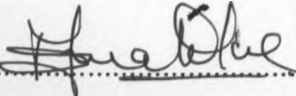
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## **DEDICATION**

This work is dedicated to my family, who urged me on,  
and to almighty God for his unconditional love.

## **ACKNOWLEDGEMENT**

I would like to thank Mr. Patrick Maluki, my supervisor and lecturer for his understanding, encouragement and guidance.

I would also like to thank my family for their enthusiasm and cheerful support.

Their deep love and affection gave me the strength to be the best I can and reach for the sky.

Special thanks to all those who participated in this paper and took time to answer the questionnaire. I am immensely grateful.

Lastly, I would like to thank the almighty God for keeping me in good health and for enabling me to complete this paper. I can do all things through him who strengthens me. (Phillipians 4:13)

## ABBREVIATIONS

<b>ANEJ</b>	-	African Network of Environmental Journalists
<b>CDM</b>	-	Clean Development Mechanisms
<b>CER</b>	-	Certified Emission Gas
<b>EFI</b>	-	Electronic Fuel Injectors
<b>EIS</b>	-	Environmental Information System
<b>ERB</b>	-	Electricity Regulatory Board
<b>ERC</b>	-	Energy Regulatory Commission
<b>GDI</b>	-	Gasoline Direct Injection
<b>GHG</b>	-	Green House Gas
<b>IEA</b>	-	International Energy Agency
<b>KPRL</b>	-	Kenya Petroleum Refineries Limited
<b>LPG</b>	-	Liquefied Petroleum Gas
<b>MDG</b>	-	Millennium Development Goals
<b>N2O</b>	-	Nitrons Acids
<b>NEMA</b>	-	National Environmental Management Authority
<b>NEPAD</b>	-	New Partnership for Africa's Development
<b>NESA</b>	-	National Energy Regulatory of South Africa
<b>NOCK</b>	-	National Oil Corporation of Kenya
<b>NGO's</b>	-	Non-Governmental Organizations
<b>OPEC</b>	-	Organization of Petroleum Exporting Countries
<b>PAH</b>	-	Poly Aromatics Hydro-carbonates
<b>PCFV</b>	-	Partnership for Cleaner fuels & Vehicles
<b>PDL</b>	-	Petroleum Development Limited
<b>PM10</b>	-	Particulates Micrograms ten
<b>PFC</b>	-	Per Fluoro Carbons
<b>PIEA</b>	-	Petroleum Institute of East Africa
<b>TEL</b>	-	Tetra Ethyl Lead
<b>SWOD</b>	-	Safe Waste Oil Disposal
<b>UN</b>	-	United Nations
<b>UNEP</b>	-	United Nations Environmental Programme
<b>UNFCC</b>	-	United Nations Framework Convention on Climatic Change
<b>WSSD</b>	-	World Summit on Sustainable Development

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### 1.3 ABSTRACT

Lead is a poison whose effects have been known for nearly 3,000 years and written about by historical figures from the Greek poet and physician Nikander to the Roman architect Vitruvius to Benjamin Franklin.<sup>1</sup> Odourless, colourless and tasteless, lead can be detected only through chemical analysis. Unlike carcinogens and killers as pesticides, most chemicals, waste oils and even radioactive materials, lead does not break down over time. It does not vaporize, and it never disappears.

Lead added to automotive fuel leads to particulate lead pollution. In recent years, there has been concern on the PM10 particles. These particles have a diameter of less than 10 micro - gm and can penetrate through the skin lining into the lungs. Smoke particulates can be inhaled beyond the larynx and penetrate to the lungs. The effect of smoke (particulates) is said to begin at 2.5 micro-gm. Diesel engine vehicles emissions particles are the most hazardous as they emit carcinogenic 10.

The developed world long ceased the use of leaded fuel. In the USA it was outlawed as automotive gasoline additive in 1986, many countries followed. In 2000, The European Union banned the use leaded additives in gasoline. In Europe all cars manufactured after 1990 use lead-free petrol.

In Kenya, the level of allowable sulphur in diesel is one percent (1%). This is 20 times more than in Europe, where the limit is 0.05%. Sulphur dioxide is synergistic in combination with smoke. Together, they affect the respiratory system eventually causing respiratory paralysis. Sulphur dioxide also is responsible for acid rain.

In Kenya lead contains about 0.44g/l compared to Europe where the maximum allowed limits is 0.15g/l. This represents a three-fold difference. Lead is a

<sup>1</sup> . Jamie Lincoln Kitman, The Secret History of Lead [www.mindfully.org/Pesticide/Lead-History.htm#ref](http://www.mindfully.org/Pesticide/Lead-History.htm#ref)

neuro-toxin that impairs the brain development of children, reduces their IQ and causes poor concentration. Lead exposure to adults can cause elevated blood pressure causing hypertension, heart attacks and premature death.

The use of lead oil products generates green house gases. Green house gases trap heat from the sun leading to an increase in the earth temperature resulting in changes in climatic patterns.

Motorists, vehicle mechanics or artisans working in Jua Kali garages and the general public are exposed to a variety of harmful agents. The urban poor are also at risk since they typically live adjacent to the road thus are exposed to high levels of lead and sulphur and unknown levels of organic pollutants such as benzene and poly-aromatic hydrocarbons (PAH).

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Heavy vehicle traffic, especially in the urban centers, is the largest source of lead pollution in Kenya. Lead accounts for 90% of all atmospheric emissions in the country. As professor Ratemo Michieka, Executive Director, National Environment Management Authority (NEMA) points out. "Development we must, but in a sustainable manner. Let us begin by making our production and consumption pattern sustainable. It is time we ask ourselves how we treat our used oil and how energy efficient our systems are".<sup>2</sup>

Rapid population growth is cited as an aspect that has increased pollution as the demand for agricultural and industrial goods and services has increased leading to the generation of vast amounts of waste. The useable waste, if not properly disposed (of) is not only an environmental hazard, but also an eye sore. Kenya's air pollution is from the massive releases of pollutants by the high and unsustainable consumption of energy, petroleum and its by products,

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<sup>2</sup> Professor Ratemo Michieka (1<sup>st</sup> Quarter 2005) Petroleum Insight: Magazine of Petroleum Industry Page 4



transport and industrial resources. Fumes produced from consumption of leaded oil are detrimental to the environment and the people living in it.<sup>3</sup>

Though most countries are yet to make this a major policy issue, information on contributing factors to climatic changes and variability and incidences of climatic-induced diseases require consideration when coming up with control strategies. A combination of environment management, chemical and biological control has been suggested in national level strategies. The increase in green house gas and the importance of climate has manifested itself in several forms, in different regions.

Deficiency in fresh water, air etc, resulting from climate changes has the potential to deepen through poor sanitary and health conditions. Man is getting more vulnerable to infections. Vulnerability of man to climate changes occurs due to the variation in the frequency and duration of those changes or because people are constrained socially, economically or politically, from responding adequately to those changes.

Climatic variability is already having a huge negative effect on Kenya socio-economic development. This is likely to worsen if the contributing factors to climate change are not addressed. Factors contributing to climate changes such as lead poisoning of air and water are likely to compound the difficulties faced by a region where agricultural yields and per capital foods production have been steadily declining and where population growth is expected to double the demand for food, health and water among other resources.

Government roles include development of clean air policies and to ensure that the emission standards are developed and enforced. Such standards should match the air standards, fuel standards and vehicle standards and should have

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<sup>3</sup> Davidson, O., Halsnaes . The development and climate nexus: The case of Sub-Saharan Africa. *Climate Policy* (2003).

sufficient lead-time for implementation to ensure stability.<sup>4</sup> Kenya is currently in the process of developing and legislating air emissions standards through the National Environmental Management Authority (NEMA).

It will take informed people, clean fuel and clean vehicles to effectively reduce emission. It is then important to acknowledge the role fuel retailers, service stations attendants and supervisors play in educating and advising its public on fuel specification, hence empowering the motoring public to make informed purchases.<sup>5</sup> Nature and impact of unleaded premium campaigns in Kenya are a noteworthy survey.

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<sup>4</sup> Speech by Professor Ratemo Micheka, Director General NEEMA at a quarterly luncheon at The grand Regency Hotel on 22 March 2005.

<sup>5</sup> Speech by Professor Ratemo Micheka, Director General NEEMA at a quarterly luncheon at The grand Regency Hotel on 22 March 2005.

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## CHAPTER ONE:

### INTRODUCTION

#### 1.1 Background Information

The most important specification for petrol is the octane number. There is a minimum octane number that a car requires for better engine life and performance. This is because the higher the octane number the greater the resistance of the fuel to the engine knocks. The rationale for adding lead to fuel was as a cost effective way to increase fuel octane thus controlling engine knocks. In fixing this, the engineers created a bigger problem. They introduced a lethal substance whose damage is largely irreversible.

A number of the older refineries especially in developing countries still use lead additives to boost the octane number. However, most modern refineries are equipped with technologies that do not require the use of lead to meet intended petrol octane specifications. In Kenya premium has octane number 93 and regular petrol octane number 83 respectively<sup>6</sup>

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Unleaded premium does not contain lead poisons and therefore is less harmful, leaded petrol is the main source of lead in the atmosphere. When leaded petrol is burnt, fine particles of lead are emitted from the exhaust pipe and can travel for long distances. These lead particles are easily inhaled into the human body or settle into the soil, dust or food. Children are most vulnerable due to their high absorption rate and outdoor activities. No level of lead is safe. Lead is associated with diseases like general loss of intelligence, behavioral disorders, premature death among children, increased blood pressure, liver and kidney damage, impaired infertility, heart attacks and strokes among adults.

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<sup>6</sup> Petroleum Institute of East Africa, Training Course Manual. January – December 2005.

Lead damages the engine by corroding exhaust valves, pipes and spark plugs. Use of unleaded premium saves about 80% on spark plugs and doubles the life of the exhaust pipe, which leads to less oil changes and a longer period between vehicle maintenance, thus reducing vehicle maintenance costs.

Leaded premium is banned in most first world countries of the world and is only widely used in Africa. Internationally unleaded petrol costs less than leaded petrol. This is due to the fact that over 85% of petrol consumed worldwide is unleaded, with leaded petrol being used predominantly in Africa. In Kenya, there is no price differential between leaded and unleaded petrol hence no cost to switching over to unleaded.

Unleaded petrol is effectively used in a vehicle fitted with catalytic converter. Catalytic converter allow for a reduction of other vehicle pollutants by up to 90% and therefore allowing cleaner vehicle technology that is good for the environment.

The United Nations Environmental Programme (UNEP) through the Partnership for Cleaner Fuels and Vehicles (PCFV) - launched at the World Summit on Sustainable Development (WSSD) in 2002. WSSD is involved in the regional coordination of programmes and activities towards phase out of leaded petrol by December 2005. Sub-Saharan African countries have committed themselves to phase out leaded petrol by this period in accord referred to the Dakar Declaration.<sup>7</sup>

Already eight countries in Sub-Saharan Africa have completely phased out leaded petrol and many more have already set the phase out dates or have programmes and activities to phase out leaded petrol. The countries that have phased out the product include Ethiopia,

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<sup>7</sup> Peter Oraro, Energy Specialist – Climate Network Africa, Impact (February 2005) pg 31

Egypt, Ghana, Mauritania, Libya, Tunisia, Sudan and Morocco. South Africa and Kenya have declared they will phase out lead by January 2006.<sup>8</sup>

On 7<sup>th</sup> May 2004, the Kenyan government committed to phase out leaded petrol by December 2005. The Ministry of Environment through the National Environment Management Authority (NEMA) chairs a multi sectorial task force, which includes United Nations Environmental Program and Petroleum Institute of East Africa, whose goal is to phase-out unleaded petrol. Various petroleum-marketing companies are also proactively promoting the use of unleaded petrol. However, it is known that there are a number of infrastructure actions that still need to be taken to ensure full implementation of the phase of leaded gasoline by end of 2005.<sup>9</sup>

UNEP & PIEA have been jointly involved in educating the service station dealers and pump attendants on the merit of unleaded petrol. About 400 pump attendants have been trained in Nairobi, Mombasa, Eldoret and Kisumu.

PIEA works closely with NEMA to create oil sector environment regulations and standard that will ensure that experts performing environmental impact assessments in the oil sector meet environmental expectations.

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<sup>8</sup> [www.gasandoil.com](http://www.gasandoil.com) - Sub-Sahara African countries on target with change to unleaded fuel, Source: Namibia Economist

<sup>9</sup> Simeon Nyachae, Minister of Energy, speech on May 7, 2004 at UNEP



### 1.1.1 Introduction Of Unleaded Fuel In Kenya

Although Kenya aspires to use unleaded petrol and low sulphur diesel that meet international environment and quality standards, Kenya Petroleum Refineries Limited (KPRL) is unable to produce fuels that meet global standards. It has been ascertained through past studies that KPRL needs to invest not only in product quality cleanup but also to ensure its medium-to-long term survival without the current tariff and tariff bases protection by the government.<sup>10</sup> Disagreements among shareholders of the Mombasa-based KPRL have dominated the airwaves in the past two years, with some calling for its ultimate closure.

According to the UN Rio de Janeiro Earth Summit held in 1992, the refinery pledged to achieve sustainable development in accordance with the principles of the Rio Declaration referred to as Agenda 21. KPRL recently received a World Bank sponsored study on the viability of upgrading the refinery to produce environment friendly fuels or closing down the plant and convert it into an import facility.<sup>11</sup> The company shareholders are Kenyan government and BP/Chevron, Texaco/Shell.

The company provides crude oil processing and product storage services for oil marketers. Its processing level of approximately 1.6 million tones per annum, the refinery covers approximately 60 percent of the country's demand for liquefied petroleum gas LPG, and approximately 65 percent of the country's demand of gasoline, kerosene and diesel (with exception of supply to power stations in Nairobi that uses a special low sulphur fuel), while oil marketers import the other balance.

The refinery processes crude oil for more than 20 marketers under the term of process agreement. Its income is entirely from processing fees which has remained almost

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<sup>10</sup> Extract from a feature story in PIEA report, Petroleum Insight, 2<sup>nd</sup> Quarter 2005

<sup>11</sup> Alexander's Gas & Oil Connections, Company news Africa, volume 11, issue one January 12

unchanged since its deregulation. In the period immediately following deregulation operation performance declined. Products yield did not match basic data, there were frequent unscheduled shutdowns and safety performance was also poor. Therefore in 1997 a program was initiated to bring a sustained structural improvement in performance. Technical performance improved and safety performance now ranks amongst the best in the world as indicated by the refinery being presented with seven Shell international safety awards since 1997.<sup>12</sup>

Recently the board mandated KPRL management to invite competitive bids from consultants to carry out design for extension of the refinery LPG storage to 8000 cubic meters capacity and pipeline to new jetty in the port.

In order for the refinery to remain a key link in the supply chain for petroleum product in Kenya, and surrounding markets, it needs to respond to further pressure. Key issues facing the refinery being that of product quality and competitive position. The refinery has served the country reliably and efficiently for many years. However with the need to introduce unleaded gasoline and the move towards lower sulphur diesel fuel, investment is required to meet the new specifications. Also it has become more difficult of the refinery to compete with the price of imported products.

In addition to the investment required for cleaner fuels, the refinery is simultaneously processing a proposal to upgrade its facility, enabling it to produce higher value products, operate a higher intake and provide a wider flexibility for the processing of cheaper crude oil.

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<sup>12</sup> African Energy Policy Research Network (AFREPREN) pricing and investment policy Issues in the downstream petroleum sector in Africa by Stepheb Karekezi, Timoth Ranja & John Kimani

The shareholders are currently considering upgrading of the refinery by means of residue conversion and the investment required to meet future clean fuel quality specifications. Recently Foster Wheeler energy Limited was engaged to carry out a configuration analysis of the refinery to enable its optimum investment to be identified and its economics evaluated. The conclusion was presented to KPRL shareholders. In the event, Mr Chris House, Managing Director of Kenya Petroleum Refinery Limited said KPRL has been preparing its tanks for unleaded fuel production over the past couple of years. He is optimistic that the refinery will be totally compliant by the end of 2008. A Thermal Gasoil Unit (TGU) will make this possible, or simply a Thermal Cracker, which will enable the refinery to produce several products, including liquefied petroleum gas (LPG), at a cheaper rate.<sup>13</sup>

### 1.1.2 Producing Quality Cleaner Fuel

Gasoline is produced in the refinery by blending together two process streams. The light component known as tops has an octane number of approximately 67. The heavier stream naphtha has an octane number of around 43, but this is increased by processing in a catalytic reforming unit to a level of about 92. The resultant blend for the production propositions of these streams still does not meet the market specifications of octane 93. Therefore the octane booster tetra ethyl lead (TEL) is added to meet the specifications. The use of TEL as an octane booster is the normal way that refineries around the world have produced motor gasoline before the introduction of the unleaded grade.<sup>14</sup>

Elimination of lead from the blend requires both components to have a higher octane number. In order to achieve this it is necessary to instill a new plant to increase the octane number of the lighter component from its natural level of 67 to higher level of

<sup>13</sup> Alexander's Gas & Oil Connections, Company news Africa, volume 11, issue one January 12

<sup>14</sup> *Progress Towards Cleaner Fuel and Cleaner Air in East Africa* Report of the Workshop on The Phase Out of Leaded Gasoline in East Africa Held at UNEP Headquarters, Nairobi, from 5 to 7 June 2002

approximately 88. This process is called isomerisation. Secondly, the octane number of the heavier component also needs to be increased. This is achieved through the installation of more advanced catalytic reformer units. This catalyst upgrading was carried out by KPRL at the end of 2004.

Shell first introduced unleaded premium petrol in Kenya in November 2001. The product was introduced initially in Nairobi and then rolled out to the rest of the major towns in Kenya. The five main multinational companies (Shell/BP, Kenol/Kobil, Total Kenya, Caltex Kenya and Mobil) are now retailing unleaded premium alongside leaded premium in the major towns in Kenya.

The launch of unleaded premium was done in a major hotel in Nairobi. After the launch, press adverts were put in the Daily Nation and the Standard. Posters were also put at fuel stations forecourt and on their retail shops. The advert focused on the environmental effects of the lead to the country and its availability and a list of locations where it was available. The rest of the industry followed similar trend with their focus on the environment. Magazines were also used as advertising media for the new unleaded product. Kenol/Kobil was the first and only company to introduce the radio advertisement to the Kenyan motorists. The five main fuel retailers have done no advertising on television.

### **1.1.3 History Of Kenyan Oil Companies**

In the Sixties and early Seventies Kenya had six international brands; Shell, BP, Esso, Mobil, Total, Agip and one local brand Kenol. Esso and Mobil were until 1962, in a marketing joint venture called Stanvac. When Stanvac split, Esso remained in the Eastern Africa region while Mobil intermitted the South Africa market. Mobil immediately re-entered the Kenyan market and remained here until 1984 when it decided to sell out to investors who renamed the new outfit Kobil.

In South Africa, Mobil with the highest market share finally pulled out of the market in 1984 due to shareholders protest against Apartheid and 50% sold out to Exxon who have remained the largest Marketer in South Africa.

In 1996 Esso decided to pull out of East Africa. In Kenya it sold out to Mobil who had just decided to return to this market. In Uganda and Tanzania, Esso sold out to Gapco. In 1998 Mobil and Exxon worldwide merged to become Exxon Mobil. Esso is the Exxon brand outside the United States, so Esso and Mobil are in fact back together where they started as Stanvac.

Kenol is a local brand going back to 1958 and had a long term supply agreement with Caltex who supplied all their product requirements. Kobil, which had acquired Mobil earlier entered into a joint management agreement with Kenol in 1985. Kenol is a publicly quoted company and has remained so to date.

In the region Shell/BP had for many years existed as an equal joint brand-marketing venture. However, in the late eighties Shell/BP in Uganda and Tanzania split, with shell taking Uganda and BP taking Tanzania, while Kenya retained the Shell/BP joint venture. Shell has since re-entered the Tanzania market. At the beginning of the millennium Agip sold out to Shell/BP after nearly 40 years in the Kenyan market. Recently (2005) BP announced its pullout from the Kenyan market and is currently selling its assets.

Total and Caltex market structures in the region have remained very much unchanged except when Caltex sold out to Gapco in Tanzania in the mid nineties and later reentered the same market.

After the petroleum market was liberised in 1994 many local and regional brands appeared in the market.

#### **1.1.4 History of Kenya Petroleum Refinery**

Completed at independence in 1963, the original name of KPRL was East Africa Oil Refineries Ltd, which later changed to April 1971 when the government acquired 50% shareholding. The balance of shareholding remained with Caltex, Esso, BP and Shell in equal proportions.

In 1996 when Esso pulled out of Kenya market they sold out their shares to the remaining private sector shareholders Caltex, Shell and BP. Shell has retained from the very beginning the management responsibility of KPRL. The other initial non-shareholders refinery processors (not shareholders) were Mobil Total and Agip.

KPRL supplied fuel to Kenya Uganda, Southern Sudan and Northern Tanzania (Kilimanjaro and Mwanza). Petroleum supplies with Tanzania ended with the political fallout and demise of the East African Community in 1977 when the common borders were closed. In the early 80's prompted by a supply crisis in Kenya, Ugandans decided to import finished products directly instead of crude processing at KPRL.

The Mombasa to Nairobi oil pipeline project was executed and commissioned by the government in 1978.

In January 1980, the Ministry of Energy was created, it took over the price regulation responsibility from the treasury. The National Oil corporation of Kenya (NOCK) was formed and the Petroleum Development Limited (PDL) was introduced to finance retail outlets in the very remote parts of Kenya (through NOCK) where the private oil sector found it un economic to operate. It was required that 70% of all crude processed to be procured through NOCK.

## 1.2 Problem Statement

Most motorists are familiar with the availability of unleaded premium in the market. The intensity of the damage done by unleaded premium to the vehicle and to the health is not widely publicized or focused on. However, most motorists are aware that leaded premium is harmful to the environment, but not aware of exactly what it does.

The press adverts and media campaigns are vague on the hazards of lead, they are more of public relations campaigns to show the companies care about the environment. Catchy taglines are used in reference to the environment, however information on pros and cons and the importance of phasing it out globally is limited.

The consistency of the availability of the product is poor as it is easy to drive into a station and find leaded available and unleaded unavailable. Stations upcountry have also been ignored and fuel companies mainly focus on major towns. In major towns not all stations have the product and some areas are ignored.

Many motorists are still driving into a service station and asking for 'super' and do not want to fuel unleaded, probably driven by ignorance or lack of proper communication. A major misconception is that unleaded fuel vehicles guzzle more fuel than leaded fuel cars. Motorists are also not aware whether their vehicles have a catalytic converter and whether they will adapt to the fuel or get damaged. There is lack of understanding of exactly what the catalytic converter does.

Although Kenya has officially banned use of gasoline oil, it is still being traded in and motorists seem to prefer it compared to unleaded brands.

### **1.3 Research Questions**

1. What should the motorists know about the use of unleaded premium in their vehicles?
2. Can any vehicle use unleaded premium?
3. Why is unleaded premium better for the vehicle, health and environment?
4. Do the vehicles need any modification to use unleaded fuel
5. Is it true unleaded petrol protects the environment, how can use of unleaded premium reduce maintenance costs?

### **1.4 General Objectives**

The general objective of the study is to examine the nature and effectiveness of the information campaigns done by the fuel marketers retailing in Kenya, environmental organizations and Petroleum Institute of East Africa (PIEA).

### **1.5 Specific Objectives**

1. Establish specific mediums which have been used for unleaded fuel campaigns to inform the public in Nairobi on the product.
2. Establish the content and information dissemination in the unleaded fuel campaigns.
3. Establish whether the knowledge has been effective in changing fuel consumption patterns from leaded premium to unleaded premium.

### **1.6 Hypothesis**

- Unleaded fuel campaigns in Kenya have not effectively informed motorists of the hazards of using leaded premium
- Kenyan motorists remain largely ignorant and unaware of the pros and cons of using unleaded fuel in their cars.
- Kenyan Motorists are not cautious of the environment.



## **1.7 Rational/Justification Of Study**

Leaded gasoline is mainly used for the propulsion of passenger motorcars, motor cycles and auto cycles. Just as in other parts of the world, the great majority of commercial vehicles (passenger serve cars, freight transport vehicles) and farm machinery (tractors and other farm and industrial units) are diesel propelled. Both petrol and diesel when burned in the combustion engine units emit fumes, which contain lead and sulphur respectively.

These emission and fumes are harmful to nature and life as they cause pollution and induce disease related to the same. The introduction of unleaded petrol in Kenya should increase awareness and subsequent consumption of clean fuel that is health friendly and environmentally sustainable. It is important therefore that oil industry ensures the basic standards and practices are in place and practiced uniformly by all stakeholders.

This study will help identify the importance of the phase out of unleaded premium in Kenya. It will also identify the knowledge and attitudes of both the motorists and the pedestrians being exposed to lead and their awareness. It is important to understand the campaigns and where they can be improved or restructured in order to communicate more efficiently to the public. Only then will the public understand how it affects them, take a stand and what they can do to protect themselves.

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## **1.8 Scope and Limitation of Study**

The study gives the background on the issues that pertain to sustainable development including petroleum products emission, their effect and the impact on the human life, vehicles and environment.

The study accounts for the need to have adaptation mechanisms to ensure that the climate is not affected thus the need for leaded fuel is phased out.

Also in view of the leaded petroleum negative implications the study surveys the awareness levels of the motoring public, the impact of communication media hence the responses of the targeted audience in bid to attain positive changes.

Leaded gasoline in Kenya is mainly used for the propulsion of passenger motorcars, motorcycles and auto cycles. The means used to reach this market is through newspaper, radio and leaflets and posters. This group is literate.

The study is design survey in nature. The design enables comparative exploration of effectiveness of campaigns in disseminating information. The new Kenyan motorist prefers a fast and efficient fueling experience, he/she has become discerning and sensitive, he/she is in a rush to get to his destination and does not want to be inconvenienced by taking any questions over personal issues or views and trends of consumption choice and decisions.

As the number of motorist increase in Kenya, fuel marketer have come up fast drive in-drive out fast service facilities especially during rush hours to remain competitive. Access to motorist is therefore difficult and would create a buildup of vehicles at a retail point.

These facts could jeopardize the sampling strategy while also limiting the number of respondents who could be possible interviewed or given the questionnaire. It is therefore implies that both time and desire on the part of the prospective respondents could be a great limiting factor hence a serious constraint. This could result in poor administration and poor responses.

## **1.9 Definition of Key Terms**

### **Fuel**

A product that is consumed to produce energy, heat or power. In this case the product is petroleum.

### **Unleaded Premium**

Unleaded premium petrol refers to premium motor spirit that has been refined without the use of lead. Gasoline or Fuel produced without the use of lead additives.

### **Advertising**

Designing, and disseminating a public announcement for the sake of informing the public on a product and especially to promote sales. The activity of attracting public attention to a product or business, as by paid announcements in the print, broadcast, or electronic media.

### **Campaigns**

A series of organized operations undertaken to accomplish a purpose or achieve an objective. In this case a series of informative and advertising campaigns. To engage in an operation planned to achieve a certain goal:

*Advertising campaign for a new product; a candidate's political campaign.*

### **Low Sulphur Diesel**

Diesel processed with lower contents of sulphur. The content may be as low as 0.05.

### **Motorist**

One who rides or rides in a vehicle. In this case the owner of the vehicle.

### **Fuel Retailers**

The major oil or petroleum companies that sell petroleum products to motorists. Sell fuel in small quantities directly to consumers.

## **1.10 Theoretical Framework**

### **The Knowledge Gap Hypothesis**

Tichenor Et Al (1970) claims that when the flow of information in a social system is increased, the better educated, those with higher socio-economic status, will be able to absorb the information better than less educated people with lower status. Increased information thus widens the knowledge gap instead of diminishing it.

Rogers (1976) points out that information results not only in increasing knowledge gaps but also in gaps concerning behaviour and attitudes. Accordingly, he changes the term to 'the communication effects of the gap' he also remarks that mass communication is not the only cause of the gap, communication directly between the individuals may also have similar effects. He finally underlines the fact that the gap need not be caused exclusively by different levels of education other facts may also contribute to the creation of the gaps.

### **Communication Potential**

Nowak Et Al (1976) refers to the term communication potential as those characteristics and resources which enable the individual to give and take information and which facilitate the communication process for him. In this study discussion the communication potential is referred as a means of obtaining certain values in life. The size and shape of communication potential depends on three main types of characteristics and resources.

#### **a) Personal characteristics**

Man has certain basic often native facilities like seeing and speaking and acquired facilities like speaking different languages and typewriting. He also has a potential of communication knowledge and attitudes and traits of personality.

#### **b) Characteristics depend on individual social position. This position is identified or defined by variables like income, education age and sex.**

#### **c) Characteristics on social structure where individual is found. An important factor is the function of individuals primary groups. (e.g. family work groups) and**

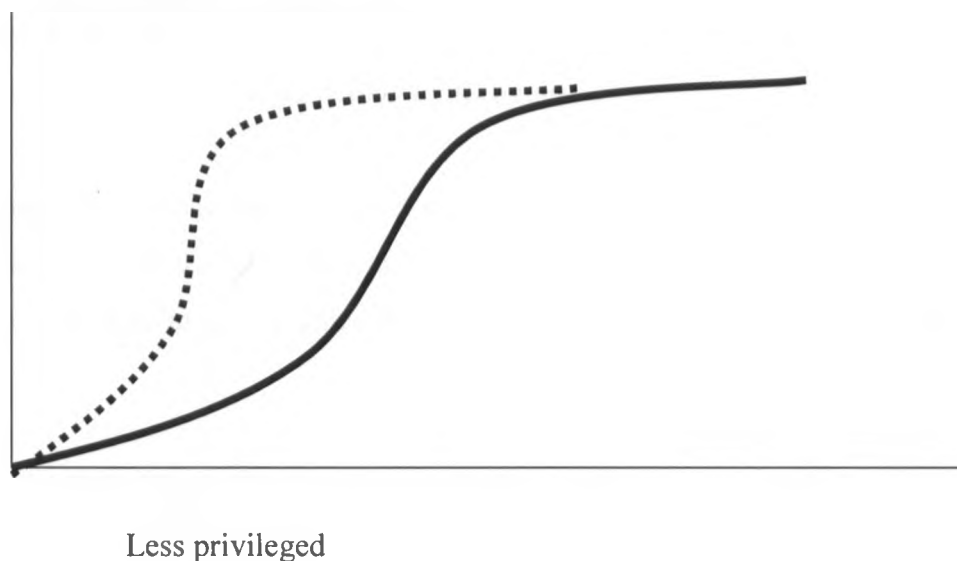
secondary groups (clubs, associations schools organization) in communication. In this context, society as a communication system is also relevant.

The potential may lead to individual obtaining certain values and reaching certain objectives. Value experiencing the sense of identity and solidarity, being able to affect ones life situation and being able to affect society as a whole.

If we regard the above model as a model of mass media, we should consider the three types of characteristics (or resources) as independent casual variables. The degree of achievement of ones objective and values then become the dependent variable effect and consequences. In a broader perspective we might assume the following: In a society there are systematic differences between communication potentials to different groups, this will result in systematic differences in the achievement of objectives and values of specific groups

**TABLE 1.1**

Access to  
information  
and  
knowledge  
privileged



Time

Closing information gap, in which the less privileged group 'catches up' with the more privileged one .

### **From a gap to gaps**

The phenomenon in question has been often talked about as 'the information gap or the knowledge gap. There are many information gaps, they however do not look alike. It is conceivable that the information gap or knowledge gap concerning world politics is wider than the one concerning increase of costs of foodstuff during the past few years. Different gaps cut through the population of different ways. It is often claimed that the gaps tend to increase as time passes. This may be true in some cases but Thuberg Et Al (1979) considers that they often acquire the aspect shown in the figure below.

In this figure the dotted lines represents the reading of relevant to groups in society which are privileged, these groups respect communication (in this case the motorists who by

assumption are the privileged group) ie those with a high communication potential. The continuous line represents the corresponding development in the less privileged groups (the general public who do not own a vehicles) we see how the gap is at first increased, but how the less privileged category catch up with the other. The final result is that the information gap is closed as far as this particular subject goes.

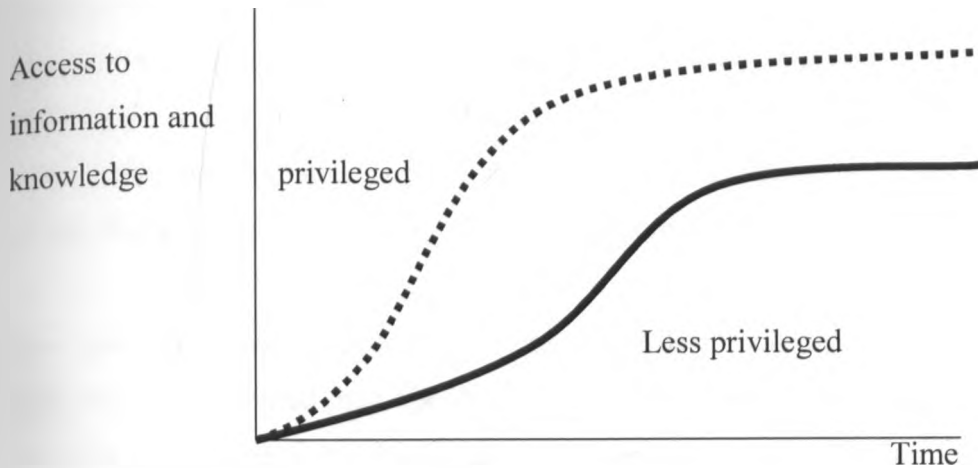
For example, we may consider the information campaign that precedes the change in use of leaded to unleaded fuel. In the onset there are certain information gap and knowledge gap about the importance/advantages of unleaded fuel to individual health the car and the environment.

The two curved approaching and joining phenomenon is termed 'ceiling effect' such ceilings may be reached when the potential information about the subject in question (in this case the unleaded fuels) is limited. Those who have a larger capacity for absorbing information after sometime have no more to gather on information flow on a particular subject (unleaded fuels). This fact enables the less privileged to catch up. It is also conceivable that a ceiling is reached when the privileged group in a certain situation no longer feels motivated for seeking more information while the less privileged group is still motivated and in the long run becomes equally well informed ( Ethema and Kline 1977). When a subject drops out of a general discussion so that no one or very few talk about it any longer, the gap between privileged and underprivileged remains or may widen.

In a dynamic society new information gaps appear incessantly as various subjects increase and decrease in topicality and relevance. The conditions favourable or unfavourable to each gap varies depending on the complexity or content of the subject. The communication potential mentioned above should however be a decisive factor according to Nowaek Et Al (1976). This is especially relevant to the subjects about which is profitable to be well informed. If we are to regard the information gaps in a

sociological light the important thing is not the amount of information as much but what information one is able to absorb and transmit.

TABLE 1.2



#### Non-closing information gap

The actual development of different information gaps depends on many factors. Donohue Et Al (1975) proposed for example the following hypothesis is which received support.

1. Where an issue arouses general concern for a community as a whole, knowledge about that issue is more likely to become more evenly distributed.
2. This equalization is more likely to occur when the issue emerges in a climate of social conflict.
3. Such equalization in knowledge is more likely to occur in small homogeneous community than in a large pluralistic one.

The opinion of Rogers (1976) cited above that mass media are not the only creator of information gaps is relevant here. In many cases this gaps may appear because



communication between individuals work better with some categories of people than with others.

It is an interesting question whether different media tend to create different types of gaps. There is some evidence that television has got a greater potential of closing gaps than the print press. This may be due to the fact that television usually is a more homogeneous and limited source where as in cases of the press, each paper reaches different public s with a more differentiated content. Probably more significant is the fact that television is widely trusted source and tends to reach higher proportion of many countries.

New media such as various forms of televised data transmission where information is individually distributed may also have a tendency to widen information gaps since their use will depend on individual's interest, motivation and previous knowledge. Such media is more available to better educated and higher status groups. Models of information gaps may among other things be seen as a reaction against the naive and exaggerated liberal belief in the ability of mass media to create a homogenously well informed mass of citizens. A discussion of this subject is more important when it comes to the role of communication in the developing countries. The insights conferred by the models may decisively affect the planning of information work in such areas.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

Thomas Midgely discovered that adding tetraethyl lead in gasoline would reduce the knocking and pinging in internal combustion of engines.<sup>15</sup> In 1923 gasoline with lead additive was made available in the market.

Lead is a highly toxic metal. Cumulative exposure to lead affects the brain and the nervous development of children, it also contributes to cardiovascular diseases in adults. It also causes long term harmful effects to the environment and motor vehicle emissions are one of the highest sources of lead exposure.

Technology has made it possible to achieve the required octane levels for efficient combustion without the use of lead. Research has shown that significant reduction of present and future and human environmental exposure to lead can lead be achieved cost effectively by removing lead from gasoline. Unleaded premium petrol refers to premium motor spirit that has been refined without the use of lead. In addition unleaded gasoline has the benefit of reduced engine wear and a longer life for the spark plugs and the exhaust systems.<sup>16</sup>

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The idea of introducing unleaded petrol in Africa was mooted on June 26 to June 28, 2001 at a conference held in Dakar Senegal, organized by the World Bank, USEPA, IPECA and UNEP. Participants from 25 sub-Saharan African governments, the private sector and the civil society groups adopted the Dakar declaration on the phase out of leaded gasoline in sub Saharan Africa.<sup>17</sup>

<sup>15</sup> The Secret History of Lead ,Jamie Lincoln Kitman [www.mindfully.org/Pesticide/Lead-History.htm#ref](http://www.mindfully.org/Pesticide/Lead-History.htm#ref)

<sup>16</sup> Weinw, W. H (1990) Climate Change And Variability,And The Resulting Social Economic And Logical Implications Verlae, Berlin Pg 409

<sup>17</sup> [Http://Www.Cleanairnet.Org/Ssa/1414/Article-36184.Html](http://Www.Cleanairnet.Org/Ssa/1414/Article-36184.Html) The Transition To Unleaded Gasoline: Issues And Experience

The decision was based on surveys of lead levels in the blood of Sub-Saharan African city populations showing that in many cases the World Health Organisations guidelines on lead content in petrol were being exceeded, posing a great risk.

After considering these issues, the 25 participants agreed to what is now referred to as the Declaration of Dakar. They agreed to a joint efforts to accelerate the formulation and implementation of programmes to completely phase out leaded gasoline in all Sub-Saharan African countries as soon as possible, the latest by 2005.

Point number 10 in the declaration of the Sub-Saharan countries threw down the gauntlet to "[African Union] and other [African] regional organisations to endorse the phasing out of leaded gasoline in their priority programmes and to contribute to the harmonisation of standard and technical specifications".

The following year, at the World Summit on Sustainable Development held in Johannesburg, South Africa, other countries added their voices to the Declaration of Dakar, and a promise was made on the phasing out of leaded fuel in Sub-Saharan Africa. An affirmative decision was made in June 2004 during the African Ministerial Conference on the Environment in Site, Libya.<sup>18</sup>

Countries with independent refinery facilities like Kenya, were encouraged to accelerate their respective lead phase out programs. The countries were then required to harmonise the gasoline standards in sub-regional markets to enforce the standards.<sup>19</sup>

The sub-regional action plans were expected to be complete within a year of upon which respective Governments were to formulate national clean air programs.

The programs would entail improvement of oil supply chain operators, and upgrading of storage and distribution facilities in accordance with the target lead phase out timetable.

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<sup>18</sup> [www.unep.org/pcfv/RegAct/Africa/Africa.htm](http://www.unep.org/pcfv/RegAct/Africa/Africa.htm)

<sup>19</sup> Daily Nation Newspaper, (10 February 2005) Extract From Horizon: Science Technology And World Ideas

To cover all facets of the industry, the Dakar resolution mandated other stakeholders such as the World Health Organisation, United Nations Environmental Program and bilateral environmental groups in developing capacity to help governments implement the lead phase out programs within the set air quality management limits.<sup>20</sup>

To ensure the entire populations in signatory countries become familiar with the hazards of leaded fuel and what their Governments required of them, an appropriate public information campaign was to be developed with the help of NGOs and community groups.

To enforce the deadline, the summit requested the WB and other international donor agencies to give priority to lead phase out in economic policy dialogues with African governments and to continue supporting required technical assistance programs and assist in the financing of viable investments.

The African Union and other regional organisations like the ECOWAS, WAEMU, SADCC, CAEMU also endorsed the phase out programs and to contribute to the harmonisation of standards and technical specifications.

Of the signatories, Egypt was the first to phase out leaded gasoline from its market in 2003. Ghana and Mauritania followed in 2004.<sup>21</sup>

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<sup>20</sup> World Health Organization (WHO) A World Health Organization Report , 2000

<sup>21</sup> WMO, (2004) WMO Statement On The Status Of The Global Climate In 2004. Press Release No 718 (15 December 2004)

## 2.2 The Phase Out – East Africa

A follow-up workshop was held at UNEP head quarters from 5-7 June 2002 phase out of lead gasoline in east Africa.<sup>22</sup>

Shell introduced unleaded premium into the Kenyan Market in a campaign called 'lets make a clean start' in November 2001. The images in the press advert showed a nozzle fuelling into a mass of water. It contained information that Shell had introduced the product because it causes less pollution and is better for the engine. It did not elaborate on how.

The introduction of this product led to a lot of controversy from motorist who did not understand the significance of the product to their vehicles, what vehicle models could use the new product and how the switch would affect their vehicles. Some analysts felt it was not the right time to introduce the product to the Kenyan market, especially due to large number of old vehicles on our roads. The uproar showed there was interest in the product but lack of sufficient information by Shell/BP. Shell/BP responded by informing motorist that they would get more information once they drove into a Shell or BP service station thus failing to provide adequate information to the general public and limiting it to its customers.

Shell/BP failed to adequately pass the information to the general public and limited it to its customers at selected stations. Competitors in the fuel industry and the government officials also hit at BP accusing them of introducing a product that would kill KPRL. This brought in further confusion in the motoring public.

Caltex introduced the unleaded fuel in May 2002 in a campaign called 'quality of Life'. The advert was shallow; it showed an image of a drop of oil. The information simply

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<sup>22</sup> (2000-2004) : Report Of The Greater Horn Of Africa Climate Outlook Forum No 9-14

indicated that the company had introduced unleaded premium in line with its health environmental and safety policy.

Mobil introduced the unleaded fuel in March 2002 in a campaign called 'lets drive for a cleaner environment'. The images on the advert were graphics of a clean and green environment. However, an actual picture of a green environment would have had more impact. No information was put on the advert apart from where the fuel was available.

Kenol/Kobil introduced the product later in August 2002 in a campaign called 'give life to your surroundings'. The image was a picture of a car driving into an environment. This advert offered more information on the product, but it was not enough.

The consequent launch of unleaded premium by the main fuel marketers also provided minimal information and failed to educate their customers on the significance of the product to Kenyans.

The Petroleum Institute of East Africa on realizing the lack of information in the market launched an eight weeks television campaign that was poorly done resulting into an ineffective impact creation campaign.

The institute did not give up and embarked on offering a comprehensive health and safety petroleum course as a guide to the industry on products, health and the environment. Among its many training courses PIEA offers training on principles of Environmental Health safety and practical applications of environmental impact assessment and environmental audits

In developed countries, public concern over the effect of lead and on people and the environment has led to many countries adopting legislation restricting or banning their use. However, there is a little concern to the developing countries due to more urgent

needs to solve more immediate problems such health risks and poverty.<sup>23</sup> Kenya as most developing countries is not at the forefront of controlling the release of lead.

Notably all African governments, Kenya included have signed and ratified the United Nations convention on climate change with more than half having ratified the Kyoto protocol in 1997<sup>24</sup>. Kyoto protocol efforts and projects should not be confused with the ongoing campaigns for cleaner fuels. While the Kyoto protocol focuses on global warming, a move to cleaner fuels is aimed at reduction and elimination of health and environmental pollutants such as lead and sulphur, which have an immediate and direct impact on human health and the environment.

During negotiation on the Kyoto protocol in Japan in 1997, African stated that a more equitable approach to combating climate change be based on the principle of equating as per capita emissions allocations.

Africa, the poorest continent stands to suffer the most from the devastating impact of the climate change. Africa cannot afford to keep silent and hope the negotiations will favour her. She has to be proactive and urgently so as her very survival is threatened.

Climatic change is already happening and many African countries are now frequently experiencing negative impact on climate changes. If Africa waits in the sidelines then the realistic and practical approach she has previously proposed will be brushed aside (Grace Akun: impact newsletter on climate network Africa, Feb 2005 page 3) Kenya is a country rich in biodiversity, natural resources, wildlife, fisheries and water it is therefore of great

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<sup>23</sup> IPCC, (2001) Climatic Change, The Third Assessment Report, Stephan Schmidhering, Changing Course: A Global Business Perspective On Development And The Environment

<sup>24</sup> Action Taken After: Report By Marigi S. (2001) A Brief Of The Third Assessment Report (TAR) 28-29 May 2001 Kilifi Kenya

benefit to Kenya to take control of the long term health and environment risks involved in the deposition of lead into the environment.

The country has already witnessed the disastrous effects of lead and other pollutants when over 6,000 flamingos in lake Nakuru died due to mass exposure to among other things lead and cadmium. Two years ago a study done by a local university in collaboration with UNEP discovered that Nairobi residents consume 14 times more lead in kale better known in Kiswahili as *sukuma wiki* than the global average. No study has been done on the pollution of air and water in Kenya. However you can bet the amount of lead is higher than normal.

In Egypt, for example, it is estimated that lead is responsible for 11,600 heart attacks and 1,400 strokes every year.

In conference held in Nairobi in then June 2002 the then Kenyan Minister of Energy Hon Achilo Ayako, promised Kenya will help put Africa on track for a continent wide switch to lead free petrol by the end of 2005. Providing adequate information to motorists and ensuring they understand the importance of eliminating lead pollution.<sup>25</sup>

### **2.3 Climatic Changes And Technology Transfer In Africa**

Significant technical progress relevant to the reduction of green house gas emission has been made since 1995. Advances are taking place in a wide range of technologies at different stages of development such as market introduction of wind turbines the rapid elimination of industrial by product gases such as nitrous acids (N<sub>2</sub>O) from acid production and perfluorocarbons (PFC) from aluminum production, efficient hybrid engine car, the advancement of fuel cell technology and demonstration of underground carbon dioxide storage.

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<sup>25</sup> Technological Need Assessment For Climatic Change In Kenya Forum Paper Presented By Peter Oraro, Energy Consultant, Climate Network Africa.



Article 4.5 of The United Nations Framework Convention on Climate Change states that the developing countries parties and other parties included in Annex II 'shall take all practical steps to promote, facilitate and finance appropriate transfer of, or access to environmentally sound technologies and know-how to other parties, particularly developing country parties to enable them implement the provisions of the convention.'<sup>26</sup>

In view of the fact that these technological options for the emission reduction do exist and that Kenya is a signatory to Agenda 21 convention or Rio Declaration; the government of Kenya which partially owns the Kenya Petroleum Refinery Limited (KPRL) has come up with the refinery rationalization decision. The government has to consider societal cost in addition to environmental and economic cost when making decisions on refinery upgrade investment difference. Policy and investment decisions by government can no longer be delayed as the international movements towards cleaner fuels and vehicle is fast accelerating.

In June 2003, Kenya gazetted the Environmental Impact Assessment and Audit Regulations requiring all existing facilities and listed in the second schedule of Environmental management and coordination Act, 1999 to undertake an environmental audit pursuant of section 68 of the Act. This is necessary to satisfy the statutory requirements of the Act, specifically section 68 & 69. The environmental audit should take into consideration the regulations and applicable local and international standards and best practices. To fulfill the legal requirements, the environment audit report should collate data relating to environmental health safety concern of the facility.<sup>27</sup>

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<sup>26</sup> [unfccc.int/resource/docs/convkp/kpeng.pdf](http://unfccc.int/resource/docs/convkp/kpeng.pdf) Kyoto Protocol To The United Nations Framework Convention

<sup>27</sup> Extract from Kenya Gazette, June 2003: Environment Management and Coordination Act 19, Section 68 & 69

For Kenya to achieve technology transfer to mitigate climate changes, as provided for in agenda 2, reforms in Energy Pricing Policies must reflect the full environmental cost of energy. This can be done by removing any subsidies on the use of energy through tax deductions for committing and putting a value added tax on energy.

Kenya should development setting of standards for energy efficiency and energy labeling.

Shift policy should mix towards more economic instruments by adopting incentives / dis-incentives to correct market signals towards cleaner technologies. There should be improvement in energy efficiency i.e. demand side energy management and investments in energy efficient technologies should be more attractive.

Kenya should also improve its access to latest energy technologies and energy management system. IPCC, (2001) Climate Change Mitigation.

When discussing technology transfers, it is important to bring the private sector on board. A few participants in the clean fuel technology concessional basis. Business enterprises exist to generate wealth by adding value. Their level of return on investment is a measure of efficiency. Technology acquisition is an investment, which needs to produce returns from a business point of view.

It appears that there are suitable financial mechanisms for Africa to acquire the environmentally friendly technologies. What seems to be lacking is the software.

The current environmental management system in Africa has apparent weakness. These include lack of elaborate policy, objectives and targets institutional framework, plans,

procedures and practices in environmental management on impacts of emission and waste generated particularly from the industrial sector.<sup>28</sup>

## 2.4 Towards Cleaner Fuels

The Oil and Gas Africa 2005 conference was held in Johannesburg, South Africa from February 22-24. A paper was presented on the petroleum downstream regulatory framework in the East Africa region. The theme of the presentation was how the Government should prepare regulatory groundwork before affecting petroleum downstream market liberalization. A number of countries in Africa, Kenya included, still have control on petroleum prices and markets and are in the process of liberalization.<sup>29</sup>

The South Africa has in the legislative process a National Energy Regulatory Bill, which create a single energy regulator called the National Energy Regulatory of South Africa (NESA) for all forms of energy.

In Kenya, the Energy Bill 2004 plan to establish Energy Regulatory Commission (ERC) is yet to be established. The promptness and flexibility of South Africa Government is strikingly interesting, while it's Kenya and its counterparts drag in creating legislation and regulation to keep in pace with evolving new energy infrastructure investments.

New Partnership for Africa's Development (NEPAD), in its way forward has an energy infrastructure agenda for its continent, which includes formation of the African Energy Commission. The move towards cleaner fuels by January 2006 is receiving a lot of Government and stakeholders' attention. The plan by most of the Dakar Declaration deadline of late 2005 for unleaded gasoline. This option does not involve plant modification, as it is only gasoline blending process and option.

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<sup>28</sup> Stephan Schid, changing course: a global business perspective on development and environment

<sup>29</sup> Speech at the Grand Regency, PIEA quarterly luncheon George Wachira General Manager PIEA.

The more complex programme of diesel sulfur reduction from 3000ppm to the European Union levels of 50ppm will be addressed by refinery up grades would simultaneous address elimination of any need for octane booster in gasoline.<sup>30</sup> Review of the Energy Bill 2005 seems to have stowed down with draft from the Attorney general's chambers now receiving the final touch ups. The enactment of the Bill is a condition for release of the energy sector donor finding.

A workshop for African journalists on the implementation of Millennium Development goals was held alongside the 23<sup>rd</sup> session of the UNEP governing council/Global Ministerial Environment Forum, from 21-25 February 2005, at the United Nations offices, Gigiri, Nairobi.

A field trip for the journalists formed part of the training, with a visit to the state-of-the-art facilities at Nation Media Group, Nairobi Offices the water hyacinth-infested Nairobi Dam, appalling sanitation in parts of Kibera Slums and Rukenya in Athi River. A day later, each journalist had: a nail-biting story about the field trip, especially life in Kibera Slums. Such insinuations should often recur with the relevant information on nature and impact of pollutants and their negative effect on the environment; in our Daily Newspapers or General Print Press.

After a weeklong workshop, which attracted participants from over 20 countries in Africa, the members of the Fourth estate formed their own association, the African Network of Environmental Journalists (ANEJ), with Kenya hosting the Secretariat.

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<sup>30</sup> Extract from the commitments by Governments And Intergovernmental Organizations And Entitie And Major Groups Of Civil Society For The World Summit Of Sustainable Development in Johannesburg South Africa 26 August – 4 September 2002. A NEPAD Initiative

The establishment of the proposed Safe Waste Oil Disposal (SWOD) Foundation that is expected to foresee the collection and disposal of waste oils in Kenya. The foundation will be structured along the lines of ROSE Foundation of South Africa. The energy bill 2004, is intended to bring together all regulatory instruments in all areas of the Energy sector i.e. electricity, Petroleum and alternative energies.

The new energy act will replace The Electricity Power Act 1997 and the Petroleum Act 1972. The main feature of the Bill is the proposed Energy Regulatory Commission (ERC), which will restructure the existing Electricity regulatory Board (ERB) to incorporate petroleum regulation.<sup>31</sup>

The ERC should essentially remove from the Ministry of Energy all regulatory aspect of energy including petroleum with the Ministry being responsible primarily for policy issue. The ERC Chief executive officer would be the Director General appointed by the Minister and having at least 15 years experience in areas related to engineering law, finance, economics or energy. Under him would be the Director of petroleum and Director of Electricity.

An independent Energy tribunal appointed by the minister would handle all complains pertaining to licensing and other issues.

The following are pertinent features of the Bill focusing ion the petroleum Sub-sector.

Regulation for petroleum. The ERC will make regulations as necessary in areas of petroleum licensing, standards, design and construct ion quality monitoring, environment health safety, supply and strategic stock.

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<sup>31</sup> Extract From The Proceeding Of The Working Group On The 23<sup>rd</sup> Session If UNEP Governing Global Ministerial Environmental Forum (2005) Nairobi February 21-25

Operating licenses will be required for the following petroleum businesses: importation, refining, exportation, wholesale, retail, storage, parking and transportation.

Construction permits will be required for the following: pipeline refinery, bulk storage facility, bulk LPG facilities and retail dispensing sites.

The Kenya Bureau of Standards is recognized as the agency for producing standards for petroleum products, equipment, facilities and installations.

Petroleum importers shall maintain stocks amounts as prescribed by ERC in conjunction with the minister.

The minister may with the consent of the National Assembly undertake the provision of whole or part of financing, procurement maintenance and management of strategic stocks.

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The provisions of the environment management and Coordination Act are fully provided for.

Specifically for petroleum transportation: A petroleum transporter shall require a petroleum business; a petroleum driver shall require a petroleum certification and every local authority shall design places for the parking of petroleum tanker.

The purpose of the Clean development mechanism (CDM) is defined in Article 12 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change. The CDM has a two-fold purpose:-<sup>32</sup>

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<sup>32</sup> Daniel Bodansky And Sophie Chon: International Climate Efforts Beyond 2012: A Survey Approaches, 2004

- (1) To assist developing country parties to the Kyoto protocol (non-Annex 1 parties) in achieving sustainable development, thereby contributing to the ultimate objective of the Convention;
- (2) and to assist developed country Parties to the Kyoto Protocol (Annex 1 Parties) in achieving compliance with part of their quantified emission limitation and reduction commitments under Article 3.

CDM projects that reduce emissions of greenhouse gases will create Certified Emissions Reductions (CER), which can then be used by Annex 1 Parties to achieve compliance with their quantified emission limitation and reduction commitments under the Kyoto Protocol. The CDM mechanism therefore works to directly facilitate investment by Annex 1 parties (and their private entities) in greenhouse gas reduction projects as well as to facilitate the transfer of new technologies that reduce greenhouse gas (GHG) emissions in non-Annex 1 countries.

In order to ensure that CDM projects fulfill the two objectives mentioned above, the international legal rules on the CDM require Parties participating in the CDM to establish national authorities with expertise and mandate to approve proposed greenhouse gas emission reduction projects. Any new project, supported by CDM must obtain all necessary approvals required of project investors and developers under national laws.

Such approval could include development and planning consents, environment impact assessments, foreign investment approval and general compliance with other investment laws; hence information dissemination.

However, where a project is to be developed as a CDM project, It would also be necessary that it obtains the approval of the non-Annex 1 country hosting the project (the Host Country) to pursue the project as a CDM project in accordance with any sustainable development policy requirements and any other legal requirements set out by the Host Country.

If this approval is obtained, CDM project participants would also need them to ensure that the project is subsequently approved and registered as a CDM project by the Governing body of the CDM, the CDM Executive Board.

If the CDM is to achieve its dual objectives, the sustainable development attributes of projects would need to be examined. To do this, some basic background information on sustainability is needed for use in monitoring and measuring the state of both the environment and the society and their interactions with economic development as required by the twofold objective of the CDM.

## **2.5 Oil Firms And Safe Product Transportation**

Approximately 75 percent of the energy needed for Kenya's economic growth and development is from petroleum products. Transporting this product, particularly by road, is a high risk business. Environment pollution from oil leakages, accidents that lead to spillages must be carefully controlled because they may contaminate water resources and other natural resources. The development of supportive infrastructure such as road, transport facilities are very important. (Caroline Kimutai: Petroleum Insight magazine, 2<sup>nd</sup> quarter 2005).

Accidents have led to fatalities, loss of product, the destruction of property and environmental degradation. A road transportation Safety Committee that brings together all oil companies has also been formed to effectively tackle safety issues that affect them<sup>33</sup>.

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<sup>33</sup> George O.K'Okoth, secretary of the Road Transportation Safety Committee Daily Nation



## 2.6 Safety And Health Committee Rules For Petroleum Sub-Sector

On April 28<sup>th</sup> the Minister of Labour promulgated the Factories and Other Place of Work (safety and Health committee) Rules 2004, to regulate safety and health issues in factories and other placers of work. The rules were enacted to further operationalize the factories and other places of work Act 1990. In April 2005, the Minister of labour promulgated the medical rules for monitoring noise levels respectively. The lead agency that administers the Act is known as the directorate of Occupational health and safety services DOHSS0. (Sanjay Gandhi, DOHSS registered safety and health Advisers) in the petroleum sub sector, facilities such as refineries, terminals, depots, services and stations and other similar installations that employ a minimum of twenty persons are referred to as “other places of work” under the Act<sup>34</sup>.

According to the safety and Health committee Rules 2004, it is mandatory for organizations that have a minimum of twenty persons to constitute safety and health committee rules define a “worker” to collectively include permanent contract and casual employees working for an organization whilst the owner is referred to as the ‘occupiers’. The composition of the committees shall be made up of an equal number of persons from management and workers. The management is to provide a chairman, a secretary and a safety and health representative for the company.

Subsequently for occupiers that have 20 -100 employees, there shall be a committee comprising five persons from management and three persons elected by the workers. For occupiers that have more than one thousand employees, there shall be a committee comprising seven persons elected by the workers.

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<sup>34</sup> Extract from a feature story in PIEA report, Petroleum Insight, 3<sup>rd</sup> Quarter 2005

The safety and Health(S&H) committee is mandated to carry out the following functions and duties:

Establish annual work place S & H inspection schedules.

Conduct quarterly workplace S &H inspection

Carry out Accident investigations and reporting to the DOHSS Director

Identify and report on occupational hazards and ill health to the occupier

Compile workplace statistics on accidents, dangerous occurrences, ill-health

Investigate worker complaints on health, safety welfare including recommendations to occupier.

Assess the adequacy of safety and health measures for hazardous work

Establish communication methods between workers and management.

Organize safety and health competitions

Transfer safety and health knowledge to workers (training, e.t.c)

The safety and health committee is required to undertake a minimum of four formal safety and health meetings in a calendar year with written minutes being taken. The specific roles and responsibilities of the chairman, secretary and members of the committee are clearly spelt out in safety and health committee rules 2004. these rules further describes the duties of the occupier with respect to safety and health management which included undertaking risk assessments, developing a formal safety and health policy, workers health exposure monitoring e.t.c.

The safety and health committee Rules 2004 requires the occupier to cause a safety and health Audit once in a period of twelve months using a registered safety and health

Adviser .the audit is required to be undertaken in accordance with DOHSS's approved criteria which can be procured for Kshs 200 at their offices on commercial Street Nairobi.

The least of safety and Health advisers was recently gazetted by the Acting Director of the DOHSS and is available to occupiers from the Director office. Another important aspect of the safety and Health committee Rules 2004 is that all member s of the occupier's safety and Health committee are required to undertake a thirty hours Safety and Health induction Course provided by an approved DOHSS training institution. The approved training institutions were also recently gazetted by the Acting Director of the DOHSS and are required to provide safety and Health training in accordance with the DOHSS's approved curriculum.

As stated at the beginning of the discussion, the petroleum sub-sector like all other sectors is required to be in compliance with Kenya laws and regulations and carries a maximum of fine of Kshs. 50,000. Safety and Health management in the petroleum sub-sector is not anew phenomenon. In fact most established oil companies, new entrants and some independent in Kenya subscribe to high standards of health, safety and Environment (HSE) as dictated by the standard of business conduct. It is anticipated that the compliance with the safety and health committee Rule 2004 by occupying will contribute towards raising safety and health awareness level amongst employees, lowering accident frequency rates, increasing employee moral and ultimately improving business performance.

## **2.7 Oil Demand And Energy Consumption**

In September 2000, World leaders from 189 member states of the Unite Nations adopted a declaration that addressed global challenges related to education, health, gender and poverty. The "Millennium Declaration" came as a result of advocacy work calling on the international community to meet the challenges facing our world.

The centrality of the Declaration to the work of United Nation System lent further weight to the need to encourage a favorable environment within which citizens could play their role in contributing to the various goals set out in the Declaration. Regrettably; energy services were not given prominence in the discussion.<sup>35</sup>

The relationship between development, energy and the environment is complex and is often not given the attention it deserves. It is widely recognized that the availability of modern, reliable and efficient energy services is an important, and indeed essential, drive for economic development. The 2002 World summit on sustainable Development (WSSD) stressed that the need to improve access to economically viable, socially acceptable and environmentally sound energy services is vital if poverty is to be tackled effectively. In spite of this, most countries in Africa, Kenya included are still meeting a large proportion of their national energy demands from traditional Biomass, which is often obtained and used in an environmentally unfriendly way.

Globally, energy consumption grew by 60% between 1972 and 1999 (UNEP 2002). This is equivalent to a sustained annual growth rate of 1.74% per annum. Furthermore, the current realities clearly indicate the need to urgently and consistently make responsible decisions. It would be utterly imprudent for the world community to sit back and ignore the signs of time.

Available statistics from the international Energy Agency.(Key World Energy Statistics from IEA 2002 Edition), shows that Africa contributes little to the world energy supply. Africa contribution to the world energy supply increased from 3.6% in 1973 to 5% in 1999. The total world energy supply increased from 6, 036 Million tones of oil equivalent to 9,702 Million tones overt the same period.

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<sup>35</sup> Peter Orawo: Impact, Newsletter of climatic network Africa; February, 2005 Page24

Africa's share of crude oil supply increased from 0.8% to 5.2% and hard coal by 6.3% from 1973 to 2000. In the year 2000, the world supply was 3,555 Million tons (mt) of crude oil, 2536 mt of natural gas and 3,637 mt of hard coal. The International Energy Agency (IEA) has forecast oil demand will rise by 2.2 percent next year, slowing from 2004's record growth as higher interest rates restrain US and European economics.

IEA said in its first estimate for next year the global oil consumption will rise by 1.82 million barrels to 83.2 million a day. The Paris -based adviser to 26 industrialized countries also raised the forecast for growth this year by 180,000 barrels to 2.4 Million barrels per day (bpd), more than double on October Projection.

Oil demand has surged this year, sending US crude price above \$42 a barrel and gasoline pump prices to record high. The projection for 2005 show organization of petroleum exporting Countries (OPEC) will strengthen its grip on world markets, as growth in supplies from non-member countries from Angola to Russia fail to keep pace with demand. The outlooks suggest continuing upward pressure on prices. PIEA's forecast for next year assumes the world economy will expand at about 4 percent less than the 5 per cent expected this year.

Annual expenditure on petroleum fuel runs in hundreds of millions of dollars for Kenya and the rest of East Africa. In 1998 and 1999, the annual consumable of refined petroleum products in Uganda was 538 million litres of which 1655,000 (or 30%) was diesel. In the same period, oil consumption in Kenya has been estimated to be 3,000 million litres per year, with refined products being exported to neighboring countries. Kenya spend over 40 % of its profits foreign exchange earnings on imported crude oil and other petroleum products.

The oil industry has a large influence on prices of other commodities in the market. Commodity price rise since 2000 is mainly attributed to increase in crude oil prices. High prices of petroleum threatens economic stability of many countries, Kenya included. IEA said stock in the 30 nations belonging to the Organization for Economic Cooperation and Development in May rose by 33 Million barrels to 2.5 billion, 12 million barrels more than a year ago. ([www.mbendi.co.za/industry/oilg/af/kep005htm](http://www.mbendi.co.za/industry/oilg/af/kep005htm)) because of the rising demand, the IEA increased this years estimate of the need for oil from OPEC, also known as the call on OPEC, by 300,000 bpd to 27.2 million bpd. The call next year rises by a further 200,000 bpd i.e. average 27.4 million bpd.

For the resource companies, if these are not the best of times then they must be pretty close. But there are several dark clouds hovering. First, despite surging demand, the real price of many commodities has fallen dramatically and remain extremely low by historical standards. The copper price, for example, is a fifth of what it was in 1850 in real terms, Lennon records in the Anglo American Journal Optima.<sup>36</sup>

Secondly, there is the issue of global warming over the past century, atmospheric concentration of carbon dioxide have risen from 280 parts per million by volume to 370 parts. Global temperature have risen 1°C over the same period.

According to Roger Wicks, head of energy at Anglo American and chairman of the World Coal Institute Scientific Consensus is that climate stabilization requires total of CO<sub>2</sub> emission to be limited to the range of 450-550 parts million. "Even applying the best technology available in the year 2000, research has shown that by 2090, the world will have emitted 480 gigatons of carbon more than is consistent with the stabilized 1990 level of CO<sub>2</sub> concentration in the atmosphere"<sup>37</sup> he writes, again in Optima.

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<sup>36</sup> Anglo American Journal Roger Wicks, chairman, World Coal Institute Scientific Consensus

<sup>37</sup> Anglo American Journal Roger Wicks, chairman, World Coal Institute Scientific Consensus

The scale of the CO<sub>2</sub> issues is only now beginning to be understood. To secure a reduction of one gigaton of carbon emission would for example, require power stations generating twice the total current generating capacity of China (with its billion plus population and high rate of economic growth to have all their CO<sub>2</sub> emissions captured and stored).

The alternative and perhaps most effective solution is simply to “sequester” CO<sub>2</sub> by for example burying it. This is not as weird or impossible as it seems. The recent carbon sequestration leadership forum, a 17-nation coalition dedicated to the development and deployment of carbon-sequestration technologies, found oil fields had a total capacity of about 126 gigatons. (© 2005 Business Day) IPCC, (2001); climate change mitigation. The third assessment Report.

## 2.7 Kenya's Petrol Consumption 2004

Consolidated Oil Industry Sales Volumes ('000 liters)

Product	Year 2003				Jan - Nov 2004			
	Inland Sales	Exports	Bunkers	Total	Inland Sales	Exports	Bunkers	Total
Avgas	2,133	422		2,555	2,462	463		2,925
JetA-1	619,359	39,277		658,636	675,930	38,640		714,570
<b>Premium</b>								
Gasoline	353,342	57,193	805	411,340	376,034	92,817		468,851
Regular								
Gasoline	103,992	774		104,766	86,453			86,453
Kerosene	241,505	33,165	274	274,944	305,825	38,877		344,702
Gas Oil	768,517	114,106	1,984	884,607	948,066	124,953	18,473	1,091,49
<b>Industrial</b>								
Diesel	28,525	1,444		29,969	30,787	655		31442
Fuel Oils	436,982	122,645	11,110	570,737	472,107	220,712	22,498	715,317
LPG*	40,929	1,842		42,771	41,884	3,540		45,424
Bitumen **	4,958	8,319		13,277	8,262	15,665		23,927
Lubricants	32,728	11,198	378	44,304	36,508	11,145	440	48,093
Greases*	656	290		946	604	225	1	830
<b>TOTAL</b>	<b>2,633,626</b>	<b>390,675</b>	<b>14,551</b>	<b>3,038,85</b>	<b>2,984,922</b>	<b>547,692</b>	<b>41,412</b>	<b>3,574,02</b>

Kenya consumed more petroleum products last year than in 2003 despite higher prices. Energy consumption, especially diesel and lubricants, is a very good indicator of moving economy. However, there is need to exercise caution on the 2003 sales as this is the year when substantial unregistered "black market" sales played havoc on the local market.



There were especially from illegal, undeclared imports that flooded the Kenya market in 2003. That year, diversion of duty-free exports into the local market was also quite rampant.

These malpractices had the effect of lowering official sales in 2003, while at the same time reducing Kenya Revenue Authority's revenue. The worst fact is that possibly led products gain illegal entry into the Kenyan Markets, which when used is dangerous.

However going purely the comparison of the submitted 2004 vs 2003 sales figures a number of conclusions are drawn”

Increased consumption of gas oil is a good indicator of increased economic activity especially in general haulage business and hence emissions

Increased consumption of Jet A-1 and Avgas points to arise in tourism and international travel activities, and hence emissions into the atmosphere.

Increased consumption of fuel oil is assign of heavy industries increased activities (sugar, tea, cement, power generation e.t.c) increase in LPG consumption is an indicator of increased consumption by hotels the tourist circuits, and hence waste emissions

Petrol consumption increased only marginally it is possible that there were newly guzzling vehicles, resulting in heavy emissions

Kerosene is still very widely used especially in the slums and rural areas even when the prices were much higher.

All the above facts are indicators of increase petroleum consumption hence increase in the emissions. This is much ore dangerous if the fuel is not clean or leaded.

## **CHAPTER THREE: METHODOLOGY**

### **3.1 Site Selection and Description**

The site is Nairobi, in the central business district and its outskirts. Nairobi has the highest number of fuel retailing stations, the mainstream and independents, compared to all other towns in Kenya. This is mainly due to the fact that it is the capital city of Kenya and a major business center with many companies setting up in the town. This site has different motorist who drive a wide range of vehicles with unique specifications. The study however focuses on private motorists.

### **3.2 Design And Sampling Procedure**

Purposive sampling was used in this study. All private motorists in Nairobi were included in this study. A total of 100 motorists were included in this study.

### **3.3 Source Of Data**

The study targets the motorist in Nairobi who frequent fuel stations and who could be reached on the same sites. The target is a private motorist who owns his/her car.

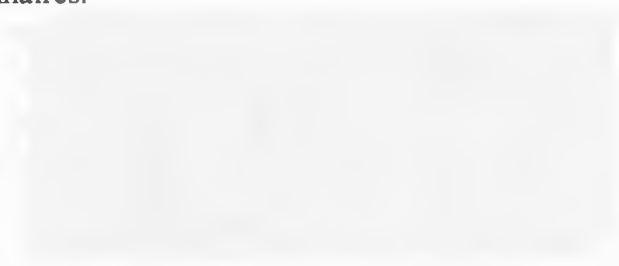
### **3.4 Data Collection Method**

The motorist were reached at service stations, as they are fuelling, as they had ample time to be explained on the survey. It is also the same point where the questionnaire was dropped and collected.

Four enumerators were recruited and trained. They were trained on unleaded fuel and the objectives of the survey. Pre-testing was done in two stations and data generated was analyzed. Minor changes on structure were where necessary.

### 3.5 Data Analysis And Processing

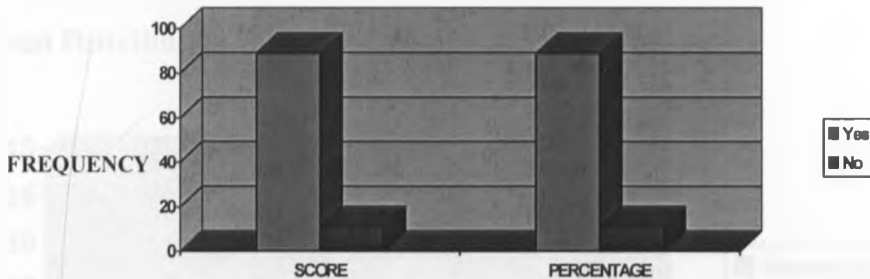
Data was analyzed quantitatively using bar graphs. Data quality control was ensured by close supervision of enumerators on consistency completeness and clarity of completed questionnaires.



## CHAPTER 4 : FINDINGS

### 4.1 Data Interpretation

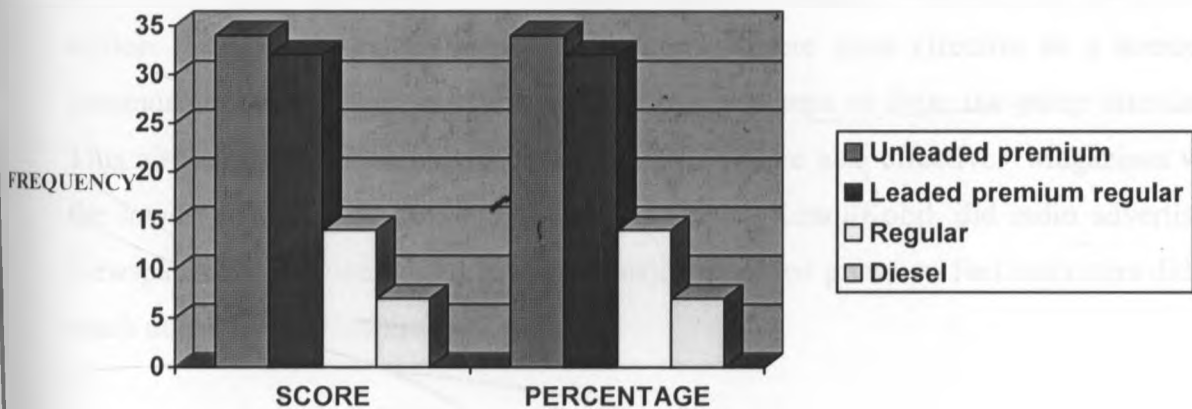
Figure 1. Total Awareness Rate by The Fuel Retailed in Kenya



#### Observation:

Majority of the motorist, up to 89% are aware of retail or existence of leaded and unleaded fuel in Kenyan market. The disparity between the two groups (YES and NO) is huge an indication that a majority of them are exposed to information on unleaded premium. They could have access to the information of what kind of fuels are retailed locally. However 11% is an indication that there is a vacuum.

Figure 2. Total Distribution by Brand of Fuel Used

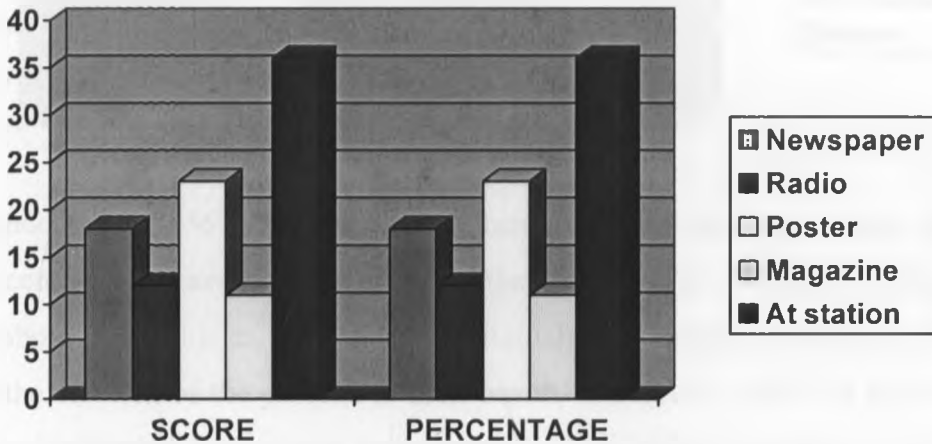


#### Observation:

Up to 32% of the surveyed sample spend their money for fuel on the unleaded premium. Meaning the campaigns have not been able to change the fueling habits of more than half

of the respondents. The majority use super or unleaded. Most service stations in Nairobi do not retail regular also showing that the motorist might not be aware of the fuel they take and assume it is the usual. Only 7% consume diesel.

**Figure 3. Total Distribution by Information Source /Media**

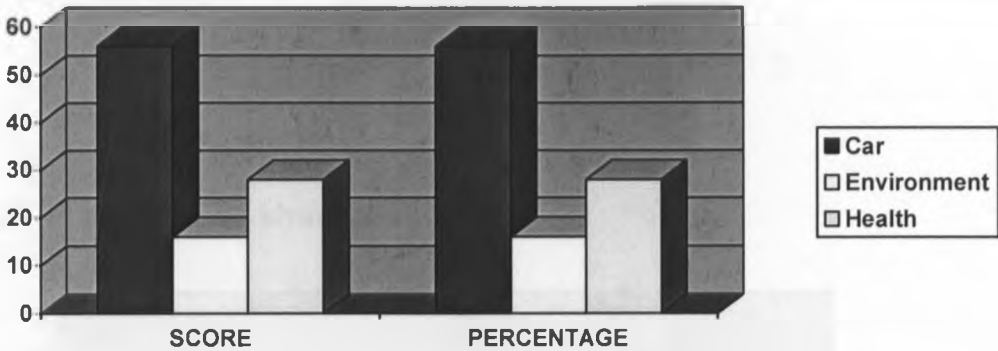


**Observation:**

36% of the interviewed motorists got the information about leaded and unleaded premium and its existence in the Kenyan market through a source at the fuel service station. This shows the point of sale centers were most effective as a source of communication probably from the labeling of the pumps or from the pump attendants. This also shows their training programs by PIEA were also effective. Magazines were the lowest followed by radio. Only one marketer, Kenol/Kobil, did radio advertising. Newspapers, which were used by all the major unleaded premium fuel marketers did not reach at least quarter of the respondents.

**Figure 4. Motorists Knowledge of the advantages of Unleaded fuel**

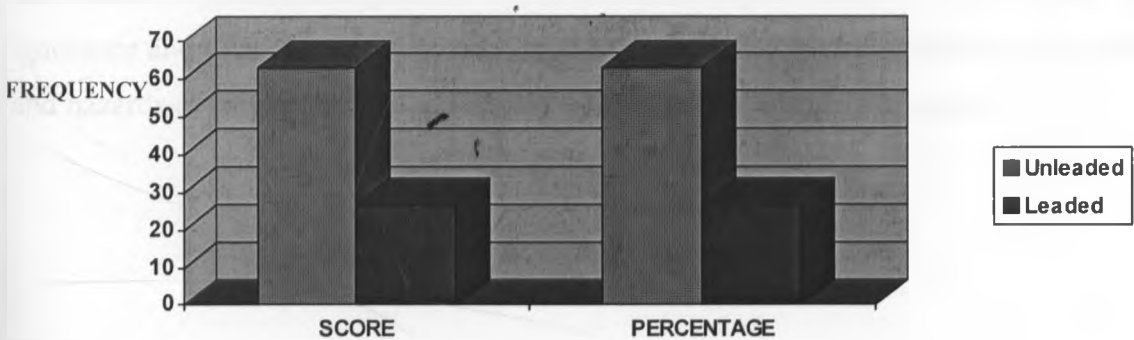
**Observation:**



Most respondents, up to 56%, are aware of the benefits of unleaded fuel to their vehicles. A large percent was also aware of the effects to their health. This means the motorists are concerned about their vehicles, and get information on their vehicles. A large percent has also noted the effected of the product to their health. However, only 16% are aware of the impact of unleaded fuel on the environment. This indicate motorist are still not cautious of their environment and the impact caused if polluted.

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**Figure 5. Choice and Preference Distribution of Fuel**

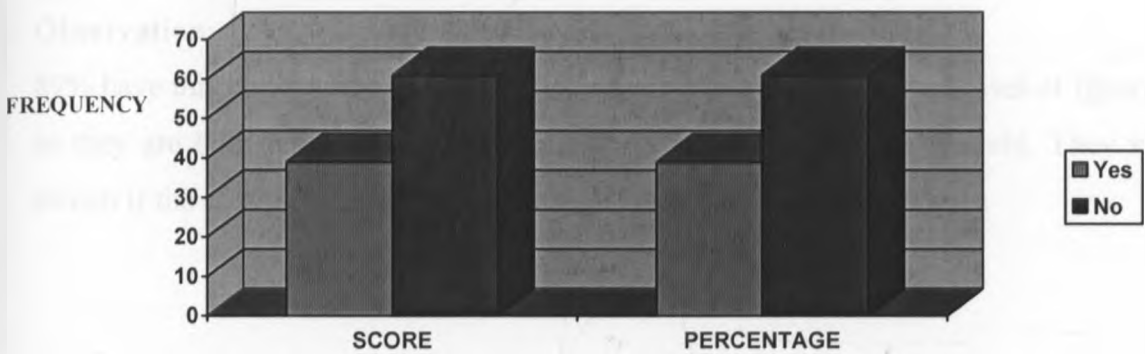


**Observation:**

Most motorist are aware that unleaded fuel is better than leaded fuel, however they still use unleaded, this contradicts their choices. This means they are aware of the pros and

cons but still prefer the later. It is hard to tell whether the product is accessible to most of them at their local fuel outlets. However they could also hesitate to use the product because they are not aware of the impact of the switch to their vehicles.

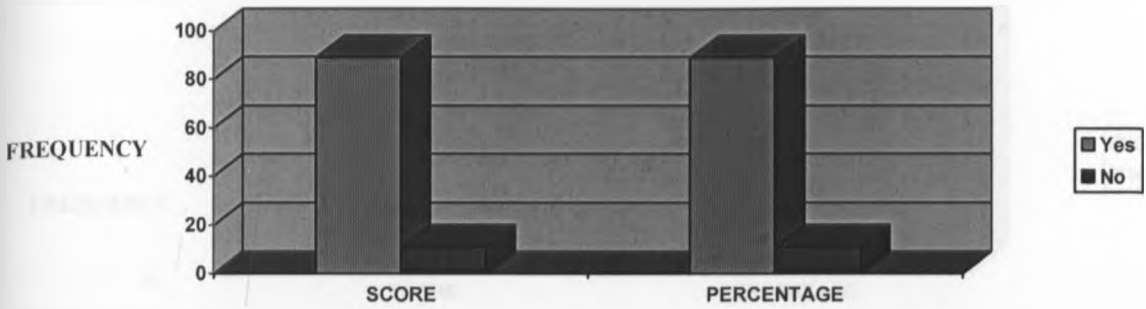
**Figure 6.GreenHouse Gas Awareness**



**Observation:**

Deduction may be drawn to the fact that most motorists, up to 39% are not well informed of the advantages that unleaded premium has for their environment well enough to know what green house gases are. Internationally there is an uproar on green house gases and their effect to the current generation and its future impact. However, the results show ignorance and lack of concern of the global environmental pollution issues and the effects and hazards of carbon dioxide to Kenyan who will also be hugely affected.

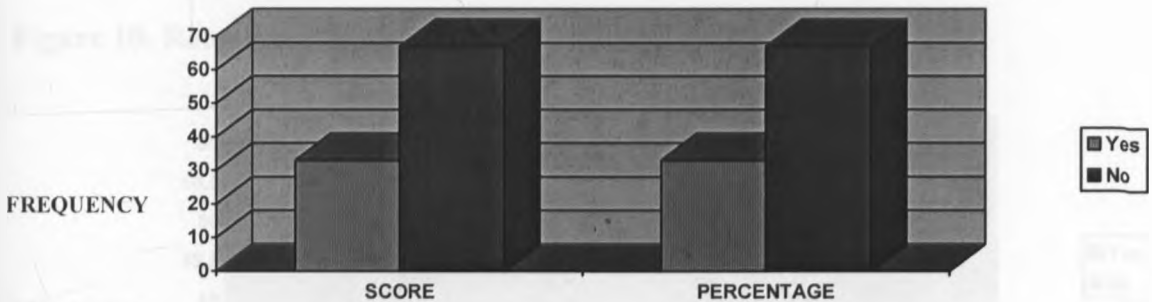
**Figure 7. Fuel Cost**



**Observation:**

89% have this believe that unleaded fuel is more costly. This shows a level of ignorance, as they are both retail at the same price at all service stations in Nairobi. They would switch if the cost were cheaper, this means they are very price conscious.

**Figure 8. Catalytic Converter**

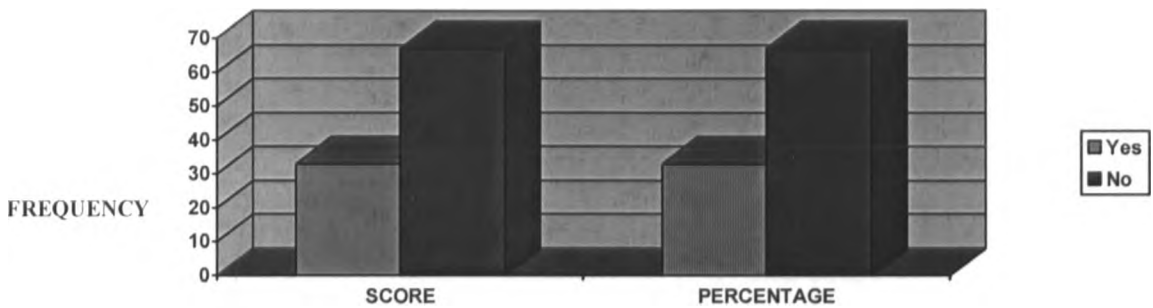


**Observation:**

When unleaded premium was introduced their was a huge concern whther most vehicles had a catalytic converter. In this survey most of the motorists were aware their cars have a catalytic converter, however a large percentage did not know, or thought it didn't.



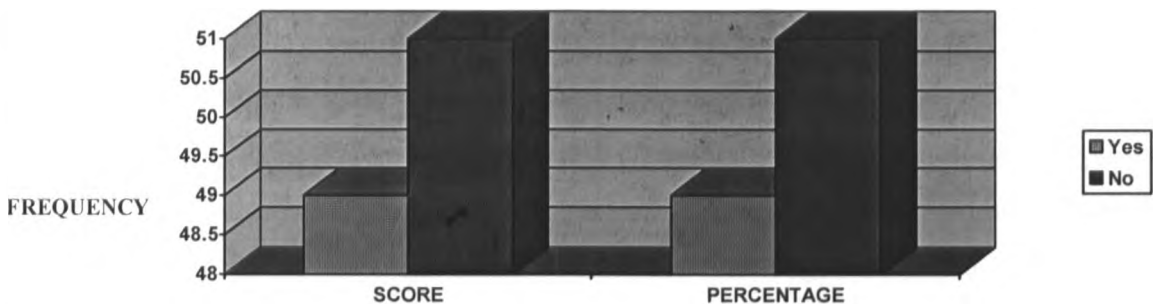
**Figure 9. Cost Effective**



**Observation:**

Where as its clear that in Kenya both leaded and unleaded premium costs the same, most motorists interviewed believed that unleaded fuel is cost effective, in spite of the fact that a bigger percentage could not give clear reasons, how and why.

**Figure 10. Remember Advert**

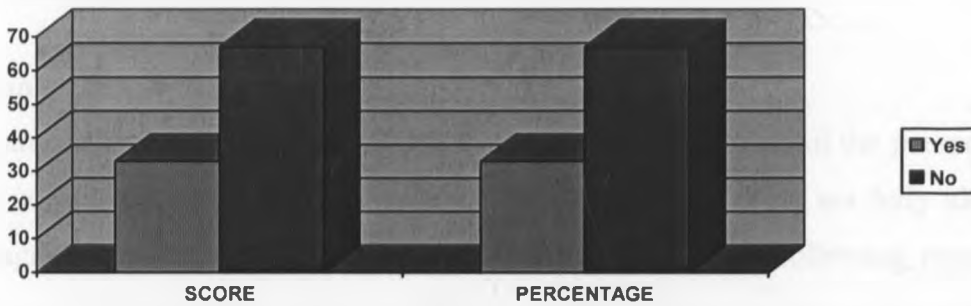


**Observation:**

49 % remember the advert, while 51 % do not remember adverts run by all the five oil companies meaning that the adverts were not targeted to the right market and the right audience thus the audience was not reached effectively. This is extremely disappointing considering the large sums of money spend to put the adverts in different mediums. It is

not clear whether it is the designs of the adverts that were not effective. The catchy slogans and images did not effectively enough to retain a mental picture in the mind of most respondents. The designs did not emotionally appeal to the audience.

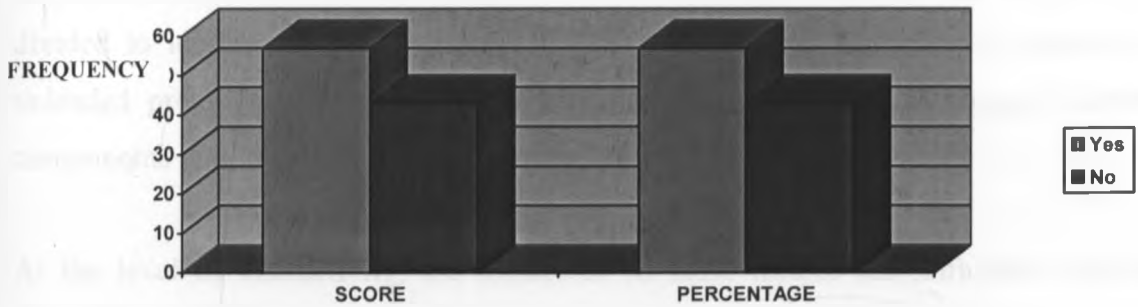
**Figure 11. Was the communication effective on pros and cons?**



**Observation:**

Most of the motorists are of the opinion that the communication in the campaigns was not effective in communicating the pros and cons of unleaded premium. There are many hazards of using leaded premium that should emotionally drive the motorists to get more information on the product and try and protect themselves, the environment and their vehicles. This means the oil retailers failed in introducing their product effectively to their consumers.

**Figure 12. Effective Communication**



**Observation**

Following an earlier observation that majority of motorists were aware of the presence of leaded and unleaded fuel in the Kenya market and that a majority could not fully identify the advantages of unleaded fuel, it can therefore be inferred. That following results in this figure, that Oil companies were not effective enough in disseminating information to the motorists.

## 4.2 DATA ANALYSIS

To access the nature and the impact of unleaded premium campaigns in Kenya, their increasing presence, awareness and use, close-ended questionnaire was structured and divided to identify awareness, sources of information and the general knowledge on unleaded premium. The three factors are interactive. The method proposes different components that together explain variance.

At the level of interactivity, the impact of its main factors that influence individual deposition are tabulated and included in the analysis it seems, that more attention should be devoted to the relation between the media and the audience. How does these novelties change and structure the dissemination of information by the media? It might be that there is a gap between the expectations that are inscribed in the meditated communication and the expectations that audiences have in relation to the media. It is possible to infer that information is indicative extensions of the media or unless they are forgetting an entirely different group of audience.

Audience fragmentation on the one hand and content homogenization on the other can together function in the same way: the audience can be discouraged or uninterested from active involvement if the interactive communication vanishes, which in consequence leads to abandonment of the specific potentials.

What can be said, according to these findings the level of awareness up to 89% of the population studied are aware of the existence of leaded and unleaded premium, where as only 11% of the population are not aware of this fact. Heeter (1989) identified six dimensions of interactivity: Complexity of choice available efforts users must exert, responsiveness to the user, monitoring information use, ease of adding information and facilitation of interpersonal communication (Kennedy et al 1999) adapted the structure to their study of different media. Complexity of choice was constructed as an index measure

of choice of e.g. Language, Message, and Framing etc. The most surprising and telling results are found in the fact that few motorists (16%) are aware or do have knowledge about the in parent of their fuel choice to the environment. According to these findings, it can be said that those media that so offer access of information more likely do not present a more comprehensive information background of the product: 59% of the population studied do not even remember any previous information or advert on these particular products: despite the fact that up to 89% of them are aware the two brands of fuel exist locally. Is it possible to say that some communication services excludes others? Is it possible that some cases certain communication forms are more connected that the others.

Majority of the respondents got there information from the fuel stations the concept of interactivity has been taken as an implied feature of mediated communication from the very beginning, however following the history of this fields research, it could be agreed that the point formed by Jensen, namely that the form refers to several district phenomena and should thus be studied in plural (Jensen, 2002:184) Interactivity as defining characteristic of media reflects itself at three different levels

- 1) Medium – user relation of communication
- 2) At a broader relation between media and the rest of the social structure, and finally
- 3) At the individual – society nexus.

In Dahlgren's opinion, where interactivity is understood in reference to new technical relation between production and reception of mediated contents, the interactivity potential is especially relevant in the context of its probable effects: the greater chance for interactivity offers the audience free choice in selecting the media content they want and thus limiting the productive power an its impact on selecting. On the other side, the notion of interactivity enables also new possibilities for a more direct connection between media producers or journalists and their publics.

In this case study, stakeholders in the petrol and industry are in a position to enhance interactivity during the campaign. Empirical study of the source of information indicate that most awareness was created from the fuel service stations although much more has to be done in terms of comprehensive information on the finding implies that though 89% are aware, having got the information from the fuel stations, 33% feel that there is need to hear more on the pros and cons of the said products 43% agree that the information got was not communicated effectively.

The question of nature and impact can be traced from the conditions that influence the differences in interactivity of the media and or audience. Kenny et al (1999) following a study by Mc Millian (1998), found in their opinion that interactivity hence impact increases.

- 1) When the goal of communication is more to exchange information than to persuade; Campaign for unleaded fuel is aimed at providing an insight as to why it should not be used.
- 2) When participants have greater control of the communication environment  
The motorists have control over their vehicles payment and location of choice for fuel.
- 3) When they take an active role to benefit fully from the communication; unleaded fuel has a lot of advantages over the leaded and has also benefits to the user car, health and environment.
- 4) When they act and react to messages via two-way communication; more than most often motorists must fuel so there's similar, more time for feedback.
- 5) When timing of communication is flexible and responsive to demands of participants by end of December 2005 the government will ban and stop any use of or importation of leaded fuel.
- 6) When the communication environment creates a sense of place (Kenney et al 1999:4)

In this case, the six conditions are observed and understood to stimulate impact. It is not just technical implementation of specific interactive mechanism, but implies important effects of more general communication aims and preference on the side of producer and also between their users. Given the nature and related impacts of media in dissemination of information in the study research, people are aware, though they don't comprehend the whole information, which is lacking in effective content.

Here, additional research is needed to explain more thoroughly the conditions and factors that delineate awareness level from lack of comprehensive information pertaining to unleaded and leaded premium the advantages of each, as compared to the other hence a rather lower percent of positive respondents more indicative, however, is a quite diversified set of communication media thus possibilities, offered save for the fuel station and outdoor media, the disparity between, the newspapers, magazine and radio offer a rather less different potentials for communication.

The result, therefore, of the tables show, not surprisingly, that awareness does not correlate directly to comprehension, and thus consumption. Most motorists got there knowledge from the fuel service stations. The fact that 33% do not full known the pros and cons of unleaded and leaded fuel; and that 43% need to hear more from the fuel company, shows that the nature and impact is not effective.

## CHAPTER FIVE : CONCLUSIONS AND RECOMMENDATIONS

### 5.1 The current market situation

The Dakar declaration binds 25 counties including Kenya to phase out unleaded premium. On 10<sup>th</sup> November 2005, the energy minister Mr. Simeon Nyachae declared that unleaded premium was banned in Kenya commencing January 2006. The major fuel retailers responded by saying they were not surprised by the ban, however, this came as a surprise to many motorists.

For the first time the media responded by writing articles about the Dakar declaration and the effects of unleaded premium. The media had previously ignored this topic and offered very little information in the mainstream media. It had however been well covered in scientific magazines and journals. However this medium is available to a very small population. They failed in playing a role to educate the public thus leading to public ignorance.

The motor industry experts responded by saying that the Mr. Nyachae's one page statement may have looked harmless, however, its ramifications on the motor industry was bound to be far and wide. It amounts to a decree to all motorists that their vehicles be compliant with unleaded fuels, or risk footing huge bills in frequent engine overhauls that may come with engine knocks for non-compliant vehicles.

It is estimated that 125,000 vehicles on Kenyan roads must be fitted with catalytic converters to use unleaded fuel. These are vehicles that were manufactured in the 1970's or early 1980s and are mostly found in rural areas.

"Converting such vehicles to use of unleaded fuel is an expensive affair," said Maxwell Milimu, a co-owner of TO SPEC Auto Garage in Nairobi's Hurlingham estate. Either the rural folks who own these vehicles will have to ground them or fork out a cool Sh1.18 billion to fix their jalopies.



The catalytic converter is an auto part that is fixed in the exhaust system, where petroleum mixes with air to oxidise pollutants such as carbon monoxide. This usually involves the purchase of an entire exhaust system pushing the cost of the changeover even higher.

A second hand catalytic converter costs between KSh6,000 and KSh8,000 depending on the vehicle manufacturer while installation costs an average of KSh1,500. New converters on the other hand cost between KSh16,000 and KSh17,000 with the mechanics charging an average of KSh 2,000 to fix them.

It is not clear yet whether these high expenses will introduce a black market for this product.

The oil marketer are also concerned about how genuine the government is and whether they will be able to keep to their promise without upgrading the refinery and adding additives instead which are said to be very harmful. A leading oil company Kenol/Kobil has criticized the Government's intention of using shortcuts to achieve its lead-free gasoline status in the market. The Managing Director Jacob Segman said use of enhancement additives to produce unleaded would compromise quality.

Lead is definitely a product that should be eliminated to sustain better health and improve the quality of life and the environment.

Modern engines have hardened valve seats, hence they do not need lubrication from lead. For old engines, lead substitutes are available which are yet to appear in the market. They provide a protective coating on valve seats and inhibit valve sink.

Another safe solution to this problem will be to exchange the valve seats with those of hardened material. This is a job, which can be undertaken by most machine shops locally.

Also, old engines rely on the octane rating to improve power generated. This can be solved by obtaining service information about ignition timing and low compression kits which may be required for unleaded or low-lead fuels of lower octane.

With the increased demand for reduced air pollution, at the local level and mainly urban areas, it has become necessary for the automotive industry to seek ways of conforming to the strict legislation which is becoming tougher with technological development.

The other aspect to be considered for the old and locally assembled vehicles will be the provision of a catalytic converter.

A catalytic converter, as its name suggests, is a component in the exhaust system which converts harmful pollutants into harmless gases. It strips oxygen away from nitrogen oxide to form relatively harmless gases. It strips oxygen away from the nitrogen oxide to form relatively harmless water, carbon dioxide and nitrogen.

In developed countries, it is a requirement by legislation for all vehicles to be fitted with a catalytic converter, but in Kenya, since this legislation is not in force, there is no provision for it, and since it gets destroyed by lead, local motor vehicle assemblers are not enforced to it.

Using unleaded petrol without this catalytic converter makes no difference in conserving our environment. This is because the hydrocarbons would not have been removed to the required minimum levels. Advanced catalytic converters like the one used on most gasoline Direct Injection (GDI) engines has the potential to reduce emissions to up to 90 percent and more when the engine has warmed up. It is activated at temperatures beyond 250 degrees Celsius.

There are other technologies which have been invented, all geared towards reducing the amount of exhaust emissions, which are not enforced in Kenya.

Phasing out carburetors was meant to reduce exhaust emissions. It was discovered that the carburetor was not consistent in amount of fuel to air ratio it gives under different loads, leading to difficulties in taming emissions.

The Electronic Fuel Injection (EFI) has proved satisfactory in controlling emissions. This has been possible due to the way the EFI system co-ordinates with several systems of a vehicle to provide the best air/fuel mixture.

Turbo-charging/super – charging is another way to reduce emissions. It is possible to go from a two-litre to a one-litre engine, and with a turbo or supercharger, obtain the torque of the two litre. This will give a 20 per cent advantage in fuel consumption. These are known as lean engines. Many manufacturers are talking of variable compression, lightweight design, and engines with small displacement, but with power of a large engine obtainable by high pressure super-charging.

## **5.2 The Way Forward – Best Practices for Petroleum Industry**

Emissions from fossil fuels are responsible for changes affecting the global climate. For example, Nitrogen and Sulphur oxides are precursors to acid rain and contribute to formation of smog, affects human health and impairs visibility. Likewise roadside and urban agriculture may contain lead from the combustion of gasoline and when ingested causes neurological disorders, brain injury, learning disabilities, damage to kidneys, liver, reproductive systems and interference in metabolic activities and related ailments.

Other forms of environmental pollution by petroleum products and by products are due to oils and grease spillage and unethical management and disposal of wastes by garages, as

well as ineffective enforcement of vehicle maintenance and substandard spare parts and low quality grease and oils.

**Good Practices:** practices which enhance environmental management are adherence to environmental standards, environmental planning and involvement of the public in decision-making.

**Environmental Standards:** effective management of environmental issues is largely dependent on standards as they provide benchmarks for permitting activities. Standards provide consistency in enforcement. The following environmental measures need to be implemented to supplement existing ones: amend traffic laws to incorporate environmental standards in vehicles inspections, dealers in motor vehicles and spares, and dealers in petroleum products; and making pre-shipment inspections of equipment, including vehicles a requirement.

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**Planning:** the objective of environmental planning is to separate incompatible uses of physical space in order to maximize use and minimize conflict.

**Information and Public Participation:** Access to information is a key factor in environmental regulation and governance. It is a powerful tool in ensuring compliance. An important attribute of a good regulatory framework is measured by public participation. One consequence of failing to identify and consult stakeholders is that incomplete false information may reach them through other means, creating long-lasting, unwarranted hostility to a project. It is therefore necessary for investigators to actively encourage public consultation at three different levels: conveying the information to the public, listening to the opinions and preferences of the public, and involving the public in making decisions. The nature and size of the project, the nature and number of stakeholders and the status of national legislation should define when, where and what level of public consultation is required.

**Sulphur:** the Mombasa oil refinery produces diesel of 10,000ppm (1.0 %) sulphur content against global target of less than 50ppm (0.005%) sulphur. Sulphur dioxide particulates and volatile compounds adversely affect human health and crop yields. A source of this pollutant is fuel used by motorized vehicles.

Ways of reducing or eliminating sulphur content in petroleum include: importing only fuel with low sulphur content: The Mombasa oil refinery should have technologies for desulphurization of fuels; users of high sulphur fuels should install “end pipe” emission desulphurization technology.

**Lead:** lead is eventually being outlawed in most markets in the world as a way of cleaning up the atmosphere. Kenya is a signatory to the Dakar Declaration of June 2001 by sub-Saharan governments outlawing leaded gasoline by 2005. The Mombasa refinery, which relies on lead as an additive to boost octane performance of petrol blends is currently the subject of discussions for modernization.

**Leakage of Fuel Storage facilities:** Industry should install leak detection technologies or better still develop other efficient techniques for preventing occurrence of leakages in fuel storage facilities. A litre of petroleum which leaks may contaminate up to 10 million litres of water, rendering such water unfit for human consumption. However, a leakage into the sewerage system can be very dangerous. The 1972 gasoline leakage in Guadalajara city, Mexico caused devastating explosion that killed over 200 people.

**Management of Oil Stations:** Significant pollution occurs at oil services stations due to oil spills and poor management of oil waste.

The Authority is working with the petroleum sector to draft EIA and environmental audit (EA) guidelines to enhance existing regulations for the sector. An important

consideration in developing service stations is the provision of oil interceptors should prevent oil spills and waste from polluting water or the soil.

**Disaster Preparedness:** Oil spillage during transportation is likely to cause fires, pollute the soil and kill biodiversity. An issue of concern to the Authority is the lack of appropriate equipment and trained personnel at oil installations for managing potential accidents and disasters associated with petroleum and its products and by products. Fire extinguishers alone are not sufficient. However, any equipment must conform to design requirement, while staff must be sufficiently trained to respond rapidly to manage accidents and disasters.

### 5.3 RECOMMENDATIONS:

The use of leaded fuel is causing massive and widespread harm to the Kenyan population. Not much thought has however, gone into anticipating the long-term impact of a lead phase out from an economy that has been suffering its wrath for more than five decades. The reason there has not been public outrage about it is merely because no one has cared to measure the damage and made the findings public.

If the lead content in the food we eat is many times the global average, then it can only mean that the country's male population has been less potent than they could ever be without lead. It also means that whatever the impression we have of how frequently our womenfolk are giving birth, the performance rate is much lower than it would be in a lead-free environment.

One therefore hopes that as the Ministry of Energy chiefs were planning the phase out, their counterparts at the Ministry of Planning were chalking out a long-term plan of action of how the country wants to deal with the aftermath.

Lead, experts say, reduces the mental capability of infants by more than 4.2 points – that is using the standard scale of measuring the intelligence quantum commonly known as IQ. This means that in a lead-free economy, we are not only going to have more children but much more intelligent and smarter juniors in our homes and schools.

Unless what has been said about the harm that lead causes are mere red herrings, freeing a population from the yoke of lead should translate into an acceleration in the rate of population growth. This should send planners thinking about the expansion of facilities such as schools and hospitals or in the absence of it craft a massive birth-control programme to tether the growth.

This is how large this lead phase out thing is and how wide one hopes the policymakers have been in their dealing with it.

Environmental information is an essential tool for environmental and natural resources management hence should be packaged and disseminated effectively. There is a need to strongly establish enforce the mandate given to the National Environmental Information System and Documentation Centers.

One core functions of the National Environment Management Authority (NEMA) is to undertake and co-ordinate research, investigation and surveys in the environmental field and subsequently disseminate information on the findings of such surveys. For NEMA to provide such important service to the public, it intends to establish a National Environmental Information System (EIS) at the headquarters and documentation centers in the districts. EIS will be supplying information upon request and on routine basis to lead agencies, including Government ministries, research and development institutions, industries and decision makers.

The EIS and the documentation centers will also seek to promote environmental awareness activities among the public. The centers will be continuously updated with environmental related journals, technical periodicals and books besides availing CD-ROMs containing policies on environment related databases.

Considering the vulnerability of the African continent, which is a victim of galloping environment degradation, the media and environmental bodies, public and private development partners should help preserve the environment through a concerted effect of acquiring and disseminating information on the nature and impact of the environmental pollutants. They should also educate and assist journalists in this ambition.

Both the main and independent oil retailing companies have a role to play in the society they retail their products. They should leave that society a better place through environmental and social responsibility activities. The effects of lead are alarming and it seems this companies take them in a stride. The companies should look more seriously



into this issue and come up with well-researched and impactful campaigns in the mass media to create the public concern on this issue and in order to avoid the developing of a black market for the lead premium.

Many people are quick to say Africa has bigger problems, other than the environment. This is true. However, it is the high time the problem was tackled or it will be a bigger burden to our already existing problems in the future.

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## ANNEXURES

### Annex I. Questionnaire

Dear Motorist,

I would like you to participate in this survey by taking a few moments of your time to answer this questionnaire about your fuel consumption decisions.

Thanks.

### QUESTIONNAIRE

1. Are you aware that leaded and unleaded fuel is retailed in Kenya?

- Yes  No

2. What fuel do you use?

- Unleaded Premium  Leaded Premium (Super)  Regular  Diesel

If you use leaded , why \_\_\_\_\_

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3. How did you find out about the availability of unleaded fuel?

- Newspaper  Radio  Posters  Posters  Magazine  At Station

Other \_\_\_\_\_

4. Are you aware of the advantages unleaded fuel to your

Your Car  Yes  No

The Environment  Yes  No



Your Health

Yes

No

5. In your opinion which fuel is better

Unleaded Premium     Leaded Premium (Super)

Why \_\_\_\_\_.

6. Are you aware of the term 'green houses gases' and their its effects?

Yes

No

7. Would you switch to unleaded premium if it were cheaper than leaded?

Yes

No

8. Are you aware where your vehicle is fitted with a catalytic converter?

Yes

No

9. In your opinion which fuel is more cost effective?

Unleaded Premium     Leaded Premium (Super)

10. Do you remember any advertisement of unleaded premium?

Yes

No

If yes, from which company \_\_\_\_\_ what content from the advert do you

remember \_\_\_\_\_.

11. In your opinion did the advert effectively communicate the pros and cons of unleaded premium

Yes

No

12. In your opinion do you think the fuel retailing companies have effectively communicated on unleaded premium.

Yes

No

**Thank you for taking time to answer this questionnaire!!**

## Annex II. SPPS Table of Analysis

1. Are you aware that leaded and unleaded fuel is retailed in Kenya?

(Awareness)

No.	ITEM	SCORE	PERCENTAGE
1	YES	89	89%
2	NO	11	11%

2. What fuel do you use? (Fuel)

No.	ITEM	SCORE	PERCENTAGE
1	Unleaded	34	34%
2	Leaded premium	31	31%
3	Regular	28	28%
4	Diesel	7	7%

3. How did you find out about the availability of unleaded fuel? (How found)

No.	ITEM	SCORE	PERCENTAGE
1	Newspaper	18	18%
2	Radio	12	12%
3	Poster	23	23%
4	Magazine	11	11%
5	At station	36	36%

4. Are you aware of the advantages unleaded fuel to your (Advantages of unleaded premium)

No.	ITEM	SCORE	PERCENTAGE
1	Car	56	32%
2	Environment	16	16%
3	Health	28	28%

5. In your opinion which fuel is better? (Which fuel is better)

No.	ITEM	SCORE	PERCENTAGE
1	Unleaded	63	63%
2	Leaded	27	27%

6. Are you aware of the term 'green houses gases' and their its effects? (GHG awareness)

No.	ITEM	SCORE	PERCENTAGE
1	Yes	39	39%
2	No	61	61%

7. Would you switch to unleaded premium if it were cheaper than leaded? (Most costly fuel)

No	ITEM	SCORE	PERCENTAGE
1	Yes	89	89%
2	No	11	11%

8. Do you remember any advertisement of unleaded premium? (**Remember any advert on unleaded premium**)

No.	ITEM	SCORE	PERCENTAGE
1	Yes	59	59%
2	No	41	41%

9. In your opinion which fuel(**Was the communication effective on pros and cons**)

No	ITEM	SCORE	PERCENTAGE
1	Yes	33	33%
2	No	67	67%

10. (**Are the fuel companies effective in communication**)

No	ITEM	SCORE	PERCENTAGE
1	Yes	57	57%
2	No	43	43%

11. In your opinion did the advert effectively communicate the pros and cons of unleaded premium?

No	ITEM	SCORE	PERCENTAGE
1	Yes	33	33%
2	No	67	67%

12. In your opinion do you think the fuel retailing companies have effectively communicated on unleaded premium.

No	ITEM	SCORE	PERCENTAGE
1	Yes	43	43%
2	No	57	57%