

LOW SULPHUR FUELS AND CLEAN VEHICLES

Towards a Clean and Healthy Environment



Report of the National Environment Management Authority (NEMA) & Motor Vehicle Inspection Unit (MVIU)

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4. Consumer information Network (CIN)
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FOREWORD

The biggest air quality problem in developing countries is air pollution in urban areas. It is estimated that 800,000, people die prematurely each year from urban air pollution. Most of these premature deaths occur in developing countries. As vehicle traffic grows, the health and economic toll of poor air quality continues to mount on the most vulnerable of residents; women, children, and the elderly who live, play, walk and work on or close to congested urban highways.

Vehicle emissions are one of a number of contributing factors to poor urban air quality. In terms of the health impacts, four pollutants are of particular concern- particulate matter (PM), ozone, carbon monoxide (Co), and sulphur dioxides (SOx). Health effects associated with ambient particulate matter which can be inhaled deep into the lungs include premature death, aggravation of respiratory and cardiovascular disease.

NEMA and UNEP signed a small scale funding agreement to undertake national sensitization on low sulphur fuels and cleaner fuels. The aim of the project is to reduce sulphur in vehicles fuels to 50 ppm or below worldwide, concurrent with clean vehicles and clean vehicles technologies, with roadmaps and timelines developed regionally and nationally.

Four workshops were conducted; three regional stakeholder workshops in Mombasa, Kisumu, Nairobi and one national policymakers workshop. This was as a result of the partnership forged between NEMA, UNEP and MVIU to sensitize the public on the harmful effects of high sulphur content in fuels dispensed at the main service outlets particularly those in the transport sector.

The objective was to engage the stakeholders to include low sulphur fuels and clean vehicles as part of sustainable air quality management in their future plans and operations and to seek co-operation and joint efforts in the deployment and application of newer emission control technologies that should substantially lower toxic emissions, by promoting the use of low sulfur fuels and recognizing that these fuels will continue to impact positively in our economy and environment.

I wish to acknowledge the contributions of UNEP, who funded the project, MVIU who were the key stakeholders of this project, other stakeholders, and the steering committee for supporting this exercise and made it a success. I also look forward to supporting further their efforts in ensuring that we have a cleaner and healthy environment for all.

DR. MUUSYA MWINZI
DIRECTOR GENERAL

ACKNOWLEDGEMENT

The preparation and compilation of a comprehensive Report on the outcome of the three Regional and one National Workshops on Low Sulphur and cleaner fuels was an enormous task.

Special Acknowledgement goes to the United Nations Environment Programme (UNEP) who supported the process by voting funds for the undertaking the sensitization exercise through workshops and media campaigns and drafting sessions hence this comprehensive Report. The Director General and the NEMA management provided the guidance and critique required to make the document factual and complete. The Motor Vehicle Inspection Unit (MVIU) for their support in ensuring that these workshops were a success.

Special thanks goes to other stakeholders who included the Kenya Bureau of Standards (KEBs), Kenya Meteorological Department, Petroleum Institute of East Africa (PIEA), Kenya Oil Refineries Limited (KPRL), Consumer Information Network (CIN) national oil, Ministry of Industrialization, Ministry of Energy, Kenya Revenue Authority, UNEP, Motor Vehicle Inspection Unit, for their enormous contribution towards the success of the document.

Finally, special thanks goes to the NEMA Low Sulphur Steering Committee Taskforce that comprised of Dr. Ayub Macharia, Wangari Kihara, Hildegard Wambayi, Robert Orina, Muitung'u Mwai, Agnes Kamiri, Felix Mugambi, Mary Mutheki, Sarah Muthoni, and Cecilia Muchama who dedicated long hours of work to ensure the completion of this document. Bravo to the team.

EXECUTIVE SUMMARY

This interim report presents the status of implementation low sulphur fuels and clean vehicles programme in Kenya. It is a result of collaborative processes and networking of a team of institutions whose greatest concern is the protection of the environment through inculcating civic responsibility in the citizens of Kenya through promotion of public awareness and education on the benefits of using low sulphur fuels and clean vehicles. The project was initiated in June 2009 with the initial phase running to December through a series of meetings, workshops and consultations by and with key stakeholders. The project ultimate goal is to sensitize the public and policy - makers on the benefits of lower sulphur fuels and cleaner vehicles.

Firstly, the report gives a general background on the status of sulphur fuels in Kenya indicating the efforts that have been made to introduce the use low sulphur fuels, and comparing this with the global status on sulphur campaigns.

A myriad of challenges facing the country are discussed in relation to the campaign, including the effects of sulphur levels in the atmosphere on the environment, the economy and human health.

The various roles played by the PCFV and UNEP in the Global campaign are explained in the second chapter. Issues concerning the development of fuel standards are also discussed by the Kenya Bureau of Standards (KEBS) showing the advanced stage in the process of gazettelement of air quality standards. Of particular importance is the Petroleum Monitoring Unit which is in place to guard the proper use of fuels. A trend analysis of the quality of air in the East and Southern Africa is given with examples of case studies from both the developing and developed countries. The chapter also discusses the supply chain of fuel in Kenya; marketing and supply of petroleum, quality of oil, its source and distribution are described.

Chapter four summarizes the awareness campaigns that were held in the country over a six-month period. Regional sensitization workshops held came out with findings and recommendations that are proposed in this report for future actions to up- scale the campaign on promotion of low sulphur fuel use, the most immediate proposal being a National vehicle emissions testing Clinic accompanied with media campaigns.

ACRONYMS

AAQL	Ambient Air Quality Level
AFRA	Average Flight Assessment
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
CIN	Consumer Information Network
GoK	Government of Kenya
KEBS	Kenya Bureau of Standards
KOT	Kipevu Oil Terminal
KPRL	Kenya Petroleum Refineries Limited
KRA	Kenya Revenue Authority
LPG	Liquefied Petroleum Gas
MSTQ	Metrology, Standards, Testing and Quality Assurance
MVIU	Motor Vehicle Inspection unit
NEMA	National Environment Management Authority
OTS	Open Tender System
PCFV	Participation for Clean Fuels and Vehicles
PIEA	Petroleum Institute East Africa
PM	Particulate Matter
PMU	Petroleum Monitoring Unit
PPM	Parts Per Million
SOT	Shimanzi Oil Terminal
WHO	World Health Organization

1.0 CHAPTER ONE

1.1 Introduction

The global campaigns on improving the status of fuels by the Partnership for Clean Fuels and Vehicles (PCFV) has made tremendous steps in achieving its three founding objectives which are global elimination of leaded gasoline, phase down of sulphur in fuels and the concurrent adoption of cleaner vehicles.

Road transport in Kenya is regarded as the engine of economic growth and development in many ways. And with it comes the use of diesel driven heavy duty engines. The use of gasoline and diesel in the transport industry has led to the emission of significant amounts of nitrogen oxides, sulphur oxides, ozone, particulate matter (PM), carbon monoxide, hydrocarbons and fine particles of lead compound, which are harmful to the environment and human health. As a result air pollution in urban areas and many parts of the rural regions of Kenya has intensified, and created concern with respect to public health.

Like lead, sulfur generates air pollution that leads to severe health consequences. The fine PM emissions when inhaled aggravate respiratory and cardiovascular diseases and increase the risk of lung cancer. The successful removal of lead fuel by many countries by the end of 2008 gave way to prioritization of reduction of sulphur in vehicle fuels. Kenya recorded this success as well, hence joined the rest of the world in attempting the second objective of PCFV, to go low on sulphur fuel use.

In January 2009, the United Nations Environment Programme (UNEP) identified the National Environment Management Authority (NEMA) as the local partner institution that would carry out the low sulphur fuels campaign. A Small Scale Funding Agreement (SSFA) was made between UNEP and NEMA on 20 January 2009 based on the recommendations of the Fourth Global Partnership Meeting of the of PCFV that was held in Nairobi on 15th December 2005-

To reduce sulphur in vehicle fuels to 50 ppm or below worldwide, concurrent with clean vehicles and clean vehicles technologies, with roadmaps and timelines developed regionally and nationally

It was also based on the costed work plan of the Urban Environment Unit in UNEP for 2008/2009-

To assist governments in the development and implementation of policies to improve the air quality in developing country cities including support to PCFV and the development of urban air quality monitoring in the Sub-Saharan Africa and sustainable urban transport in Asia and the Pacific (20 countries), (GC22/4 III, Johannesburg Plan of Implementation, paras. 49 and 50, GC. 23/1 (external partners: World Bank, PCFV partners)

and the request made by NEMA and the Motor Vehicle Inspection Unit (MVIU) under the Ministry of Transport of Kenya.

1.2 Project Objectives and Justification

NEMA collaborated with MVIU in executing the objectives of this programme herein referred to as **National Sensitization on Low Sulphur Fuels and Cleaner Vehicles**.

This project was justified on the basis of the country's refinery status being out-dated and the willingness of the government to upgrade the refinery within 4 years to enable the production of low sulphur diesel. Secondly it was noted that with reduction of sulphur in fuels the health benefits would be attained. The MVIU was challenged to enforce vehicle emission controls with modern technology. Compliance levels needed to be redefined.

The objectives of the agreement were:

- (i) To sensitize the public and decision makers on the environmental, vehicle and health benefits of lower sulphur fuels and cleaner vehicles;
- (ii) To prepare and implement an action plan for the importation of lower sulphur fuels, 500ppm in the short term and 50 ppm in the long term;
- (iii) To sensitize the public and decision makers, and prepare an action plan on the adoption of cleaner vehicles-vehicles that are installed with catalytic converters and other emission control technologies and cleaner vehicles;
- (iv) To create self compliance and policing through sensitization and detailing benefits to be accrued through proper maintenance of the vehicles.

Consequently three regional workshops in the cities of Nairobi, Kisumu and Mombasa were held between August and October. A national policy workshop was later held in Nairobi in October 2009. The workshops aimed at identifying key stakeholders that would go on to be sensitized on the significance of understanding the need to move to the use of low sulphur fuels. Presentations on key issues such as the status of fuel refinery in Kenya, energy policy, air quality standards in Kenyan urban centres and the effects of poor air quality along with open discussions were given by lead experts to participants to foster a sharing of knowledge, expertise, and concerns on the subject. Also the fuel status of various other countries in the Eastern African region was highlighted.

The Task Force had the responsibility of ensuring a successful nationwide campaign on the use and benefits of the low sulphur fuels and clean vehicle technology. The terms of reference (ToRs) were as follows:

1.3 TORs

1. To develop an action plan of implementing the regional and national workshops
2. To carry out 3 regional workshops and a national policy makers' workshop
3. To prepare and submit a progress report with recommendations for future consideration

The Task Force agreed to work and submit its first report by 30th November 2009.

1.4 Methodology of Project Execution

The Task Force adopted the following approach to conduct the campaign

- (i) Four Workshops conducted in three regions
- (ii) Working sessions on development of awareness materials
- (iii) Media campaigns
- (iv) Evaluation by questionnaires*
- (v) Workshop Review meetings

1.5 Global Status of Low Sulphur Fuels Campaign

The Clearing House for the Partnership for Clean Fuels and Vehicles is working on reducing sulphur levels in fuels in five regions, namely Sub-Saharan Africa, Central and Eastern Europe, Latin America and the Caribbean, Middle East, North Africa and West Asia, and Asia and the Pacific. Discussions on desulphurization are on course worldwide.

In February 2007 the PCFV Working Group developed the report *Opening the Door to Cleaner Vehicles in Developing and Transition Countries: The Role of Lower Sulphur Fuels*. This was to become a global guide for many developing nations that were taking on various initiatives that would enable them to reduce the use of high sulphur fuels. (www.unep.org/pcfV).

A review on the current status of sulphur fuels globally indicates that Sub-Saharan Africa has among the highest sulphur levels and especially Eastern Africa. They vary between 5,000 ppm and 10,000 ppm. In Africa, Southern Africa has improved on its reduction of sulphur levels to as low 500 ppm. Many southern countries such as Namibia, Swaziland and Lesotho, get their fuel through SA and have therefore complied with the 500ppm structure although Zimbabwe, Zambia, Malawi and Madagascar still have levels between 7,500 and 5,000ppm. The lowest levels in Western Africa have been recorded in Nigeria (1330 ppm) while the highest are in Gabon. Many of the countries whose levels remain high owe this to old national refineries which are yet to be upgraded or re-designed produce lower sulphur fuels.

Many of the Central and Eastern European countries are aiming at adopting the EU standards by aligning their national legislation with the European directives on fuels and vehicles (50 ppm). The PCVF has supported several of these countries including Albania, Bulgaria, Turkey, and Bosnia and Herzegovina. Their national levels though still remain as high as 5,000 ppm.

The situation in Latin America and the Caribbean is not much different from that of Central and Eastern Europe. The sulphur levels vary from 5,000 ppm to 50 ppm in the urban areas. Among those that aim at the low sulphur level of 500 ppm are Argentina, Brazil, Chile, Colombia, Uruguay and Peru. Chile and Brazil have taken the activities to a higher level by initiating heavy-duty diesel vehicle retrofit projects that also take into account emissions control technology. So far Mexico's sulphur levels are the lowest in the region aiming to go to as low as 15ppm in diesel fuel and 80 ppm.

The Middle East, North Africa and West Asia combine to make up a major crude (sour) oil producing region with high sulphur levels of 35,000 ppm. The sulphur levels of fuel used in this

region is as high as 5,000 ppm. Most refined fuel of 1,000-2,000 ppm sulphur is mainly produced for foreign markets. A few countries including Kuwait, Bahrain, Libya, Morocco, Tunisia and Israel however use low sulphur fuels of 350 ppm. The PCFV has hosted meetings on policy development with these nations. More important has also been the meeting with the more developed Gulf Coast Countries (GCC) such as UAE, Bahrain, Kuwait Saudi Arabia which have the means to transform the status of high sulphur to low sulphur fuel use.

The Asian and Pacific countries are quite varied in the national sulphur standards. These range from as low as 15ppm sulphur in Japan, and 50 ppm in Korea to as high as 11,000 ppm sulphur in Afghanistan. Particular attention is being given to the Asian countries because of the rapidly increasing economic and industrial development that has seen high rate of increase in vehicle numbers in Asian cities. Vehicle registration fleet for instance in Seoul, Korea has increased by 300 times in 5 decades from just below 10,000 to just less than 3 million in 2007. Beijing is projected to have as many as 3.5million by 2010. Most countries in this region are striving to lower the sulphur levels; India is aiming at 350ppm by 2010. Furthermore, most nations in this region have turned to manufacture of low sulphur compliant vehicles.

1.6 Challenges

The increasing depletion of air quality globally continues to raise concerns on its impacts on human health and what mitigating measures the world needs to take. Global discussions have borne resolutions from the targeted regions. However many challenges still face the developing countries in achieving the lower levels of sulphur despite the timelines and targets that have been set.

All the five regions are faced with the issue of old refineries that must be updated to step up quality fuel production. There exists a lack of public awareness on the benefits of using low sulphur fuels as well as a lack of awareness on the part of decision making on matters of policy. These regions lack comprehensive incentive structures for promoting cleaner fuels and vehicles for local consumption. There is need for improvement on compliance and enforcement, and training of technical capacity. The governments involved must step up efforts through political good will, expansion of national networks and partnerships, and also design master plans that will guide each region and country in achieving the purpose of lowering low sulphur.

2.0 CHAPTER TWO

Topical Presentations on the state of Sulphur Fuels and Clean Vehicles in Kenya

2.1 Effects of High Sulphur Levels

Contributions to topics on effects of high sulphur levels to human health and environment were discussed in three papers by Mr. Kilinda Kilei from the Ministry of Public Health, Mr. Robert Orina the chief environmental officer of Compliance and Enforcement at NEMA, and Mr. Peter

Bundi of Kenya Meteorological Department. An overview of the presentations is summarized below.

2.1.1 Effects on Environment

EMCA's definition for "pollutant" was clarified as any substance whether liquid, solid or gaseous which;

- a) may directly or indirectly alter the quality of any element of the receiving environment;
- b) is hazardous or potentially hazardous to human health or the environment; and includes objectionable odours, radio-activity, noise, temperature change or physical, chemical or biological change to any segment or element of the environment;

Sulphur was described as a pollutant with adverse effects on human life, plants and animals through chemical alteration of water causing widespread ecological damage.

Both the lower and higher pH concentrations in surface water that occur as a result of acid rain can cause damage to fish and other aquatic animals. At PHs lower than 5 most fish eggs will not hatch and PHs above 5 can kill adult fish. As lakes and rivers become more acidic biodiversity is reduced. Acid rain has eliminated insect life and some fish species.

Soil biology and chemistry can be seriously damaged by acid rain. Some microbes are unable to tolerate changes to low PHs and are killed. The enzymes of these microbes are denatured (changed in shape so they no longer function) by the acid. The hydronium ions of acid rain also mobilize toxins such as aluminum, and leach away essential nutrients and minerals such as magnesium. Soil chemistry can be dramatically changed when base cation ions, such as calcium and magnesium, are leached by acid rain thereby affecting sensitive species.

2.1.2 Effects on Human Health

More than 2 million people are estimated to die each year due to air pollution. Indoor air pollution, caused by burning of biomass, kerosene or coal for cooking, contributes to chest infections, mostly affecting women and children. It is estimated that 1.6 million deaths are attributed to indoor pollution.

Besides, WHO estimates that almost 800,000 people die each year from outdoor urban air pollution and most of these deaths occur in developing countries. Vehicle emission is one of the greatest contributing factors to poor air quality. Estimates of motor vehicles' contribution to urban air pollution worldwide is between 25 –75%. Given the present poor quality of fuels and vehicles often found in developing countries, the problem of urban air pollution needs to be addressed urgently.

From a public health perspective, the main concerns highlighted were on the following pollutants:

- a) **Carbon Monoxide (CO)**

Carbon Monoxide is a colourless, odourless gas produced through the incomplete combustion of carbon-based fuels. CO enters the blood stream through the lungs and reduces the delivery of oxygen to the body's organs and tissues. It bonds strongly with hemoglobin in red blood cells impairing the blood's oxygen carrying capacity.

At higher level, CO exposure can impair; visual perception, work capacity, manual dexterity and Learning ability. The health impact of CO is more serious for those who suffer from cardiovascular diseases. At sufficient concentrations, CO poisoning can cause death and hinder Performance of complex tasks

b) Hydrocarbons (HC)

These are also known as volatile organic compounds (VOC), their major source is vehicle emissions and are responsible for 50 –75% of the HC.

HC are an essential precursor for ground level ozone and are toxic and carcinogenic they include; Benzene, Acetaldehyde, Butadiene and Formaldehyde.

Exposure to HC emissions can lead to neurological disorders, reproductive disorders, respiratory disorders, cancers and other serious impacts on pregnancy and infant health.

c) Nitrogen Oxides (NO_x)

The dominant source of Nitrogen oxide is vehicle emission accounting for 50% of the total emissions. Exposure to Nitrogen dioxide can lead to acute respiratory diseases. It absorbs light, resulting to visibility impairment in polluted air. Because it is highly water soluble, the primary loss mechanism for NO_x is oxidation to nitric acid (HNO₃) which is one of the two critical acids responsible for acid rain, contributing to ecosystem damage. Nitrates can also react in the atmosphere forming nitrate aerosol particles, which also causes; human cancers and visibility impairment.

d) Particulate matter (PM)

Particulate matter is the general term for solid particles or liquid droplets suspended in the air, the major source being vehicle emissions of PM, which account 51 –90 %.

Particle composition can have serious health impacts with soluble organic fraction imparting increased toxicity and mutagenicity. The smallest particles are easily inhaled and can lodge in the lungs resulting in greater health impacts than the larger particles.

Generally, ambient PM has many impacts including chronic bronchitis, aggravation of respiratory and cardiovascular disorder, as well as aggravated asthma. Diesel PM is of special concern because it is associated with an increased risk of lung cancer and impacts on visibility. Fine particles i.e. sulfate and nitrate aerosols also cause material damage and acid deposition

e) Ozone (O₃)

Ground-level ozone also known as 'bad ozone' has no direct emission sources; it is entirely a secondary pollutant, formed when nitrogen oxides and HC react in the presence of heat and sunlight (photochemical reactions in the atmosphere). These two pollutants are often referred to as ozone precursors. Ozone destroys the photo-chemical smog. Its impacts include:

- Irritation of the respiratory system, leading to chest pain, coughing, anorexia, nausea and lung inflammation
- Reduced lung functions and difficulty in breathing
- Inflammation and damage the lining of the lungs
- Prolonged exposure can cause Permanent/chronic lung damage

f) Sulphur

Sulphur is a naturally occurring component of crude oil and is found in both gasoline and diesel. Close to 100% of the sulphur in the fuel will be emitted as SO₂. It causes a wide range of health and environmental impacts. Children, the elderly, people with heart or lung diseases are prone to adverse effects. Its impacts include

- (Dyspnea)- a breathing difficulty especially for people with asthma
- High level of SO₂ also cause respiratory illness and aggravates existing heart diseases
- SO₂ reacts with other chemicals in the air to form tiny sulfate particles which, when inhaled, accumulate in lungs leading to respiratory disorders
- Premature death.

Sulfate particles provide a relatively large surface area onto which HC condense resulting in particle growth and increasing particle matter toxicity. Sulfate particles are the major cause of reduced visibility. These have carcinogenic and toxic effects.

2.1.3 Effects of Sulphur on the Economy of Kenya

The economy of any country depends on the good health of its population. However where excessive sulphate particulate occurs several effects are observed including:

- high cost of consumer goods due to high production cost
- Depreciation of property value
- hospital admission and visits and high hospital bills
- school absence
- Work loss days
- Restricted activity days
- High sulphur accentuates engine wear thus reducing engine life and causing very high costs of vehicle and machine maintenance.

2.1.4 Other adverse effects

Also other effects identified were the damage caused due to acid rain which increases the rate of oxidation on iron, and also damage to building materials and historical monuments by the reaction between sulfuric acid in the rain and the calcium compounds in the stones (limestone, sandstone, marble and granite) to create gypsum, which then flake off.

Visibility is also reduced by sulfate and nitrate aerosols and particles in the atmosphere. This is a danger to motorists.

2.2 What does Kenya stand to benefit by reducing sulphur in fuels?

Low sulphur fuel is essentially cleaner for the environment and better for engines. It means, therefore that the large amounts of particulates (fine sooty emissions), which have been linked to asthma and cancer, and sulphur oxides, which cause acid rain, will greatly be reduced.

Reduced sulphur in fuels will also encourage the use of catalytic converters to reduce fuel consumption usher in new types of efficient engine which will reduce carbon dioxide emissions by 30%.

In built-up areas, one benefit will be seen in the aesthetic beauty of buildings (fuels with a higher content of SO₂ corrodes buildings and sculptures)

2.3 The Partnership for Clean Fuels and Vehicles (PCFV) and Global Campaign to Reduce Sulphur in Fuels

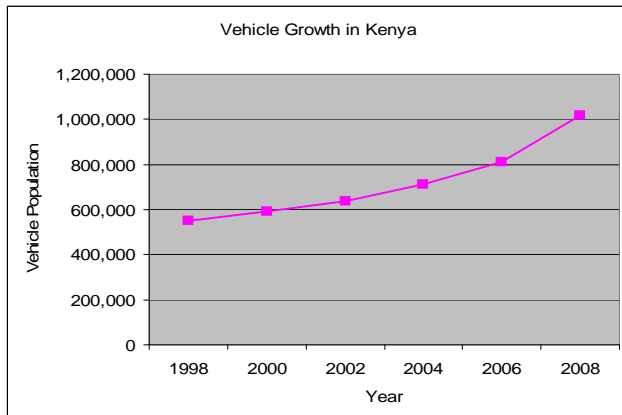
2.3.1 UNEP's role

UNEP is involved in various campaigns in Kenya and the surrounding region, aimed at ensuring that the air quality as set by the World Health Organization is maintained.

In Kenya the campaigns included;

- Supporting NEMA to carry out public sensitisation meetings on lower sulphur benefits include a national workshop
- Supporting MVIU to sensitise transporters and the public on benefits of emission reduction by vehicles in Nairobi, Mombasa and Kisumu
- Training on clean vehicle implementation strategy and Adoption of cleaner vehicle technologies
- Development of Automotive Fuel Efficiency policies & strategies
- Media campaigns to create awareness on and promote the use of low sulphur fuel.

With an increasing pace of economic development, Kenya's population of vehicles has had a tremendous increase especially in the urban hubs. Urban air quality has equally been affected.



Over 90% of air pollution is from mobile vehicle sources. A main contributor is the high number of poorly serviced old motor vehicles and poor fuel quality with high sulphur. The cost of urban air pollution is estimated to be 2% of GDP, in developed countries and more than 5% in developing countries (e.g. 7% China, to rise to 13% by 2020)

Strategies to reduce transport emission in urban areas were discussed under the following:

- Proper city planning
- Promoting non-motorized transport
- Promoting public/pooled transport
- Cleaner fuel and vehicle technologies

2.3.2 Partnership for Clean Fuels and Vehicles (PCFV)

The PCFV was set up at the World Summit on Sustainable Development, September 2002 with the main objective of addressing urban air quality in developing and transitional countries by promoting clean fuels (unleaded gasoline and low sulphur fuels) and vehicles. It comprises of 116 partners from governments, industries, international organizations and civil societies. PCFV Clearing-House is located at UNEP Headquarters in Nairobi, Kenya.

2.3.3 PCFV Goals as set in 2005

- To reduce sulphur in vehicle fuels to 50 ppm or below worldwide, concurrent with clean vehicles and clean vehicles technologies, with roadmaps and timelines developed regionally and nationally
- To phase out leaded gasoline by end of 2008 worldwide to be followed by the global introduction of vehicles with catalytic converters

Apart from the campaigns on clean fuel and vehicles, UNEP is also involved in other campaigns in the region on sulphur campaigns, cleaner vehicles and improvement of fuel efficiency.

a) Sulphur campaigns

Sulphur emissions from vehicles and industries have adverse impacts on health, environment and vehicle and machine life. PM and SO₂ are linked to respiratory diseases such as asthma attacks, throat & lung, heart diseases, dermatological effects and even premature death. On the other hand, their presence contributes to the increased soot, acid rain, and corrosion, and contributes to ozone depletion and loss of biodiversity.

Moving from use of fuel with sulphur content of 2500 ppm to 500 ppm will reduce vehicle engine wear by 10 - 20% and about 33% from 5000 ppm. This will also reduce vehicle maintenance costs otherwise levels above 2000ppm corrode the engine and other parts like the piston rings and exhaust system. Fuels low in sulphur levels could pave way for the introduction of emission reduction technologies already existing in the market.

b) Cleaner vehicles

Fuels and vehicles work together as a system; for maximum emission reductions, there is need to combine cleaner fuels with appropriate vehicle emission control technologies. Some cleaner vehicle options include low emission, fuel efficient vehicles, cleaner engines with existing technology and new technologies (hybrid, hydrogen). Retrofitting in vehicles can reduce emissions by 40-95% while catalytic converters have been known to reduce emissions up to 90%. There are also alternative fuel sources.

It is also important to consider rapid transit and reduced congestion mechanisms that may minimize pricing.

c) Improved fuel efficiency

The Global Fuel Economy Initiative was launched in March 4 2009 by International Transport Forum, International Energy Agency, Fédération Internationale de l'Automobile and the United Nations Environment Programme with the goal of improving fuel economy by 50% across the global vehicle fleet by 2050. Currently, Global average consumption is eight litres for a hundred kilometres (8L/100km). The goal aims at reducing the Global fleet average to four litres for a hundred kilometres {4L/100km (25km/L)}. This is achievable with current technology combined with appropriate vehicle size, weight and power. The result could see a drop in CO₂ emissions from 180gm/Km CO₂ to 90gm/Km.

2.3.4 Priorities for Global Fuel Economy Initiative (GFEI)

These included:

- Developing of improved data and analysis of the current situation on fuel economy;
- Working with governments to develop sound policies to encourage fuel; economy improvement for vehicles produced and/or sold in their countries;
- Working with stakeholders (such as auto makers) to better understand the potential for fuel economy improvements and solicit their support;

- Supporting awareness initiatives to provide consumers and decision makers with information on options.

2.3.5 Options for countries

Countries need to carry out an analysis of vehicle fleet i.e. make-up/composition and size of fleet; Import source (current and future including age; highest emission sources through emission testing, maintenance and inspection. There is also need for an integrated approach to combine clean fuels and clean vehicles to improve air quality. A decision needs to be made on the optimal level of low sulphur levels.

In the BAQ workshop, eleven countries were represented and these include; Burundi, Democratic Republic of Congo, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania, Uganda. The workshop resolved to look at both the vehicle and fuels standards

a) Vehicle standards:

- Regionally agreed emission standards by 2012
- Emission testing, I & M by 2010
- Age & catalytic converters by 2011
- Vehicle fuel efficiency
- Harmonise standards

b) Fuel standards:

- Sulphur to 500ppm by end of 2010
- 50ppm from 2012 onwards
- Sustainable use of bio-fuels
- Harmonise standards & practices

2.3.6 Other Regional Activities

- Malawi supporting preparation of standards to 500ppm
- Ethiopia supporting sensitization activities for low sulphur – including parliamentarians
- Tanzania supporting sensitization for low sulphur diesel to support cleaner buses (Euro 3) for BRT
- Supported sensitization in Djibouti
- In discussions with Burundi and Rwanda to support vehicle emission reduction

2.3.7 Next Steps for Kenya and the Region

Kenya proposes to achieve the following as a way forward towards the introduction of low sulphur fuels in the economy:

- Reduction of sulphur levels to 500ppm in the short term with a target to 50ppm in diesel fuels
- Import vehicles that are fitted with catalytic converters
- Review vehicle importation age and emissions standards
- Enforce regular vehicle inspection and maintenance program
- Implement targets agreed at the *Better Air Quality (BAQ) workshop for Eastern Africa* held in October 2008.

2.4 KENYA BUREAU OF STANDARDS

The Kenya Bureau of Standards (KEBS) gave a presentation on the standardization of fuels and the current sulphur levels on the fuels in the country. KEBS is the Standards body in Kenya which was established through *The Standards Act* Cap. 496 of the Laws of Kenya it started its operations on 12th July 1974 and is under the Ministry of Industrialization. Its core functions include Standards Development, Testing, Metrology, Implementation of Standards in commerce and industry, Certification, Inspection of imports, local products and exports, Training and Education in Meteorology, Standards, Testing, Quality Assurance (MSTQ) and certification.

2.4.1 KEBS Mandate

KEBS is mandated to:

- To promote the competitiveness of Kenyan goods and services;
- To improve the quality of life through the application of Measurement, Standards, Testing and Quality Assurance (MSTQ);
- To support governmental policies through the reduction of trade barriers & Promote fair trade practices; Consumer protection; and Health and safety as well as Environmental protection.

2.4.2 What is a Standard?

A standard is referred to as a document, established by consensus and approved by a recognized body, which provides for activities or their results, aimed at the achievement of the optimal degree of order in a given context

There are six main stages through which the standards development go through; these are Proposal (SPC) Committee, Public review, Balloting, Approval done by the Standards Approval Committee and Publication,^{**}. Standardization can be done at three levels i.e. national regional and International

Several Principles govern the drafting of Kenya standards. They include Openness, Transparency, Impartiality and consensus, Effectiveness and relevance as well as Coherence.

Some of the important standards developed to date that touch on the petroleum sector in Kenya are

- KS 91:- SPECIFICATION FOR LIQUID PETROLEUM GAS (LPG)
- KS 515:- REQUIREMENTS OF GASOHOL (BLENDS)
- KS 1289:- SPECIFICATION KEROSENE
- KS 1310:- SPECIFICATION FOR FUEL OILS;
- KS 2060 SPECIFICATION FOR MOTOR GASOLINE
- KS 1309-1:- SPECIFICATION FOR DIESEL FUELS PART 1;- AUTOMOIVE GAS OIL
- KS 1309-2:- SPECIFICATION FOR DIESEL FUELS PART 2;- INDUSTRIAL DIESEL OIL

2.4.3 Petroleum Monitoring Unit (PMU)

The petroleum monitoring unit (PMU) is charged with three responsibilities once the standards have been made law through publication or notification through the Kenya gazette:

- i) Monitoring and enforcing Petroleum Standards across the country.
- ii) Testing for compliance, Petroleum Products manufactured /marketed in the country.
- iii) Monitoring and testing all Petroleum Products imported into the country.

The Technical Committee on Fuels (KEBS) agreed that the sulphur level be reduced to 500ppm (or 0.05%) sulphur. This is scheduled to become effective starting January 2010. This is the level that is recommended worldwide. The amount of sulphur in the product shall be based on the following classification;

- low sulphur diesel 16-500ppm sulphur content
- ultra low sulphur diesel 15ppm sulphur content

2.5 Trend Analysis of Air Quality

Case Study on Ambient Air Quality Levels in Urban Areas

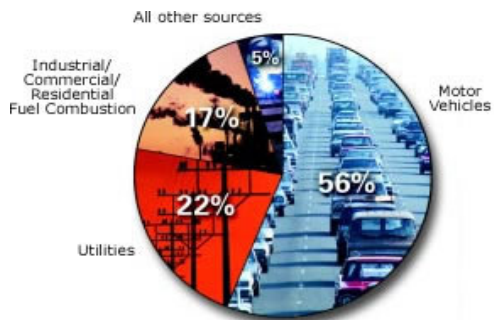
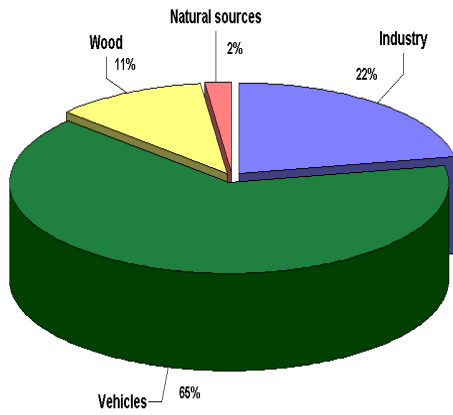
Major sources of ambient air pollution

North America: Motor vehicles (Diesel), Coal and oil - Fire powered power plants

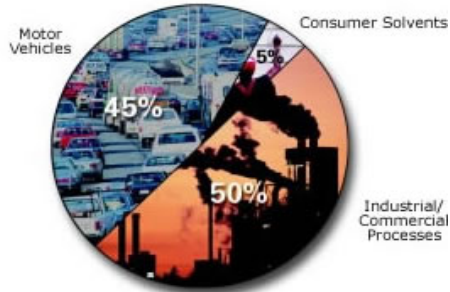
Africa: Motor vehicles (diesel), Industries, open burning and windblown dust

Sources of air pollution

SOURCE APPORTIONMENT - CAPE TOWN BROWN HAZE

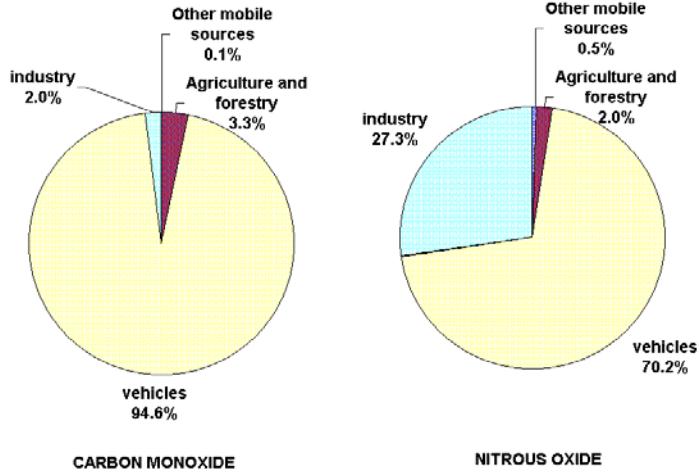


Sources of NOx



Sources of VOC

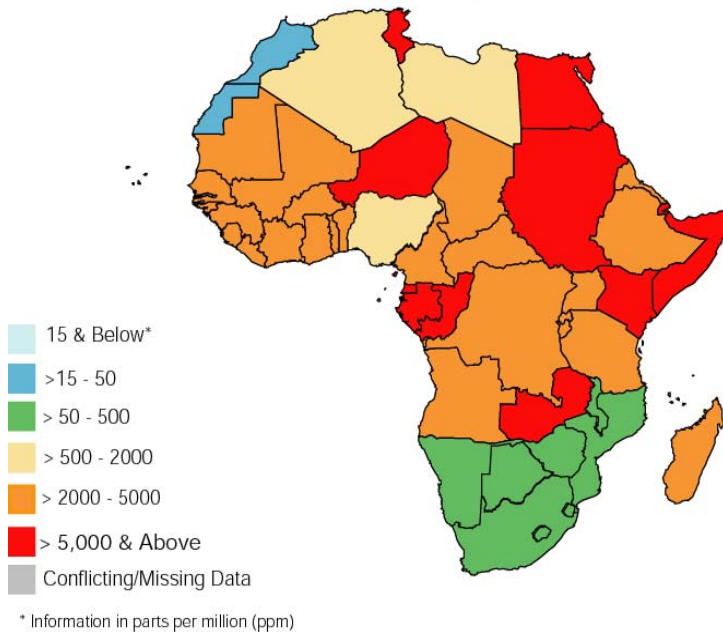
South Africa's example of air pollution sources



Progress in lowering sulphur in fuels in Africa



Diesel Fuel Sulphur Levels: Africa Status
Feb 2009



Feb 2009

Approximately 25 –75% of urban air pollution is traced to motor vehicles which use fuel of low quality (dirty fuel) resulting from the crude oil which has high sulphur content. This leads to increased emissions of SO² particulate matter. Other vehicle emissions also are Carbon monoxide, Hydrocarbons, Nitrogen Oxide, and lead. These are the major primary pollutants.

Secondary pollutants include Surface ozone, Nitrogen dioxide (NO₂) resulting from oxidation of NO, Hydrocarbons (HC) - toxic hydrocarbons include benzene, 1,2-butadiene, aldehydes & polycyclic aromatic hydrocarbons (PAH).

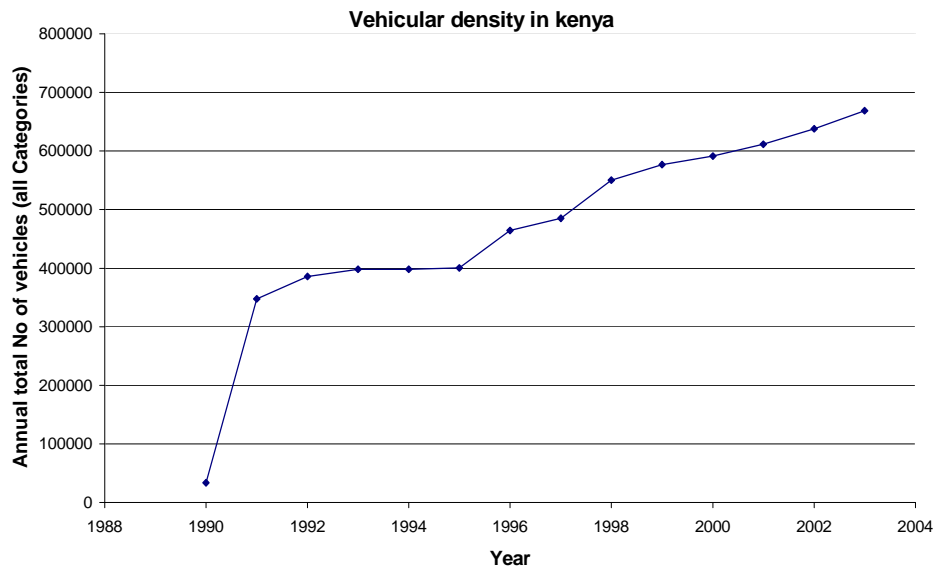
One other key emission is particulate matter (in form of soot) which exists in two types namely; PM_{2.5} (Respirable) fine particulates and PM₁₀ (inhalable). Both have adverse health implications.

2.5.2 Kenya Meteorological Department Urban Air Pollution Programme

As an initiative to monitor air pollution from vehicular emissions, a collaborative research was carried out between 2004 and 2008 by Kenya Metrological Department (KMD) as a lead institution, University of Nairobi (UON) and National Council for Science and Technology (NCST).

Three air pollution assessments were carried out in Mombasa in 2004, 2005 & 2008 over different seasons, and in Nairobi three assessments were done. The first case study in Kisumu is to be undertaken in November 2009

As part of air quality monitoring, KMD has undertaken to establish air pollution stations in Nairobi, Mombasa and Kisumu. These are the areas with the highest density of vehicles in the country.



As a result of the rapid increase in vehicle density in the country, KMD undertook roadside measurements in six sites namely; Mwembe Tayari, Sabasaba, Kongowea, Likoni Ferry, Miritini and Digo road. The following tables show the PM₁₀ concentration mean values for the six sites (ug/m³) as at November 2008.

Site No	Site Name	PM 10 in ug/m ³
1.	Mwembe Tayari	123
2.	Sabasaba	366 (V. Unhealthy)
3.	Kongowea	285
4.	Likoni Ferry	339 (Unhealthy)
5.	Miritini	218
6.	Digo road	117

AUG 2004; PM10 mean=450 ug/m³ in Mombasa was HAZADOUS

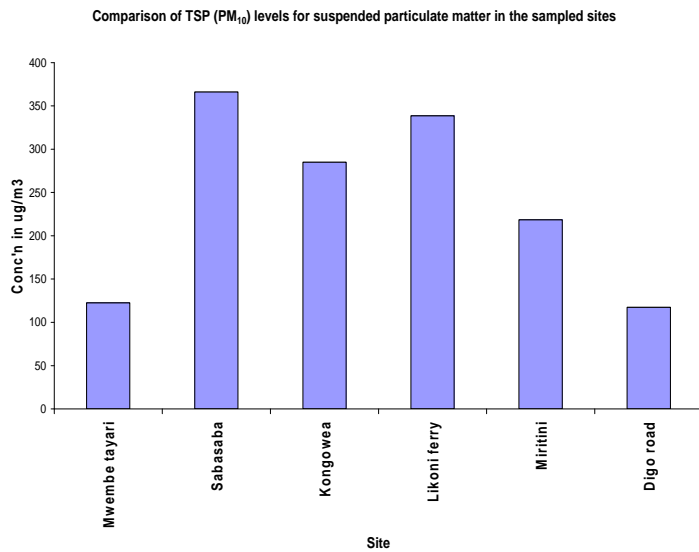


Table2: PM10 Levels in Nairobi-Nov 2004

Sampling site No:	Site Name	PM 10 in ug/m ³
1.	Githurai	581.3
2.	Westlands	375.4 (Unhealthy)
3.	Jogoo road	398.9 (V. Unhealthy)
4.	Juja road	333.8

US EPA STANDARDS FOR PARTICULATES

PM10	PM2.5	TSP	AIR QUALITY
0 – 50	0 – 15	0 – 75	GOOD
51 – 150	15 – 65	76 – 260	MODERATE
151 – 350	66 – 150	261 - 375	UNHEALTHY
351 – 420	151 – 250	376 – 625	VERY UNHEALTHY
> 421	> 251	> 626	HARZARDOUS

SOURCE: US EPA JULY 1997

VEHICULAR GASEOUS POLLUTANTS IN MOMASA

Gases	MWEMBE TAYARI	SABASABA	KONGONEA	LIKON FERRY	MRTIN	DIGO ROAD
CO	107	52	8	53	3	8
NO	4438	2980	2391	2967	1862	329
NO2	197	19	22	71	34	8
SO2	52	191	57	20	16	8

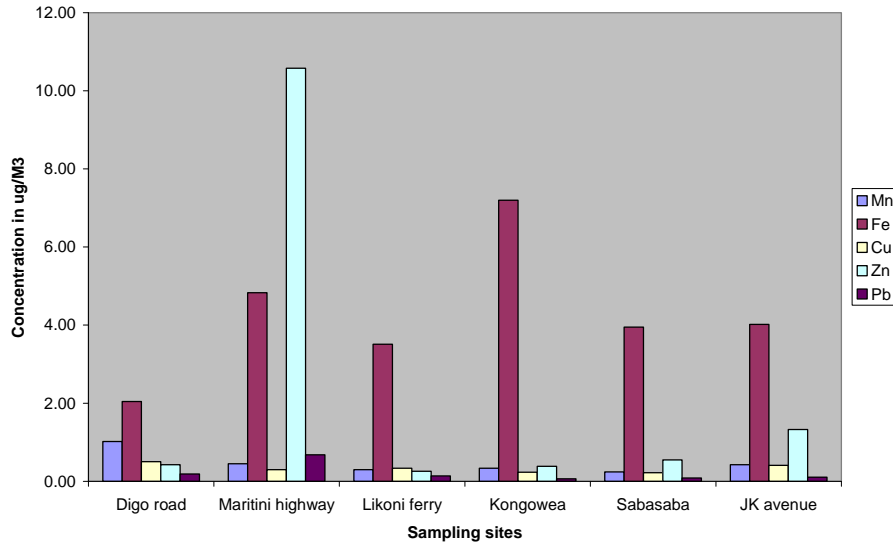
NAIROBI- Gaseous pollutants, NO, NO2, NOx, and CO (all in ppm)

Sampling site	NO	NO2	Nox	CO
JUJA RD	9.36	2.33	11.78	3.19
Westlands	16.5	6.3	22.6	3.78
Jogoo Rd	17.49	4.2	21.4	3.8
Githurai	8	3.234	9.44	3.52

From the observations, particulates are very high in Both Mombasa and Nairobi > 150 ug/m³ (WHO standard for PM10), while the gaseous concentrations are low for both Mombasa & Nairobi

HEAVY METALS

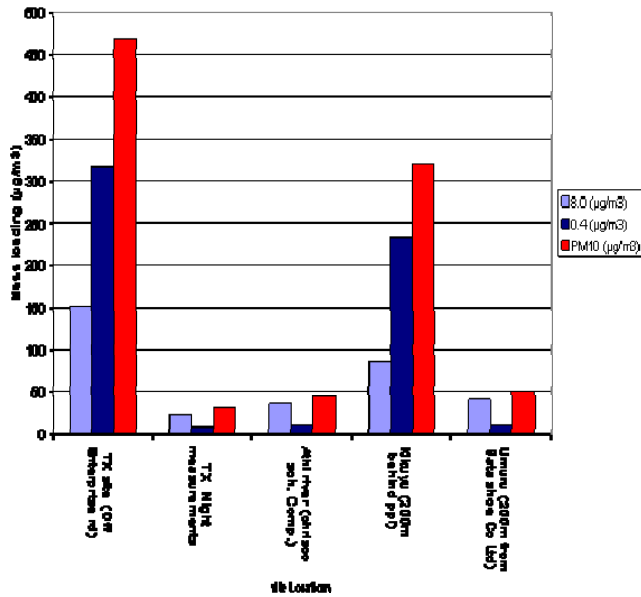
Elemental loadings in the sampled sites



Industrial ambient air quality

This was carried out in four sites in Nairobi and its outskirts. They included Enterprise Road (Nairobi), Athi River, Kikuyu and Limuru towns.

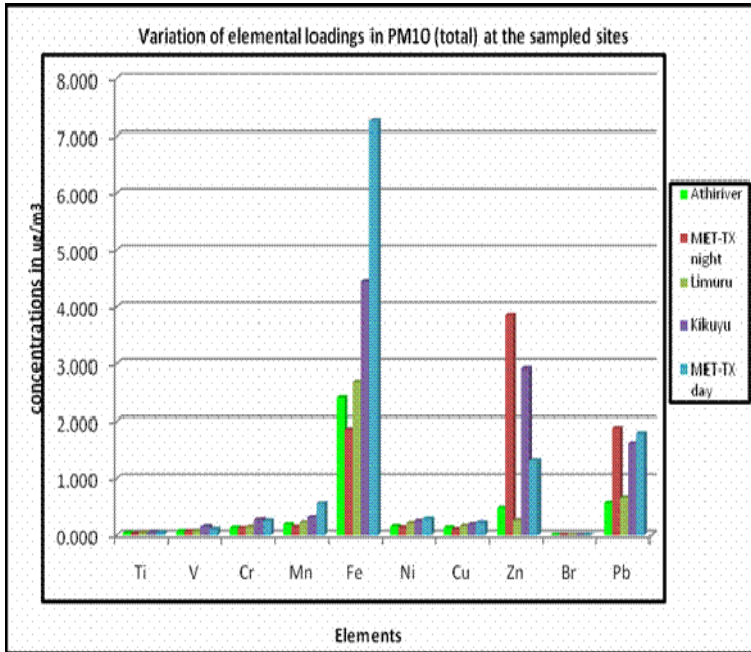
Ambient Air Quality in Nairobi Metropolitan industrial zones



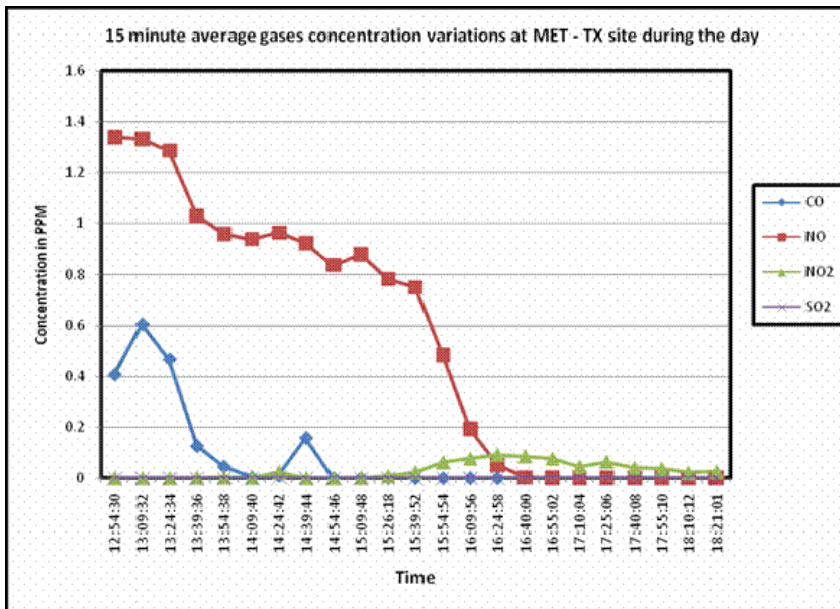
AQ INDEX

- Kikuyu PM10 = 320 ug/m3 (Unhealthy)
- TX site PM10 = 468 ug/m3 (Hazardous)

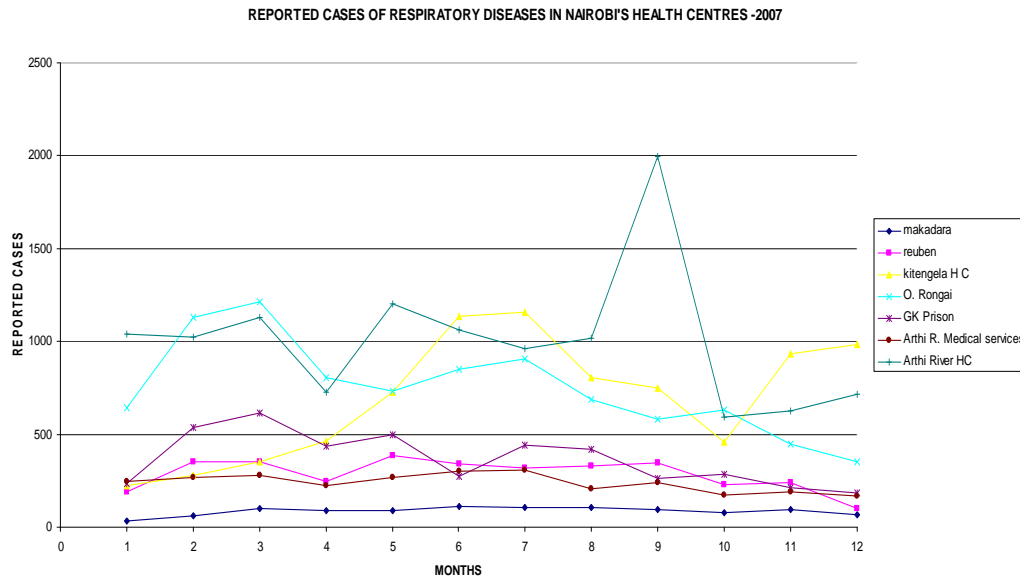
HEAVY METALS AT INDUSTRIAL AREA



Examples of gaseous emission at Enterprise Road



Example of reported cases of respiratory at Nairobi Health Centres (KMD & Ministry of public health study-2007)



Athi River Health centre reported the highest cases of respiratory diseases followed by Kitengela and Ongata Rongai. In the first two cases residents live very close to cement factories. Data observations indicate that respiratory cases are second to Malaria in Athi River.

Air pollution risk assessment in Kenya

Health risk assessment of air pollution in Kenyan cities is hampered by data gaps (lack of continuous measurements); rapid urbanization and corresponding air pollution poses a challenge to environmental authorities i.e. the unique urban contexts e.g. populations, built-up environments and pollutant mixing.

It can therefore be concluded that high concentrations of particulate matter, above 200 µg/m³ in all sites exceeds WHO limits of 150 -201 µg/m³. Strout city is an example of European city whose PM₁₀ levels are within WHO limits. Low levels of lead (Pb) in Mombasa shows the ban in usage of leaded fuels is bearing fruit. Mombasa city on the other hand is as polluted as Nairobi city where particulate levels exceeds WHO limits and this poses a real threat to human health

Pollution monitoring recommendations

While there is need for systematic and adequate air pollution monitoring network in Kenya cities, the current Level of vehicular pollution need to be brought down in Mombasa & Nairobi. It is important that relevant Ministries and lead Agencies seek funds for Urban Air pollution Monitoring.

2.6 Market, Supply and Cost Benefit Analysis of Fuel by Petroleum Institute of East Africa

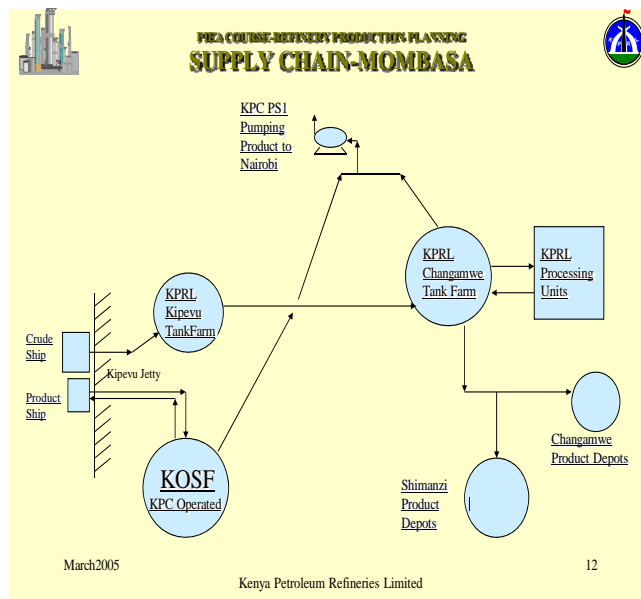
The Petroleum Institute of East Africa discussants described the status of marketing, supply and cost benefits of fuels in the country. The presentation featured the petroleum supply chain and its market process which showed the beginning of the petroleum business structure starting upstream with exploration and production, oil and gas. Downstream, there is refining and manufacturing, distribution through the pipeline and depots and finally there are sales.

2.6.1 Crude Oil Sourcing

Crude oil is sourced from United Arab Emirates (75%) and Saudi Arabia (25%). Marketers process at least 1.6 million tons annually. Kenya Supplied 45% through high sulphur diesel processed at Kenya Petroleum Refineries Limited (KPRL) & 55% imported diesel. Diesel Produced by KPRL has Sulphur content between 7,000 & 10,000 ppm.

2.6.2 Supply Chain - Mombasa

The picture below shows the chain of supply at the port of Mombasa.



2.6.3 Terminals & Jetties in Mombasa

Kipevu Oil Terminal receives crude oil that is taken into Kenya Petroleum Refineries Ltd (KPRL) and white oils into KOSF, who have large vessels with up to 80,000 metric tons. Shimanzi Oil terminal receives smaller ships with up to 25,000 metric tons with terminals

connected to KPRL by pipeline and to rail system. Mbaraki is also a jetty. Products handled include white oils, black oils, and liquefied petroleum gas. Lubricant base oils are imported and blended at Mombasa. Main local distribution depots include Mombasa (Caltex, Kobil, and Total), Nairobi (Kobil, Total, Shell/Libya oil, National Oil Corporation) and Nakuru/Kisumu/Eldoret. Transit products are permitted 30 days residence in Kenya and can be transited from Kenya Pipeline Company depots.

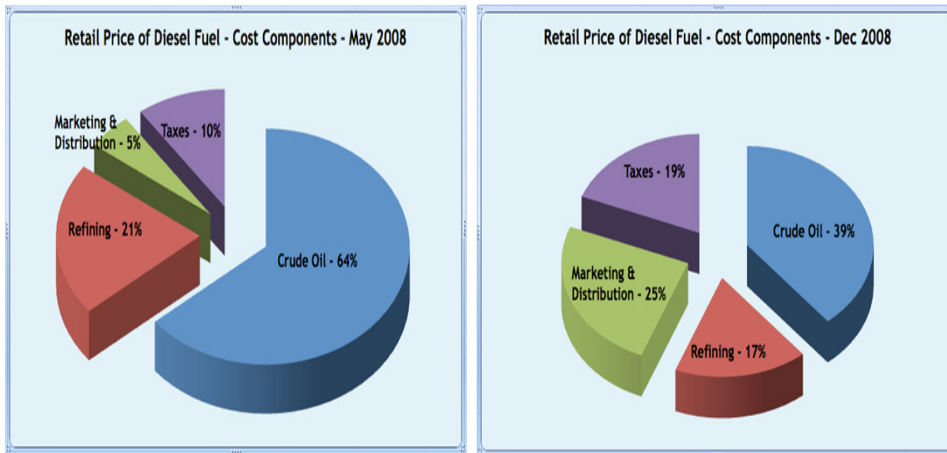
2.6.4 Marketers in Kenya

There are International Oil companies like Shell and Total who are present in nearly all business segments. Regional oil companies include Kobil, Engen, Petro, Gapco, etc while local companies are National Oil, Dalbit, Galana etc. There are 30% service stations which are independent service stations and buy products from the cheapest suppliers. All importers, wholesalers and exporters are licensed by Ministry of Energy after meeting defined criteria by processing crude oil to meet about 70% of their market requirements, and to have an agreement with KPC. Service stations are currently licensed by provincial administration.

The regional sales and demand distribution are divided into Nairobi, Western and Coast regions. Nairobi tributary area serves Nairobi, Central and Eastern contributing to 60%; Western tributary includes Rift Valley, Nyanza, Western and accounts for 30%, while Coast region accounts for 10%.

2.6.5 Cost Implications of Adapting to Low Sulphur Fuels

Factors that influence the cost of fuel include economics, supply and availability, income levels, and government policies. Global fuel trend costs influence local costs by the price of crude oils, higher inflation rate, transportation costs, etc. Diesel consumption is closely aligned with economic growth of the nation, crude oil prices in the market, inadequate and delayed imports leading to unexpected disruption in supply of diesel fuel.



Product Cost

Initially downward trend in prices of crude oil & diesel was anticipated in 2009 & 2010 due to low demand, weak economies, and attempts by organization of petroleum exporting countries to trim production to support higher prices. Costs are therefore influenced by imbalance of excess supply and reduced demand. Typical differential - \$1 to \$2 per barrel between the high sulphur and low sulphur diesel function of demand and government price regulations affect the product cost.

Health costs include decrease in productivity and loss of income due to absenteeism due to loss of work days; economic growth/industrialization increase in urban transport/energy consumption; increased motorization/production increase pollution levels; increase in health conditions/diseases resulting from hydrocarbon pollutants and increased health budgets and costs.

Environment and vehicle costs including destruction of the environmental aesthetic, acid rain compromising quality of soil that threatens food security; increased vehicle maintenance costs, corrodes pistons and wears out cylinders; increases diesel and fuel lubricant consumption among others. Adopting to use low sulphur fuels and cleaner vehicles will reverse the health and environment costs greatly.

PLATT'S FOB PRICES - AUGUST 2008

Market	Gas Oil Sulfur Level	FOB \$Bbl	FOB Difference from 5,000 ppm \$Bbl	FOB Difference in Shs/Liter
Singapore	500 ppm	148.14	2.00	0.85
	2,500 ppm	147.54	1.40	0.59
	5,000 ppm	146.14	Nil	Nil
Arab Gulf	500 ppm	144.65	3.30	1.41
	2,500 ppm	143.45	2.10	0.89
	5,000 ppm	141.35	Nil	Nil
Australia	500 ppm	155.32	2.00	0.85
	2,500 ppm	154.72	1.40	0.59
	5,000 ppm	153.32	Nil	Nil

3.0 CHAPTER THREE

3.1 AWARENESS CREATION ON LOW SULPHUR

The project carried out three regional workshops and one national policy-makers workshop to sensitize different stakeholders on the need to adopt low sulphur fuels and cleaner vehicles as outlined below.

3.1.1 Regional Workshop held at Mombasa Beach Hotel, 19th August, 2009

The first regional workshop was held in Mombasa Beach Hotel, 19th August, 2009. The objectives of the workshop were to have knowledge on the trends in specifications for fuels especially the reason why low sulphur fuels should be used.

3.1.2 Regional Workshop held at Kisumu Hotel, 9th September, 2009

This was the second regional workshop organized by MVIU in collaboration with NEMA and funded by UNEP. The aim of the workshop was to sensitize stakeholders on the benefits of the use of low sulphur diesel and also to discuss the effects of sulphur diesel emissions to the environment towards the human health.

The objectives of the workshop were highlighted as follows:

- To reduce sulphur in vehicle fuels to 50ppm or below worldwide, concurrent with clean vehicles and clean vehicles technologies, with roadmaps and timelines developed regionally and nationally.
- To create awareness on the harmful effects of High Sulphur contents in fuels on economic, social and environment.

Stakeholders had several expectations including wanting to understand the harmful effects of high sulphur contents in fuels, the current levels of compliance on low sulphur fuels globally and locally including availability of Standard and any actions being taken to meet the low sulphur fuel standards in the country.

3.1.3 Regional Workshop held at Utalii Hotel, Nairobi 7th October, 2009

The third regional workshop was held at Utalii Hotel on 7th October 2009. The objectives of the workshop were highlighted as follows:

- To engage the stakeholders to mainstream low sulphur fuels and clean vehicles as part of sustainable air quality management in their future plans.
- To seek co-operation and joint efforts in the deployment and application of newer emission control technologies that should substantially lower toxic emissions.

- To promote the use of low sulfur fuels and recognize that these fuels will continue to impact positively in our economy and environment.
- To create awareness on the harmful effects on high sulphur contents in fuels on the economy, social and environment sectors.

At the end of the workshop the participants were expected:

- To establish the current level of compliance on low sulphur fuel contents both locally and globally and what measures are being taken to meet the low sulfur fuel standards.
- To come up with clear resolutions and the way forward.
- To come up resolutions from the lessons learnt so as to improve on future workshops.

3.1.4 National Policy Makers' Workshop - Utalii Hotel, Nairobi 22nd October, 2009

The national workshop was held on 22nd October, 2009 at the Utalii hotel.

Objectives

- To find integrated ways to reduce the sulphur contents in fuels to as low as 50ppm
- To sensitize and create awareness to all Kenyans on the regulations on air quality standards.
- To build more partnerships with all stakeholders in formulating environmental laws and harmonizing the existing ones in order to manage the environment effectively and efficiently and achieve Vision 2030.

Expectations

- Participants to be convinced on the need and importance to move to low sulphur fuels use.
- Kenya Petroleum Refineries to assist in de- sulphuring crude oil by adapting to cleaner production technology.
- Successful implementation of using low sulphur fuels as it was with unleaded fuel to meet global trends.
- Rolling out of air quality regulations once they are gazetted.
- Better lives for all people.
- Hospital bills from environmental related diseases to go down when a clean and healthy environment is achieved.

4.0 CHAPTER FOUR

4.1 FINDINGS AND RECOMMENDATIONS

4.1.1 Findings

From the consultative workshops it is evident that there is need to reduce the sulphur contents in fuels and actions plans need to be put in place in order to achieve this objective.

- Kenya Bureau of standards will have set standards on low sulphur fuels from 5000ppm to 500ppm by March 2010. Ministry of Energy needs to fast track the gazettment of the standard.
- Kenya petroleum refineries is set to undergo modernization process which will result in massive reduction of sulphur content in fuels to 30ppm in less than two (2) years.

4.1.2 Recommendations

- Sensitize communities at the grassroots through Provincial and District Environment Committee on the need for a clean and healthy environment.
- Implementation of low sulphur regulation should be given the same approach as was used to phase out leaded petrol in the country.
- All stakeholders including ERC, KEBs, PIEA MVIU and NEMA should work together and harmonize their operations. A task force should be formed and mandated to streamline the operations with the view to avoid duplication and overlap of duties.
- Clear time frame for implementation of low sulphur regulation must be set out.
- KPRL plans to lower sulphur levels in diesel fuels to at least 500ppm in the short term with a target of 50ppm as a long term goal while combining with clean fuel efficient vehicles for maximum benefits.
- Vehicles imported should be fitted with catalytic converters.
- Review vehicle importation age and emissions.
- KMD to play a major role in monitoring the levels of sulphur using their machines.
- Phase out plan needs to be put in place for the 2 stroke engine and adoption of petrol engine (tuktuk).

4.2 Conclusion

There is need to brief the Permanent Secretary in the Ministry of Energy of the future plans and the need for a representation from the Ministry during future meetings.

There will be a media campaign on promoting the benefits of using low sulphur fuels, during which and NEMA is to carry out an emissions testing clinic in Nairobi as a demonstration to the public. MVIU should also inspect vehicles regularly and ensure that their service is maintained as scheduled.

IMPLEMENTATION ACTION PLAN

Date	Activity	Actor	Achievements/Remarks
March 2010	Final review Project Progress Report	NSC	
	Finalization of media campaign materials	NSC	
April 2010	Roll out of media campaign	NEMA, MVIU, PIEA,	
	Dissemination of awareness materials (stickers/brochures)	NEMA, MVIU	
	Vehicle Emissions Testing Clinic	NEMA, MVIU, Toyota Kenya	
May 2010	Monitoring of progress at KPRL, Mombasa	NSC	
June 2010	Final Report Writing	NSC	
	Handing over final report to UNEP	NSC	

ANNEXES



MVIU



REGIONAL SENSITIZATION WORKSHOP ON LOW SULPHUR FUELS AND CLEAN VEHICLES HELD AT MOMBASA BEACH HOTEL, MOMBASA 19TH AUGUST, 2009

PROGRAMME

TIME	ACTIVITY	RESOURCE
OPENING SESSION		
8.00 a.m – 8.30 a.m	Arrival and Registration	Cecilia Muchama/ Mary Mutheki
8.30 a.m – 9.00 a.m	<ul style="list-style-type: none"> ▪ Introductions ▪ Official welcome & Opening remarks ▪ Objectives and expectations of the workshop 	H. Wambayi, NEMA Provincial Commissioner, Coast Province Ruth Musembi, NEMA
9.00 a.m – 9.20 a.m	<ul style="list-style-type: none"> ▪ Partnership for Clean Fuels and Vehicles (PCFV), Global Sulphur Campaign 	Anne Marie Kinyanjui (UNEP)
9.20 a.m – 9.40 a.m	<ul style="list-style-type: none"> ▪ Overview of the Legal and Regulatory Framework on Environmental Pollution. 	David Ongare Ag. Director, EE, I & PP (NEMA)
9.40 – 10.00 a.m	<ul style="list-style-type: none"> ▪ Overview of Health Impacts of Major Pollutants from Vehicles 	Kilindi Kilei (MPHS)
10.00 a.m – 10.30 a.m	<ul style="list-style-type: none"> ▪ Q& A Session 	Wangari Kihara
10.30 a.m – 11.00 a.m	HEALTH BREAK	
SESSION II		
11.05 a.m – 11.25 a.m	<ul style="list-style-type: none"> ▪ Environmental Impacts of Vehicle Emissions 	Robert Orina (NEMA)
11.25 a.m – 11.45 a.m	<ul style="list-style-type: none"> ▪ Fuel Standards in Kenya 	Albert Nyangechi (KEBs)
11.45 a.m – 12.05 p.m	<ul style="list-style-type: none"> ▪ Case Study on Ambient Air Quality Level in Mombasa 	Mwai Muitung'u
12.05 a.m -12.25 p.m	<ul style="list-style-type: none"> ▪ Motor Vehicle Emission Testing, Inspection and Maintenance 	Musa Mutonyi (MVIU)
12.30 a.m – 1.00 p.m	<ul style="list-style-type: none"> ▪ Q& A Session 	PDE, Coast
1.00 pm – 2.00 p.m	LUNCH BREAK	
SESSION III		
2.10 p.m – 2.30 p.m	<ul style="list-style-type: none"> ▪ Supply and Marketing of Fuel in Kenya 	PIEA/Oil Industry Rep Wanjiku Manyara
2.30 p.m 4.00 p.m	<ul style="list-style-type: none"> ▪ PLENARY ▪ Way Forward 	David Ongare
4.00 p.m – 4.30 p.m	<ul style="list-style-type: none"> ▪ Closing remarks/ Vote of thanks/Departure 	Abdi Mohammed, (DMVIU)



MVIU



**REGIONAL SENSITIZATION WORKSHOP ON LOW SULPHUR FUELS AND CLEAN VEHICLES HELD AT
KISUMU HOTEL, KISUMU
WEDNESDAY, 9TH SEPTEMBER, 2009**

PROGRAMME

TIME	ACTIVITY	FACILITATOR
OPENING SESSION		
8.00 a.m – 8.30 a.m	Arrival and Registration	Cecilia Muchama/ Agnes Kamiri
8.30 a.m. – 9.00 a.m	<ul style="list-style-type: none"> ▪ Introductions ▪ Official welcome & opening remarks ▪ Objectives and expectations of the workshop 	Hildegard Wambayi (NEMA) Provincial Commissioner, Nyanza Province Ephraim Angachi (MVIU)
9.00 a.m. – 9.20 a.m	<ul style="list-style-type: none"> ▪ Partnership for Clean Fuels and Vehicles (PCFV), Global Sulphur Campaign 	Annemarie Kinyanjui (UNEP)
9.20 a.m. – 9.40 a.m.	<ul style="list-style-type: none"> ▪ Motor Vehicle Emission Testing, Inspection and Maintenance 	Musa Mutonyi (MVIU)
9.40 a.m. – 10.00 .m.	<ul style="list-style-type: none"> ▪ Case Study on Ambient Air Quality Levels in Mombasa and other regions 	Mwai Muitung'u (NEMA)
10.00 a.m. – 10.20 a.m.	<ul style="list-style-type: none"> ▪ Environmental Impacts of High Sulphur Vehicle Emissions on Human Health and the Environment 	Robert Orina (NEMA)
10.20 a.m. – 10.30 a.m.	<ul style="list-style-type: none"> ▪ Q& A Session 	Wangari Kihara (NEMA)
10.30 a.m. – 11.00 a.m.	HEALTH BREAK	
SESSION II		
11.00 a.m. – 11.25 a.m.	<ul style="list-style-type: none"> ▪ Overview of the Legal and Regulatory Framework on Environmental Pollution. 	Dr. Ayub Macharia (NEMA)
11.25 a.m. – 11.45 a.m.	<ul style="list-style-type: none"> ▪ Fuel Standards in Kenya 	Antony Langat (KEBS)
11.45 a.m. – 12.05 p.m.	<ul style="list-style-type: none"> ▪ Refinery's Position 	Gulam Hussein (KPRL)
12.05 a.m. -12.25 p.m.	<ul style="list-style-type: none"> ▪ Supply and Marketing of Fuel in Kenya 	Wanjiku Manyara (PIEA)
12.30 a.m. – 1.00 p.m.	<ul style="list-style-type: none"> ▪ Q& A Session 	Kodia Bisia, PDE Nyanza
1.00 p.m. – 2.00 p.m.	LUNCH BREAK	
1.00 pm –2.00 p.m	SESSION III	
2.00 p.m. – 2.40 p.m.	<ul style="list-style-type: none"> ▪ PLENARY ▪ Way Forward 	Dr. Ayub Macharia (NEMA)
2.40 p.m. 3.00 p.m.	<ul style="list-style-type: none"> ▪ Closing remarks/ Vote of thanks 	Abdi Mohammed (MVIU)



MVIU

**REGIONAL SENSITIZATION WORKSHOP ON LOW SULPHUR FUELS AND CLEAN VEHICLES
UTALII HOTEL, NAIROBI - 7TH OCTOBER, 2009**

PROGRAMME

TIME	ACTIVITY	FACILITATOR
OPENING SESSION		
8.00 a.m – 8.30 a.m	Arrival and Registration	Cecilia Muchama/ Mary Mutheki
8.30 a.m. – 9.00 a.m	<ul style="list-style-type: none"> ▪ Introductions ▪ Official welcome & opening remarks ▪ Objectives and expectations of the workshop 	Oceanic Sakwa, Rep. PDE, Nairobi Robert Orina (NEMA) Provincial Commissioner, Nairobi Province (MVIU)
9.00 a.m. – 9.20 a.m	<ul style="list-style-type: none"> ▪ Partnership for Clean Fuels and Vehicles (PCFV), Global Sulphur Campaign 	Annemarie Kinyanjui (UNEP)
9.20 a.m. – 9.40 a.m.	<ul style="list-style-type: none"> ▪ Motor Vehicle Emission Testing, Inspection and Maintenance 	Musa Mutonyi (MVIU)
9.40 a.m. – 10.00am.	<ul style="list-style-type: none"> ▪ Case Study on Ambient Air Quality Levels in Mombasa and other regions 	Peter Bundi (Metrological Department)
10.00 a.m. – 10.20 a.m.	<ul style="list-style-type: none"> ▪ Environmental Impacts of High Sulphur Vehicle Emissions on Human Health and the Environment 	Robert Orina (NEMA)
10.20 a.m. – 10.30 a.m.	<ul style="list-style-type: none"> ▪ Q& A Session 	Wangari Kihara (NEMA)
10.30 a.m. – 11.00 a.m.	HEALTH BREAK	
SESSION II		
11.00 a.m. – 11.25 a.m.	<ul style="list-style-type: none"> ▪ Overview of the Legal and Regulatory Framework on Environmental Pollution. 	Dr. Ayub Macharia (NEMA)
11.25 a.m. – 11.45 a.m.	<ul style="list-style-type: none"> ▪ Fuel Standards in Kenya 	Paschal Vusa (KEBS)
11.45 a.m. – 12.05 p.m.	<ul style="list-style-type: none"> ▪ Refinery's Position 	Gulam Hussein (KPRL)
12.05 a.m. -12.25 p.m.	<ul style="list-style-type: none"> ▪ Supply and Marketing of Fuel in Kenya 	Wanjiku Manyara (PIEA)
12.30 a.m. – 1.00 p.m.	<ul style="list-style-type: none"> ▪ Q& A Session 	PDE, Nairobi
1.00 p.m. – 2.00 p.m.	LUNCH BREAK	
SESSION III		
2.00 p.m. – 2.40 p.m.	<ul style="list-style-type: none"> ▪ PLENARY ▪ Way Forward 	Dr. Ayub Macharia (NEMA)
2.40 p.m. 3.00 p.m.	<ul style="list-style-type: none"> ▪ Closing remarks/ Vote of thanks 	Abdi Mohammed (MVIU)



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NATIONAL POLICY MAKERS' SENSITIZATION WORKSHOP ON LOW SULPHUR FUELS AND CLEAN VEHICLES ON 22ND OCTOBER, 2009 AT UTALII HOTEL, NAIROBI

PROGRAMME

TIME	ACTIVITY	FACILITATOR
OPENING SESSION		
8.30 a.m – 9.00a.m	Arrival and Registration	Cecilia Muchama/Mary Mutheki
SESSION I Chair: Dr. Ayub Macharia Director, Environmental Education, Information & Public Participation, NEMA		
9.00 a.m. – 9.15a.m.	<ul style="list-style-type: none"> ▪ Prayer and Introductions 	Robert Orina, NEMA
9.15a.m. – 9.30a.m.	<ul style="list-style-type: none"> ▪ Official Welcome, Objectives and Expectations 	Dr. Muusya Mwinzi Director General, NEMA
9.30a.m. – 9.40a.m.	<ul style="list-style-type: none"> ▪ Opening Remarks 	Representative of the Minister for Environment and Mineral Resources
9.40a.m. -10.25a.m.	<ul style="list-style-type: none"> ▪ Case Study on Ambient Air Quality Levels in Urban Areas & Its Impacts on Environment & Health 	Peter Bundi Meteorological Department
10.25a.m. – 10.45a.m.	<ul style="list-style-type: none"> ▪ Partnerships for Clean Fuels and Vehicles (PCFV), Global Sulphur Campaign & Highlight on Ministerial Air Quality Meeting 2008 	Jane Akumu, UNEP
10.45a.m. – 11.00a.m.	T E A B R E A K	
SESSION I Chair: Dr. Kennedy Ondimu Director, Environmental Planning and Research Coordination, NEMA		
11.00a.m. – 11.20a.m.	<ul style="list-style-type: none"> ▪ Cost Implications on Adopting to Low Sulphur Fuels 	Wanjiku Manyara, PIEA
11.20a.m. - 12.20p.m.	<ul style="list-style-type: none"> ▪ Plenary Session 	Dr. A. Macharia
12.20p.m. -12.50p.m.	<ul style="list-style-type: none"> ▪ Way Forward 	
12.50p.m. -1.00p.m.	<ul style="list-style-type: none"> ▪ Official Closing 	Provincial Commissioner, Nairobi
LUNCH BREAK		

LIST OF PARTICIPANTS

ATTENDANCE LIST

NO.	NAME	ORGANIZATION	PHYSICAL ADDRESS	TELEPHONE NO.	E-MAIL
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14.	Victor Tuitoek	Kenya Shell Ltd	Shimanzi P O Box 43561 Nairobi	0722-997052	Victor.v.tuitoek@ksi.shell.com
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20.	Musa James Omungu Mutonyi	Motor Vehicle Inspection Branch (Nairobi)	P O Box 78822 – 00507 Nairobi	0722-419842	musamutonyi@gmail.com
21.	Martin Omondi	Motor Vehicle Inspection Unit	Likoni Rd P O Box 78877 – 00507	0722-825837	martiugerroh@yahoo.com
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24.	Ali Khamis Mohamed	Wananchi Machinery		0720-547044	
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28.	Dipesh Mashru	Mash Bus & PN Mashru Ltd	Port Reite, Changamwe P O Box 98728 Mombasa		infor@pnmashru.com
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APPENDIX 2: LIST OF PARTICIPANTS

REGIONAL WORKSHOP ON LOW SULPHUR FUELS AND CLEANER VEHICLES HELD ON 9TH SEPTEMBER 2009 AT KISUMU HOTEL

PARTICIPANTS LIST

1	Millicent Akinyi Odhiambo	Shajanand Hardware P.O. Box 1485 Prison Road Kericho	32185 0722683600 0735557335	shigroup@yahoo.com chhabhadai@yahoo.com
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5	Ravi Kotecha	Midland Emporium Ltd P.O. Box 2083 – 40100 Obote Road Kisumu	0720633099	ravikots@hotmail.com
6	C. I. Evans Getembe	Kenya Police (S.O.T. Kericho) P.O. Box 3 Kericho P.O. Box 352, Molo	0729344886	
7	Haron M. Amima	James Finlays Kenya Ltd. P.O. Box 71 Kericho	0722220980	haron.amima@finlays.co.ke
8	Ken Grant	James Finlay (Kenya) Ltd Finlays Engineering Dept. P.O. Box 71 - 20200 Kericho	052-20155-9	ken.grant.co.ke
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APPENDIX 1: LIST OF PARTICIPANTS

ATTENDANCE LIST - UTALII HOTEL 7TH OCTOBER, 2009

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OPENING AND CLOSING STATEMENTS

OPENING REMARKS BY PROVINCIAL DIRECTOR OF ENVIRONMENT- ISAIAH KYENGO- 19/8/2009



Mr. Isaiah Kyengo welcomed the team from UNEP, MVIU, NEMA colleagues and the other stakeholders to the workshop on behalf of the Provincial Commissioner.

He emphasized the fact that whenever any new idea is introduced, it is difficult for people to accept change without resistance. He gave the example of low sulphur and unleaded fuel campaigns which are meant to give engines a long life. The high sulphur fuels currently being used affect vehicles, the environment and health in general.

Mr. Kyengo urged the participants to be ambassadors to educate and create awareness on the benefits of using low sulphur fuel at all levels. He mentioned that what the participants would learn from the workshop was key and hence be put into practice. Finally he thanked the participants for making efforts to attend the important workshop on the Benefits of using Low Sulphur and Clean Vehicles.

CLOSING REMARKS BY ABDI MOHAMMED, DIRECTOR, MVIU

In his closing remarks, the Mr. A. Mohamed expressed his pleasure on the level of participation during the workshop. He informed the participants that the forum gave an excellent opportunity collaborative effort in addressing air and noise pollution issues on a more sustainable footing, given the increase on the number of vehicles and levels of noise on our roads which adversely affect the environmental quality. The Environment is affected by vehicle emissions which are now a leading contributor to the greenhouse gas placing climate in jeopardy. He reiterated that environmental considerations have forced many countries to introduce regulations to limit the pollution caused by motor vehicles.

Rapid urbanization has brought tremendous opportunities and benefits in areas like education, health care and social services but it has also brought significant challenges as towns and cities work to absorb higher populations. One of the challenge is how to deal with the increasing number of vehicles on the road particularly, harmful vehicle emissions. Scientists have associated increases in extreme weather and weather-related disasters, the disappearance of forests and coastlines, and irreversible damage to crucial ecosystem with even small changes in climate. If the current trend is not checked, it would put the lives and livelihoods of millions at risk, with profound consequences for everyone, but especially for the poor.

Climate change, as we know, is principally the result of carbon-based energy consumption, or the burning of fossil fuels. Vehicles emit large quantities of carbon monoxide, hydrocarbons,

nitrogen oxides, and other toxic substances such as fine particles. The fine particles associated with vehicle emissions penetrate deep into lung tissue causing respiratory ailments and cardiovascular complications.

Vehicle emissions tend to be geographically concentrated and are difficult to disperse. Many people live and work close to traffic, including vulnerable groups such as the young and the very old. As the quantity of vehicle emissions increases, the quality of air deteriorates. This is now aggravated by the rise in the number of motorcycles and three wheelers. Carbon emissions from the transport sector pose an increasing threat to climatic change.

With the dramatic increase in Vehicle usage, transport is not only the largest source of these emissions, but also the fastest growing.

Several factors affect the level of emissions from vehicles, including:-

- Type and quality of fuels that are used
- Emission control technologies
- Vehicle maintenance practices
- Age and rate of turnover of the vehicle fleet

While some countries have taken steps to reduce the level of vehicle emissions less attention has been paid to transport planning as a means of reducing vehicle use such as:-

- Traffic management
- Use of public transport and non-motorized modes of transport

Though Governments are responsible for the legal and regulatory framework, actual achievements in the reduction of air pollution depend upon changes in the behavior of individuals and firms. For example, individual vehicle owners may be reluctant to change their travel habits.

As mobility increases, the consequences of in action will become more severe. Sharing information on technologies, planning approaches, policies and implementation experiences can help build a consensus in favour of change.

In this context, I believe what is needed is a major shift in the way we think about transport to ensure the efficient, responsible and environmentally sustainable movement of people, goods and services. A vision that takes a central approach to urban development, traffic demand management, cleaner fuels and vehicles, and the development and adoption of new technologies.

Bringing a group like this together is key to forging a way forward because progress depends on the partnership and involvement of a wide range of stakeholders.

Finally I wish to thank you all for actively participating in this forum and hope that you will put to good use all what you have learned in this workshop and pass the information to all your colleagues.

Let's commit to take this excellent beginning forward in the spirit of teamwork, to create a cleaner, more sustainable environment for future generations to enjoy.

OPENING REMARKS BY THE PROVINCIAL COMMISSIONER – NYANZA PROVINCE – MR. FRANCIS MUTIE

The Provincial Commissioner (P.C) – Nyanza Province welcomed all participants for sparing some time out of their busy schedule to attend this important workshop on environment that is touching on health issues. He encouraged participants to go out of their way to educate the public to enhance a healthy environment hence safe guarding environment. The Provincial Commissioner was very happy with the collaboration of NEMA/MVIU/UNEP in sensitizing the public on the effects of sulphur.

Participants were urged to keep on reminding people on the issue of sulphur fuels just like churches and mosques keep on reminding their followers on righteousness.

Lastly he advised participants to come up with sustainable suggestions to guide and help the public to implement this noble idea on the ground and declared the workshop officially opened.

CLOSING REMARKS/VOTE OF THANKS BY ABDI MOHAMMED

Mr. Abdi Mohammed in his closing remarks informed members that he was happy with the great success of the workshop with over 50 participants from various sectors attending.

He further informed members that motor vehicle exhaust emissions have been identified as a significant contributor to air pollution and environmental damage. This poses a great risk to the survival of all organisms including the human being and the ecosystems that support life. Climate change was also mentioned as a result of greenhouse gas emissions. Kenya is one of the countries that will go to Copenhagen, Denmark for a meeting scheduled sometime this year to discuss issues of climate change with a hope of adopting a new binding agreement that will apply to all major emitters.

To reduce the rate of growth in greenhouse gases from the transport sector, the problems must be addressed holistically. This means changing from existing travel behavior pattern from the use of personal private transport modes towards greater use of public transport as well as modifying urban development patterns to minimize the length and frequency of trips that people need to take.

There is need to revise the transport sector strategy to better respond to the urgent needs of our people based on the following four complementary approaches to increase energy efficiency in the transport sector as follows:

- Improve the energy efficiency of individual vehicles.
- Promote less energy-intensive forms of transport.
- Improve urban design to reduce individual's need to travel and
- Change to fuels with lower green-house gas emissions.

Cities and towns are engines for economic growth and development; they drive economic development and provide employment. However, urbanization has caused health hazards,

pollute the surroundings, encroach on lands and block sustainable development. Addressing urban air pollution will require an integrated approach which addresses not only mobile sources of pollution but which also includes activities to reduce pollution from stationary sources. However, minimizing the share of vehicular air pollution will remain the most important challenge.

The government should ensure that new vehicles entering the country are as clean as possible. The introduction of these cleaner vehicles will require that the cleaner fuels needed for these vehicles are made available. However, changing fuel specifications cannot be instant, oil refinery need to be modified and manufacturers of motor vehicles need to change engine specifications to ensure that air quality benefits materialize. It is the responsibility of the government to regulate the fuel quality in a phased and forward looking way. In doing so, it is important that the process has four characteristics:

- The regulations are based on sound science so that investments in fuel improvement will result in lower emissions and improved air quality.
- That they are issued in a predictable and phased manner with time frames that permits the oil and the vehicle sectors to prepare for the implementation of the new standards.
- That they are transparent and provisions are included for the monitoring of the new standards.
- That they are discussed with all concerned sectors and actors to ensure their support and acceptance to the new regulations.

Mr. Mohammed also said that the presentations at the workshop focused on the importance of cleaner fuels for lower vehicle emissions, international experience in producing cleaner fuels as well as regulatory and fiscal instruments to promote the introduction of cleaner fuels. It is recognized that NOT all countries in this region can move at the same speed in introducing cleaner fuels. What is important though, is that all countries begin to move in the right direction and that they articulate and announce their plans and objectives clearly. Once this starts to happen we will be one big step closer to cleaner air.

It is worth noting that national public health expenditure is expected to increase with worsening air pollution. Respiratory diseases are increasing especially among the poor. This therefore calls for an integrated, well co-ordinated approach in tackling air pollution as it is a multi-sectoral issue and affects all sections of the population.

As a nation we need to pause and ask ourselves the following questions:

- Why should we continue to import vehicles that do not meet the required standards in the exporting countries?
- Why do we still allow importation of fuel with high sulphur content?
- Why do we lack a formal public transport facilities while we know of countries with rapid bus transit or rail system that are cost effective?

Mr. Mohammed thanked the participants and presenters ones more for their contribution in making the workshop a success. Before declaring the workshop officially closed he quoted a famous pioneer in the Motor Industry who onces said “*coming together is a beginning, keeping together is progress and working together is succes*”

OPENING REMARKS BY DR. AYUB MACHARIA AT THE NATIONAL WORKSHOP

In his welcoming speech, Dr. Macharia emphasized the fact that the environment is a global issue which should be given serious attention. Polluting the environment with dangerous odours and other types of waste brings about impacts on climate change, water and electricity rationing, human health problems including reduced life expectancy, respiratory diseases like asthma, hospital admissions which reduce work productivity generally increase poverty levels, among others. He applauded the efforts being made in bringing stakeholders together to deliberate on how to address the issues that come out of the meetings and chat the way forward.

Mr. Abdi, in his welcoming address, assured the participants that the motor vehicle inspection unit had came up with machines that can measure emission of smoke and how oil is combusted in a vehicle. This has proven the seriousness of curbing pollution in the environment and would go a long way in ensuring that the standards are met as far as cleaner vehicles, human health and environmental issues are concerned. He emphasized the importance of Provincial Administration and the work they do with communities at the grassroot levels. He reiterated the need to incorporate them to create awareness on the need to move to low sulphur fuels.



**OFFICIAL WELCOME AND OPENING REMARKS
BY MR. PETER LELEY, DEPUTY PROVINCIAL COMMISSIONER, NAIROBI.**

In his welcoming address, Mr. P. Lelei who was representing the Provincial Commissioner, talked about fuel adulteration. He elaborated that fuel adulteration is a concern that the fuel industry should help curb by putting measures in place that regulate how fuel is handled. He said that fuel issues being technical can effectively be handled in a technical manner. The deliberations made during the meeting would inform policy, put in place regulations and standards to address fuel matters. He applauded the initiative to encourage the use of low sulphur fuels and cited the successful story of the unleaded fuel campaign by UNEP which brought about unleaded fuel into the market. He then read the Provincial Commissioner's speech.

In his speech, the PC was grateful to be invited to this very important event. He applauded the initiatives and efforts of all stakeholder involved to make such a workshop and the project a success. He highlighted the need to protect the environment by reducing sulphur content in fuel and thus attaining clean vehicles which leads to improved health and a better environment for all.

Sulphur not only impacts negatively on human health, but also on the environment and motor vehicles. Developed Nations are ahead of us in recognizing and taking action towards attaining cleaner vehicles and low sulphur fuels and Kenya should not be left behind.

Kenya is important in the regional fuel debate as it is a transit point for many of her neighbors who are landlocked, such as Uganda and Rwanda. This means that the quality of fuel in Kenya affects not only her people and neighbors but also the environment as a whole. The workshop therefore has come at an opportune time when attaining a clean and healthy environment is a challenge and demands our collective participation. Environmental awareness is fast growing and our neighbors in the region must guard such knowledge jealously and act fast to reverse the ills of environmental degradation.

He appreciated the presence of all industry players, particularly in the transport, oil and motor vehicle industries, who are involved every day with sulphur products.

While we await a solution to traffic snarl ups in our city, it is clear that the air we breathe while sitting in traffic jams is not healthy. Any effort to reduce this menace is a welcome move. He challenged all participants actively deliberated on the issues of having clean air and come up with ways to be used to lobby policy makers in a few weeks time. The valuable contributions will be used to fast track the move to low sulphur as recommended globally and gain the rewards of a cleaner environment and better health.

INTRODUCTION AND OPENING REMARKS BY DR. AYUB MACHARIA

The workshop started by Dr. A. Macharia welcoming the participants to the workshop and a word of prayer from Mr. R. Orina. The participants then made self introduction indicating which organizations they were representing.

Dr. Macharia then applauded the efforts being made by all to ensure a clean and healthy environment is achieved. He encouraged the participants to do all that is within their powers to clean environment. This will contribute to reduction of environmental related diseases like upper tract respiratory diseases, water borne diseases, malaria etc. Having a clean environment will also contribute to the reduction of hospital admissions and bill and save the nation time, money as well reduce impacts on climate change.

CLOSING REMARKS BY MR. PETER LELEI, DEPUTY PC, NAIROBI

Mr. Lelei in his closing remarks started by saying that he empathizes with NEMA for the enormous task it is mandated with of ensuring that there is a clean and healthy environment. Being a cross cutting entity, its supervisory and coordinating role is very challenging. The need for support from other stakeholders is therefore very important to help it achieve its mandate. He said that the Provincial Administration sector will work closely with NEMA to ensure that the regulations are enforced. Before creation of administrative boundaries, the issue of having an environment officer for the newly created district will be addressed in future. This will help to ensure that funds are allocated to NEMA in order for it to meet its overwhelming mandate to keep pace with the development trends.

He said the workshop to promote use of low sulphur fuels and clean vehicles was a good initiative and efforts by all concerned to ensure that this is achieved was commended. The environment will then be a clean and health will be improved for all. Kenya being an oil transit point for many of her neighbors who are landlocked, such as Uganda and Rwanda plays a major role in ensuring that the quality of oil meets the set standards. Developed Nations are ahead in recognizing and taking action on this and Kenya must not be left behind. Environmental awareness is growing fast in the region and Kenya must act quickly to reverse the ills of environmental degradation.

Finally he thanked all the industry players, particularly in the transport, oil and motor vehicle industries who are involved on a daily basis with sulphur products, for taking time to attend the workshop. By pooling their efforts together, the project's objectives will be achieved.

He requested the policy makers to hasten decisions that will contribute to reducing sulphur levels in fuels which will take Kenya closer to the clean and healthy environment we all desire. He then declared the workshop officially closed.



Towards a Clean and Healthy Environment

Mombasa Beach Hotel, 19th August, 2009



Utalii Hotel, Nairobi
7th October, 2009