UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES LTD

DEVELOPMENT OF A FUEL ECONOMY LABELING AND FEEBATE PROGRAMME FOR MOTOR VEHICLES IN KENYA

FINAL DRAFT REPORT

Submitted by:
J. K. Kenduiwo
Deputy Managing Director
University of Nairobi Enterprises and Services Limited
Arboretum Drive, off State House Rd
P.O. Box 68241-00200 Nairobi, Kenya.
Tel: +254-20-2714240/0722-205498
Fax:+254-20-2714048
E-mail: unes@uonbi.ac.ke website: www.uneskenya.com

Report Submitted to:
Eng. Joseph Ng'ang'a
Director General
Energy Regulatory Commission,
3rd Floor, Eagle Africa, Longonot Road, Upper Hill
P.O. Box 42681-00100,
NAIROBI.
Telephone +254-20-2847000/200, Fax : +254-20-2717603
E-mail: info@erc.go.ke

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LIST OF ABBREVIATIONS

ADR	Australian Design Rules
CBD	Central Business District
CO_2	Carbon Dioxide
ERC	Energy Regulatory Commission
EPA	Environment Protection Agency
EU	European Union
FE	Fuel Economy
FTP	Federal Test Procedure (U.S.A)
GFEI	Global Fuel Economy Initiative
GHG	Greenhouse Gas
GMEA	General Motors East Africa
GVW	Gross Vehicle Weight
IDF	Import License Fee
KEBS	Kenya Bureau of Standards
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
KNH	Kenyatta National Hospital
KPA	Kenya Ports Authority
KRA	Kenya Revenue Authority
KVM	Kenya Vehicle Manufacturers
LDV	Light Duty Vehicles
MNL	Multinomial Logit
NEDC	New European Driving Cycle
NEMA	National Environment Management Authority
NO_x	Nitrous Oxides
NTSA	National Transport and Safety Authority
PIEA	Petroleum Institute of East Africa
PM	Particulate Matter
SIAM	Society of India Automobile Manufacturers
SUV	Sports Utility Vehicle
UK	United Kingdom
UNEP	United Nations Environment Programme
UNES	University of Nairobi Enterprises and Services
US	United States

EXECUTIVE SUMMARY

In March 2013, the Government of Kenya through the Energy Regulatory Commission signed an agreement with UNEP to establish the country's average fuel economy (setting of baseline) and to carry out a Cost Benefit Analysis (CBA) of different policy options that promote fuel efficient vehicles. The focus of the study was the category of vehicles with a gross weight of less than 3,500 kgs and referred to as Light Duty Vehicles (LDVs). Computed records of 2010, 2011 and 2012 were used to develop the fuel economy of the local fleet of LDVs.

In February 2015 the Energy Regulatory Commission contracted the University of Nairobi Enterprises and Services Ltd (UNES) to carry out a feebate and vehicle labeling study as a follow up study to recommendations proposed in the initial vehicle inventory study.

Feebate is a combination of fees and rebates in which a 'fee' is levied on inefficient vehicles and a 'rebate' is rewarded to efficient vehicles. A Feebate system consists of a set bench mark emission (for instance, in gCO_2/km), above which a fee is levied on the inefficient vehicles and a rebate system through which less polluting vehicles (efficient vehicles) are rewarded. In a feebate system fees paid by vehicles polluting more than average is paid to efficient vehicles polluting less than average. Vehicle fuel labeling is the provision of information on vehicle fuel economy using vehicle stickers which in most cases are mound on the vehicle windscreen where prospective vehicle buyers can easily view. Vehicle fuel labeling is important for consumers to understand the choices available to them. Where government policies reward fuel economy; vehicle labeling helps consumers compare vehicle choices and can help consumers understand the cost implications over the lifetime of the vehicle.

In the feebate and labeling study the research team conducted comparative analysis of various programs in the world, identified success factors for vehicle labeling and feebate programs through review of programmes implemented world-wide. The researchers also undertook feasibility assessment based on interaction and study of stakeholders. They also conducted a survey and analysis of consumer behavior focusing on car dealers to determine the

fee to be charged and rebates to be given. The team consulted government official from key government institutions. Economic and financial analyses have been conducted to assess the resultant effects of implementing a feebate program. Lack of access to historical data on revenue generated from importation of vehicles has hindered timely and successful finalization of the study.

Three candidate fuel labels are herein proposed after in depth analysis of relevant literature and consultation with key stakeholders. The labels are presented for the client's consideration and indication of preferred choice. Designed labels are discussed in section 3 of this report. In developing the vehicle fuel labels, the team made the design as simple as possible. Consumers are likely to view the labels for a very short time. The team reviewed labels developed internationally taking note of international best practice.

To ensure that the feebate study was successfully concluded, analysis of data on revenue generated from vehicle for the past 5 years was done. Multi –criteria and econometric analysis was conducted to guide the design of the program. The study considered two estimations, the first one with petrol powered vehicles and the second with vehicles using diesel. In each estimation, a random sample size of 2000 vehicles using the data sets from 2010 – 2014 was used. Based on the dataset and results, it is evident that the higher the engine capacity, the more fuel consuming and high carbon emissions from a vehicle.

The econometric analysis using multinomial logit (MNL) established that there are very small differences in the choice of vehicle purchase based on the broad categorization of fuel type and engine size category. One thing worth mentioning is that, taking the engine size of 2501 – 3500 cc as the reference level, the purchase of vehicles within 1301 – 1500cc would register marginal decrease when import duty which directly affects vehicle pricing increases by one unit. The import duty which was taken as a proxy for any government action through taxation, would have significant effect on choice of vehicle purchase based on engine size category.

The estimations were useful in determining the rebate and rate to be charged as a fee and as an incentive in the implementation of the feebate program. Using the dataset, simulations yielded

an average CO_2 emission of 169.88 gCO_2/km which were consequently used to establish the benchmark CO_2 emission of 169.00 - 169.99 gCO_2/km. It is also worth noting that based on the dataset, the lowest carbon emitting car is Toyota Prius 91.96 gCO_2/km while the highest carbon emitting car is Bentley vehicle model 387 gCO_2/km.

In the GFEI study it was established that average age of registered light duty vehicles was 7.5 years during the period of study. The average fuel consumption was established as 7.62L/100 km while the average CO_2 was 181.78g/km for the period of study. Part of the recommendations of the study was to put measures to ensure purchase of low fuel consumption/emission vehicles and ensure that all vehicles undergo regular inspection for road worthiness and emissions.

To enhance implementation process, we recommend that Kenya Bureau Standards (KEBs) in consultation with Energy Regulatory Commission (ERC) and other stakeholders develop a standard on vehicle labeling. ERC should hold consultative forums with key stakeholders to come to an agreement on proposed vehicle labels.

In conclusion, the study established that increases in duties and fees is likely to have some marginal effects in vehicle purchase and thus influence choice based on engine size. Secondly, it was established that the average CO_2 emission using the 2010 – 2014 dataset is 169.88 gCO_2/km and the average fuel consumption is 7.12 L/100km. Therefore, implementation of feebate programme is likely to have an impact in influencing purchase of fuel efficient and less carbon emitting vehicles. Additionally, the proposed benchmark of between 169.00 gCO_2/km to 169.99 gCO_2/km and a rate of Kshs 1,500 would not significantly differ from countries that have feebate programs initiated.

1. INTRODUCTION

1.1. Background

In March 2009, the United Nations Environment Programme (UNEP), the International Energy Agency, the International Transport Forum and the FIA Foundation, launched the Global Fuel Economy Initiative (GFEI). The aim of GFEI is to reduce localized air pollution, greenhouse gas emissions and Global National Fuel bills through the promotion of cleaner fuel efficient vehicles. Subsequently, in March 2013, the Government of Kenya through the Energy Regulatory Commission signed an agreement with UNEP to establish the country's average fuel economy (setting of baseline) and to carry out a Cost Benefit Analysis (CBA) of different policy options that promote fuel efficient vehicles.

The focus of the study was the category of vehicles with gross weight of less than 3,500 kg and referred to as Light Duty Vehicles (LDVs). Records of registration of vehicles from KRA for the years 2010, 2011 and 2012 were used to develop the fuel economy of the local fleet of LDVs.

The prominent outcomes of the study included the following:

a) The total annual registration of all vehicles had increased from 33,917 in 2003 to 110,474 in 2012.
b) On the basis of the trend during the 2003 to 2012 period, predicted cumulative total registration could be 5 million in 2030 and 8.7 million in 2050.
c) The average age of registered light duty vehicles was 7.5 years during the period of study.
d) The average fuel consumption was established as 7.5L/100 km while the average CO_2 was 181.9g/Km for the period of study.
e) The number of motorcycles registered increased exponentially from 51,855 in 2008 to 140,153 in 2011.

Analysis of the data related to the population of vehicles also highlighted the following effects;

Most of the vehicles are concentrated in cities with the largest number in the capital city, Nairobi where the vehicle population is approximated to be 30% of the National figure. The traffic congestion continues to degrade the air quality in the city. Recent studies show high levels of most of the pollutants exist in the central Business District (CBD) of Nairobi. For example, concentration of fine particles in the CBD was recently measured as 98.1µg/m^3 while it is a fact that exposures above 46.1 µg/m^3 increases the risk of respiratory diseases.

The substantial growth in the number of motorcycles registered was attributed to their convenience and accessibility as motorized transport. As of 2011, the registered number was 140,000. However their presence was also associated with two negative social costs; excessive pollution and increased number of accidents.

A study at Kenyatta National Hospital (KNH) used a model that focused on respiratory illnesses attended to at the hospital and concluded that a prevalence level greater than greater than 90% exists and this with increased risk of infection in children of less than 5 years old.

The economic survey 2014 estimated the country's expenditures on petroleum products in 2012 as Kshs. 33.3 billion.

The recommendations of the study included:

a) Subjection of all vehicles to regular inspection for road worthiness and emissions.
b) Provision of efficient mass transit (bus/train) system in towns and cities.
c) The state should encourage purchase of low fuel consumption/emission vehicles.

At the conclusion of the study and on the basis of the recommendations, UNEP provided funding for a subsequent study on feebate program that would incentivize consumers to purchase more efficient vehicles. Consumers purchasing more efficient vehicles would receive an incentive and those purchasing less efficient than average would have to pay a fee.

1.2. Feebate Program

A feebate is a market based policy for encouraging reduction of greenhouse gas emissions from the passenger vehicles by levying fees on relatively high emitting vehicles and providing rebates on lower emitting vehicles. The program can be extremely useful in supporting the widespread adoption of clean fuels and vehicle technologies.

Provision of information on fuel consumption using labels on the vehicle is important in enlightening customers on fuel economy to encourage choices based on financial running costs. Display of stickers on the windscreen of the vehicles inform the prospective buyers of the fuel consumption and carbon dioxide emissions The labels enable consumers to also know the extent to which the vehicles they are buying contribute to the global climate change.

Feebate is a combination of fees and rebates in which a 'fee' is levied on inefficient vehicles and a 'rebate' is awarded to efficient vehicles. A Feebate system consists of a set bench mark emission (for instance, in gCO_2/km), above which a fee is levied on the inefficient vehicles and a rebate system through which less polluting vehicles (efficient vehicles) are rewarded. A feebate system is basically a "transfer" system, not a "tax", since the fee paid by inefficient vehicles is transferred to efficient vehicles. Figure 1.1 presents a generalized depiction of a feebate system

1.3. Vehicle Labeling

Provision of information on vehicle fuel economy using vehicle labels is important for consumers to understand the choices available to them. Where fiscal regimes incentivize fuel economy; vehicle labeling helps consumers compare vehicle choices and can assist consumers understand the tax implications over the lifetime of the vehicle.

Different approaches are taken to vehicle labeling in terms of the metrics, amount and type of information provided and graphical presentation. Vehicle fuel economy labels usually fall into one of three types, depending on how the information is provided:

a) Graphical rating (e.g. from A to G) is used in the UK and New Zealand;

b) Direct information disclosure, by providing the value of the CO_2 emissions or fuel economy, is the most common system and used in the US, South Africa, Australia, Singapore, Chile and India; or

c) Relative vehicle performance compared to the fuel economy standard, used in Japan.

The proposed labeling programme in Kenya would need to take into account the local condition.

1.4. New Vehicle Purchase Scheme

The predominant scheme in most countries for purchase of new vehicles has targeted major cities where high vehicle and human population tend to result in deterioration of the air quality. This has been the experience of cities like London, Delhi and Cairo where high levels of Particulate Matter (PM) and Oxides of Nitrogen (NO_x) have prompted implementation of scrappage programmes. Typically, such programmes offer financial incentives on surrender of an old vehicle in exchange for a more efficient one. The age at which a vehicle qualifies for scrappage is predetermined by Local Authorities e.g. it is 13 years in Austria and 20 years in Cairo.

Buy-back programmes have also been widely used to accelerate the retirement of older vehicle technology. Buy-backs provide monetary or other incentives to vehicle owners to voluntarily retire their older, often more polluting vehicle. Incentives may be provided directly to the owner and may take the form of tax benefits or may be paid directly to the newer vehicle vendor. The funding for such programmes' is typically provided by the state and industry.

In South Africa the buy-back programmes are not state funded. They are arrangements between the seller who guarantee to buy –back the vehicle after an agreed duration of use. One would buy the car for X amount and the seller guarantees to buy it back at Y amount. The options and guidelines available on line give the details as regards the purchase price, cost of insurance and registration and buy back amount after 3 or 6 months. It is also a requirement that the vehicle be initially tested and assessed by AA at the buyers cost.

2. METHODOLOGY

2.1 Introduction

In this study the consultant reviewed all available relevant information. The study team carried out literature review on Feebate Program, Vehicle labeling program and new vehicle purchase scheme. Stakeholders in the motor industry and within Government were also consulted.

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2.2 Fuel Economy Labeling Programme

In design of the fuel economy labeling the following procedure was used:

a) Comparative analysis of the various vehicle labeling systems in the world.

b) Identification of the key success factors for vehicle labeling programmes through review of the programmes implemented worldwide.

c) Applicability / feasibility assessment based on interaction and study of stakeholders (vehicle owners/ state agencies / consumer representative groups).

d) Design of a well safeguarded vehicle labeling system of both new and used imported vehicles.

e) Review of the proposed vehicle labeling programme after consultative meetings with the stakeholders.

f) Propose the resources (institutional and human capacity) and the regulatory framework required for implementation.

2.3 Feebate Programme

In design of the feebate programme the following procedure was used:

a) Comparative analysis of the various feebate systems in the world.

b) Survey and analysis of consumer behavior focusing on motorists, potential vehicle owners and car dealers – to determine the fee to be charged and rebates to be provided.

c) Identification of key success factors for feebates system.

d) Design of draft feebate programmes for further analysis and selection.

e) Economic /Financial models analysis to guide selection of candidate proposals.

f) Computer simulation analysis of financial incentives (rebates) to promote the sale and use of cleaner vehicles.

g) Scenario analysis and forecasting to establish implications to government and the public and evaluation of effectiveness for GFEI targets

h) Applicability / feasibility assessment based on interaction and study of stakeholders (vehicle owners/ state agencies / consumer representative groups).

i) Evaluation of the resources (institutional and human capacity) and the regulatory framework required for implementation.

j) Review of the proposed feebate programme after a consultative meeting with the stakeholders.

k) Preparation of study report with clear fiscal policy proposals on the implementation of feebates and rebates.

2.4 New Vehicle Purchase Schemes

In design of the New Vehicle Purchase scheme the following was undertaken;

a) Review various models of new vehicle purchase schemes, e.g., Trade-ins/scrappage/Buy backs, credit schemes etc., for both public and private sectors.

b) Identify best practices/successes, key drivers for success and failures.

c) Recommend type and age of vehicle for scrappage. Most cities have identified taxis and passenger service vehicles as the major contributor to poor air quality and recommended appropriate programmes for scrappage and upgrade.

d) Establish terms and conditions for scrappage programmes.

e) Design of suitable new vehicle purchase schemes and

f) Evaluate the resources (institutional and human capacity) and the regulatory framework required for implementation.

3. VEHICLE LABELING PROGRAM

3.1. Vehicle Labeling

3.1.1 Global Outlook of Fuel Efficiency Labeling

Fuel efficiency labeling programs have been instituted in many parts of the world including the United States, United Kingdom, European Union, New Zealand, Australia, Singapore, China, South Korea, India, Chile, Brazil and South Africa. Fuel efficiency labels are displayed on windows of vehicles for sale at dealerships in order to inform consumers.

A labeling program integrating all classes of vehicles will encourage the consumer to purchase a vehicle with higher fuel economy regardless of the size or type of vehicle. On the other hand, a class-based system is helpful if the consumer has already decided to purchase the vehicle of a particular class, such as an Sports Utility Vehicle (SUV). In such a case, the label will help the consumer in selecting a fuel efficient SUV.

Among the countries that currently have labeling programs (i.e. New Zealand, Singapore, Japan, the EU, Brazil, and the US) normally they include some form of comparative information. Labeling programs in China and Australia do not include the information. The following list highlights key features of certain labeling programs worldwide.

a) New Zealand includes a star rating system (half a star to six stars).
b) Labels in Europe use a lettering scheme from 'A' to 'G' instead of stars-- 'A' being the best, and 'G' being the worst. Brazil has adopted this scale as well.
c) In New Zealand, the UK, and the new US label, the comparison is based on an absolute fuel efficiency and/or CO_2 emissions basis (i.e. the same scale of comparison is used for vehicles regardless of fuels, size, or weight).
d) In Singapore, the amount of tax incentives or surcharge is scaled by the amount of CO_2 emission per car. The fuel consumption and the CO_2 emissions are on an absolute scale.
e) In the U.S., the label shows the fuel economy of the vehicle compared to all other vehicles in the same size class.
f) Chile is the only country with emission standards displayed on the label.

3.1.2 Fuel Efficiency Labels for Selected Countries

Here in are brief descriptions of fuel efficiency labels for selected countries:

a) United States

In the United States, the Environment Protection Agency (EPA) label displays the city and highway fuel economy in addition to combined fuel economy. A new label was issued in 2012, which includes GHG and conventional pollutant ratings. The label rates the vehicle *on a scale of one to ten in terms of GHG and smog emissions*. The label also displays an estimated annual fuel cost for the vehicle and the expected savings or increased costs for that particular vehicle compared to the average new vehicle. Plug-in hybrid and electric car labels also show the charge time and the expected range for each full charge.

b) European Union and United Kingdom

In 2000, the EU Parliament introduced legislation requiring that information on fuel economy and CO_2 emissions be provided to consumers for all new passenger cars. Member states have developed different label designs under the Parliament's general guidelines. Finland, the Netherlands, France, and the UK have adopted a scaled comparative label. These labels have a CO_2 based color-coded band system that is similar to energy efficiency labels on appliances. Familiarity with such labels has led to their easy acceptance.

The European Union fuel economy label is based on an absolute scale and not by vehicle class. The vehicles are rated and color-coded from "A" (Best) to "G" (Worst) according to the CO_2 emissions per kilometer. The UK label also includes road tax next to the average yearly fuel cost.

c) Brazil

In 2009, the Brazil National Institute of Metrology, Standardization and Industrial Quality (INMETRO) of Brazil introduced a labeling program for passenger vehicle fuel economy. Apart from information on vehicle make, model, type of transmission and fuel economy (in km/L for ethanol and gasoline-fueled vehicles and in km/m^3 for natural gas vehicles), the label includes a comparative rating scheme. As shown in the label, the vehicles will be rated from 'A' (Best) to 'E' (Worst) according to their energy consumption. The ratings are determined separately for eight different vehicle categories. Four of the vehicle categories are defined by vehicle footprint (sub-compact, compact, medium and large), whereas four other categories are defined by their

functionality (off-road vehicles, light-commercial vehicles, cargo vehicles and sports cars). Vehicle fuel economy labels are voluntary in Brazil.

d) Singapore

The Fuel Economy Labeling Scheme for passenger vehicles is administered by the Singapore Environmental Council and supported by the National Environment Agency. The old Singapore label (started in May 2005) compares fuel consumption by engine size class for city driving conditions. The label indicates engine size and the minimum and maximum fuel consumption for that engine class. On January 1, 2013, Land Transport Authority established a new fuel economy label. The new label shows the CO_2 and fuel consumption of the car based on an absolute scale. In addition, the label has the new Carbon Emissions-Based Vehicle Scheme banding. The label shows the rebate amount for all new and imported used cars with low carbon emission of less than or equal to 160 g/km and Feebate amount for high carbon emissions (>211 g/km).

e) China

China's fuel consumption labels have been mandatory on all cars since 1 January 2010. It includes city, highway and combined fuel consumption. The label displays the vehicle name, model number, engine type, displacement (cc), curb weight, fuel type, Gross Vehicle Weight (GVW), horsepower and transmission type. The label does not show CO_2 emissions. Automobile Fuel Consumption of China has created an online tool for looking up fuel efficiency labels for specific cars for sale in China (in Chinese only).

f) South Korea

The label was established in 2006 from the Energy Use Rationalization Act. Fuel economy is displayed on the label for all passenger vehicles, buses with 15 seats or less and trucks with GVW of 3.5 tons of less. Vehicles are given a grade from 1 to 5, with 1 being the most economical.

g) India

The first fuel economy label in India was developed for new cars that were sold in fiscal year 2011-2012. This label, created by the BEE (Bureau of Energy Efficiency) **is voluntary**. The label shows the combined fuel economy of the vehicle, along with the ranking of fuel efficiency on a five star system. The fuel economy is shown on an absolute scale and on

relative scale (which is the shaded gray part of the absolute scale).

India has another fuel economy label that the Society of India Automobile Manufacturers (SIAM) has created. This label is also **not mandatory** and it is not available for every car. It can only be obtained from a car dealer. The SIAM label is slightly different from the BEE label. The scale is divided by the weight of the car. Then, within the weight class, the fuel economy is marked. The highlighted box in the scale is the range of fuel economy in the same weight class.

h) Chile

Chile became the first Latin American country to mandate LDV fuel economy labels in 2011. The label provides information on CO_2 emissions, fuel economy (highway, city and combined), model and manufacturer. *Chile is the only country whose emission standards are displayed on the label.*

i) New Zealand

New Zealand's fuel efficiency label displays a star rating. There is one rating scale for all vehicles – the more stars, the less fuel it uses (i.e. six stars for the most economical to a half a star for the least efficient). New Zealand has an online fuel economy label generator.

j) Australia

Australia's fuel consumption label has been mandatory on all showroom vehicles since April 2009. The current label is not comparative, as in many EU countries, but does clearly display urban, extra-urban (rural) and combined test fuel consumption, as well as combined test CO_2 emissions.

k) South Africa

Fuel labeling in South Africa started in 2008. Car dealers are required to display stickers on the windscreens of new cars, informing prospective buyers how fuel efficient each vehicle is and how much CO_2 it emits. The labels enable consumers to know the extent to which the vehicles they buy are contributing to global climate change. The label has to be self-adhesive and removable and of a type applicable to windscreens, and must be placed at the bottom corner of the windscreen. The fuel consumption and carbon dioxide emissions values as determined by i.e. SANS 20101: 2006 recorded in litres per 100 km and grams per km respectively.

The Fuel Economy Label allows model to model comparisons and the label must feature the following points of information: Point of sale, EU based, Fuel Economy l/100 km: Combined Cycle, CO_2 emissions g/km, Standard test cycle and Reference fuel.

Table 3.1 highlights vehicle labels specifications for some countries

Table 3-1: Summary of Vehicle Labels for Selected Countries

Countries	Test Cycle	CO_2 emission Displayed?	Fuel Consumption /Economy Unit	Comparison	Mandatory (Yes/No)	Year of Introduction
United States	5 Cycle	Yes	mpg	Relative: Fuel economy Absolute: GHG and smog	Yes	1975
China	NEDC	No	l/100km	---	Yes	2010
South Korea	FTP-75 (up till 2011) US comb. (2012~)	Yes	km/l	Relative: Fuel economy	Yes	
India	NEDC	No	km/l	BEE: Relative and absolute SIAM: Relative	No	2012
Singapore	UN ECE R 101 (NEDC)	No (old)	l/100km	Relative: CO_2 emission Absolute: Fuel consumption	Yes	2013
		Yes (new)			Yes	
Brazil	FTP-75	No	km/l	Relative: Energy consumption by car class	No	2009
Chile	FTP-75	Yes	km/l	Absolute	Yes	2011
Australia	ADR 81/02 (NEDC)	Yes	l/100km	Absolute	Yes	2000
New Zealand	NEDC (new cars)	No	l/100km	Absolute	Yes	
	Japanese 10-15 (used cars)					
EU	NEDC	Yes	l/100km	Absolute	Yes	2011
South Africa	SANS 20101: 2006	Yes	l/100km	---	Yes	2008

3.1.3 Vehicle Labeling best practice

The following are features of a good vehicle labeling programs:

3.1.3.1 Mandatory labeling for all LDV

Mandatory labeling for all LDV is the global standard. Road transport contributes a sizable fraction of global CO_2 emissions. of that, light-duty passenger vehicles account for the majority, with medium- and heavy-duty trucks adding a significant portion.

3.1.3.2 Presentation of fuel consumption data and CO_2 number on vehicle labels

Inclusion of fuel consumption and CO_2 data on vehicle fuel efficiency labels will reduce the current fuel consumption and greenhouse gas emission. This measure is aimed at improving fuel efficiency by providing consumers with a capacity to choose better performing models from among those models that meet their needs. There are no measures of this type currently operating in Kenya. Vehicle dealers and emerging manufacturers should include fuel consumption and/or CO_2 information in their advertisements where they perceive this to be a marketing advantage for the advertised vehicle.

3.1.3.3 Presentation of cost estimate for the next few years on the label

In the US, the label displays the estimated annual fuel cost for the vehicle and the expected savings or increased costs for that particular vehicle compared with the average new vehicle. It rates the vehicle on a scale of one to ten in terms of GHG and smog emissions. As the price of gasoline increases, consumers feel the impact on the operating cost of their vehicle and look for vehicles that meet higher fuel efficiency standards. The more the consumers are concerned about fuel efficiency, the more they search for vehicles that meet their expected fuel economy expectations (McCarthy and Tay, 1998).

3.1.3.4 Link label to fiscal policies

Vehicle labeling should be linked to existing fiscal policies such as feebate and vehicle registration tax. These assist consumers understand the implications of buying fuel efficient cars, especially where such cars are incentivized. An example of vehicle label linked to fiscal policies is the Singapore label that indicates the amount of feebate or rebate a consumer will receive on a vehicle if purchased.

3.1.3.5 Point out Influence of driving style and vehicle use

Buying a fuel-efficient car is only the first step towards achieving good fuel economy. Vehicle labels should point out that driving habits also make a difference in vehicle fuel consumption. The following driving habits can help improve fuel efficiency.

a) **Driving sensibly**: Aggressive driving behavior such as speeding, hard acceleration and sudden braking, can lower car's fuel efficiency by as much as 10%[1]. Driving sensibly includes maintaining a safe distance from other cars and anticipating traffic conditions.

b) **Observing the speed limit:** A car's fuel efficiency decreases at speeds above 90km/h. driving within the speed limit improve fuel efficiency.

c) **Avoid excessive idling:** Idling with the engine on consumes fuel unnecessarily. Switch off your car engine if you are likely to be stopping for more than three minutes.

d) **Remove unnecessary loads:** Avoid carrying unnecessary loads, especially heavy ones, in your car, as any extra loads will reduce the car's fuel efficiency.

e) **Plan ahead:** Before heading out, tune in to the radio or visit the website to check the latest traffic conditions for the route that you are taking. Plan and combine your trips as taking multiple short trips consumes more fuel.

[1] Fuel Economy Guide - Energy Efficient Technologies- Singapore. http://app.e2singapore.gov.sg/DATA/0/docs/Booklet/Buying%20a%20Car.pdf (January 2015)

3.1.3.6 Information on Local Consumer Preferences

The most important factors that influence vehicle choice are reliability, safety, price and fuel economy (Capgemini, 2008). Consumer vehicle purchasing is also influenced by how a vehicle satisfies the practical and emotional needs of the consumer. Age, gender, income, household size, urban or suburban living, as well as availability of other travel options, all play a part in what type of vehicle a consumer decides to purchase, as do the psychographic aspects of 'what a vehicle says about me.'

Through market research one should understand the drivers of consumer behavior to provide important insight on how to better design vehicle labels to influence consumer choice. Behavioral economics, which uses social, cognitive and emotional factors to understand the economic decisions of consumers, explains that consumers are strongly influenced by emotional factors, habits, and by the behavior of the people around them. Fuel economy labels are important because they allow consumers to make informed comparisons among vehicle types.

3.1.3.7 Use branding strategies and supplement label with online-tools

In the design of vehicle labels one should make use of branding strategies such as use of color, star system and banding. Finland, the Netherlands, France, and the UK have adopted a scaled comparative label. These labels have a CO_2 based color-coded band system that is similar to energy efficiency labels on appliances. Familiarity with such labels has led to their easy acceptance.

New Zealand, on the other hand, has adopted a "star" rating system in which vehicles get up to six stars depending on their fuel economy. A single system applies to all vehicles, whereby lower fuel consumption earns more stars.

3.1.3.8 Presentation of information in a clear and concise manner

Good labels should not be overloaded with information and should use units that can be intuitively understood

3.2. Proposed Vehicle Labels for Kenya

In developing the model vehicle fuel labeling options, the consultant made the design as simple as possible. Consumers are likely to view the labels for a very short time. The consultant also took note of international best practice.

3.2.1 Proposed Label - I

The sample fuel label provided indicates both the fuel consumption and CO_2 emission of the vehicle. With expected implementation of a feebate system, the cost savings information which is a very strong consumer motivator will also be indicated. The information on the label is a guide, not a guarantee. It can help car buyers compare different vehicles. The cost per year, star rating and liters per 100km can all be used by car buyers to compare different vehicles, makes and models.

The lower part of the label has a reminder that fuel economy and emissions may be different due to a number of factors, such as how you drive and maintain your vehicle, how much you use air conditioning and other accessories, the weather, road conditions, how much the vehicle is loaded, and other factors.

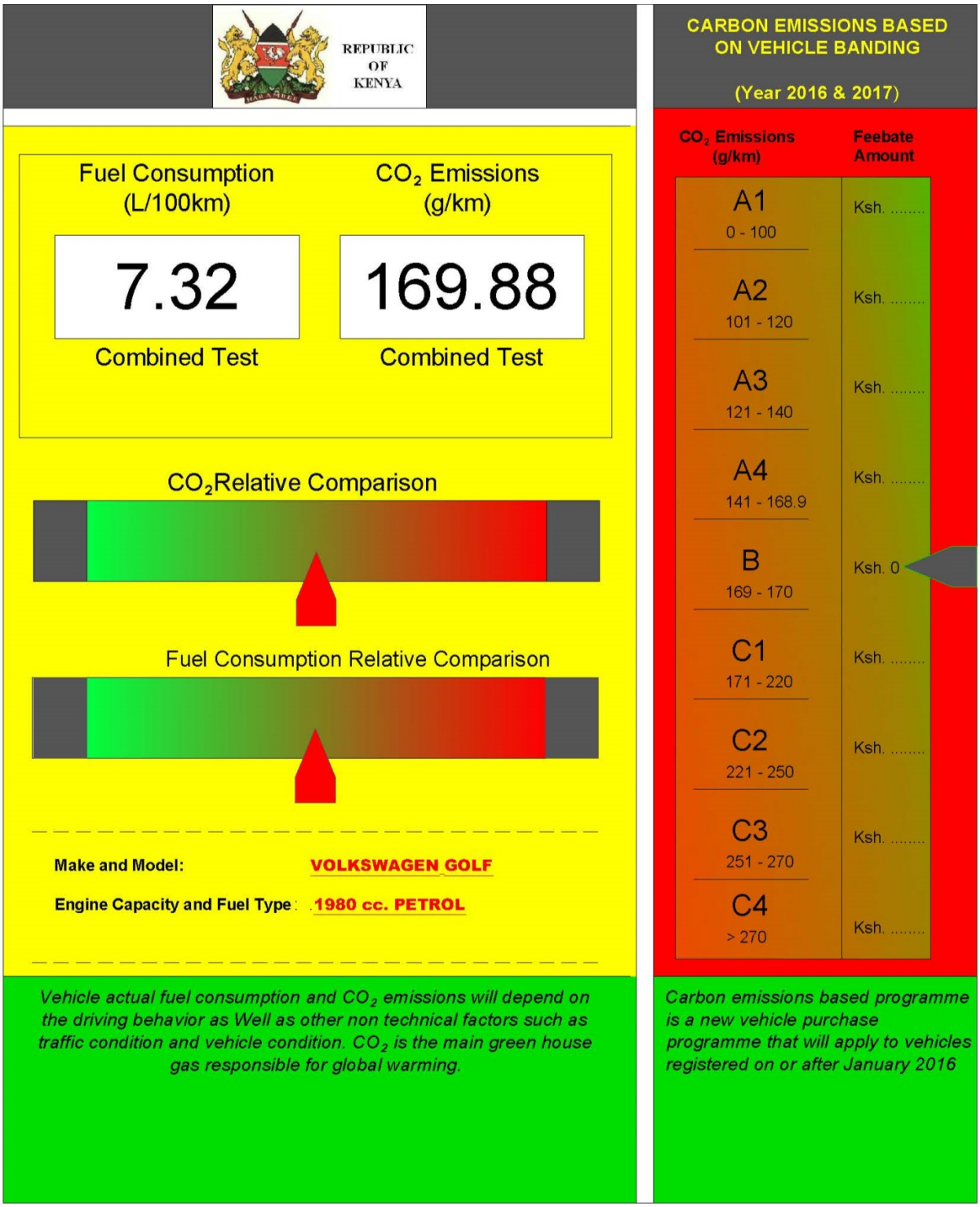

Figure 3-1: Proposed Vehicle Fuel Label (Option 1)

Slide bars provide comparison to other vehicles as a way to helping the consumer understand the values. For all vehicles, the relevant metrics worth highlighting on a label are:

a) Petroleum-based fuel consumption per 100 kilometers
b) CO_2 emissions in grams per kilometers
c) Estimated fee or rebate payable by the customer.

3.2.2 Proposed Label - II

Option 2 assigns each vehicle a rating from 1 (Best) to 5 (Worst) for fuel economy and greenhouse gas (GHG) emissions (i.e., how much carbon dioxide the vehicle's tailpipe emits each kilometer), as shown in figure 3-2. Consumers may note that higher fuel economy is associated with a better GHG emissions profile.

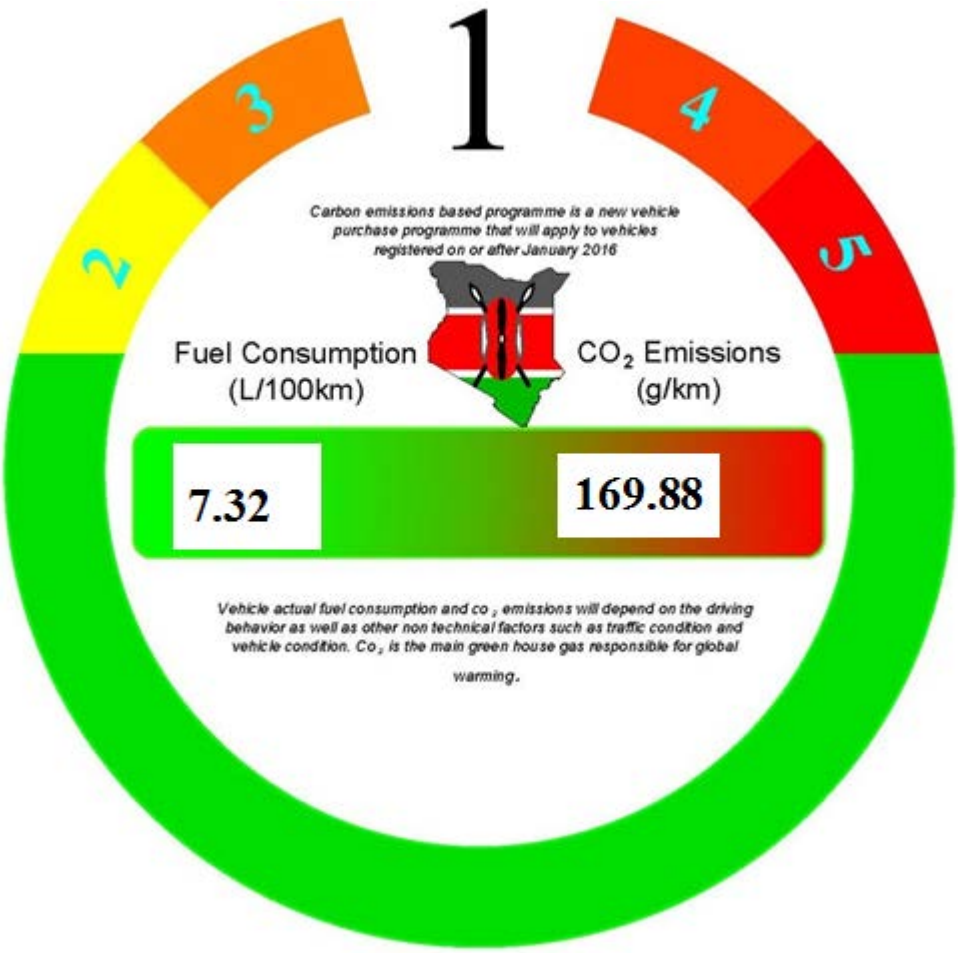

Figure 3-2: Proposed Vehicle Fuel Label Option 2

3.2.3 Proposed Label - III

Option 3 assigns each vehicle a star ratings for fuel economy and greenhouse gas (GHG) emissions (i.e., how much carbon dioxide the vehicle's tailpipe emits each kilometer), with more stars indicating better savings on the part of the consumer.

The consultant proposes a development of a web site that would be launched in conjunction with the new label. This consumer-focused web site could provide more detailed information, along with access to tools, applications, and social media.

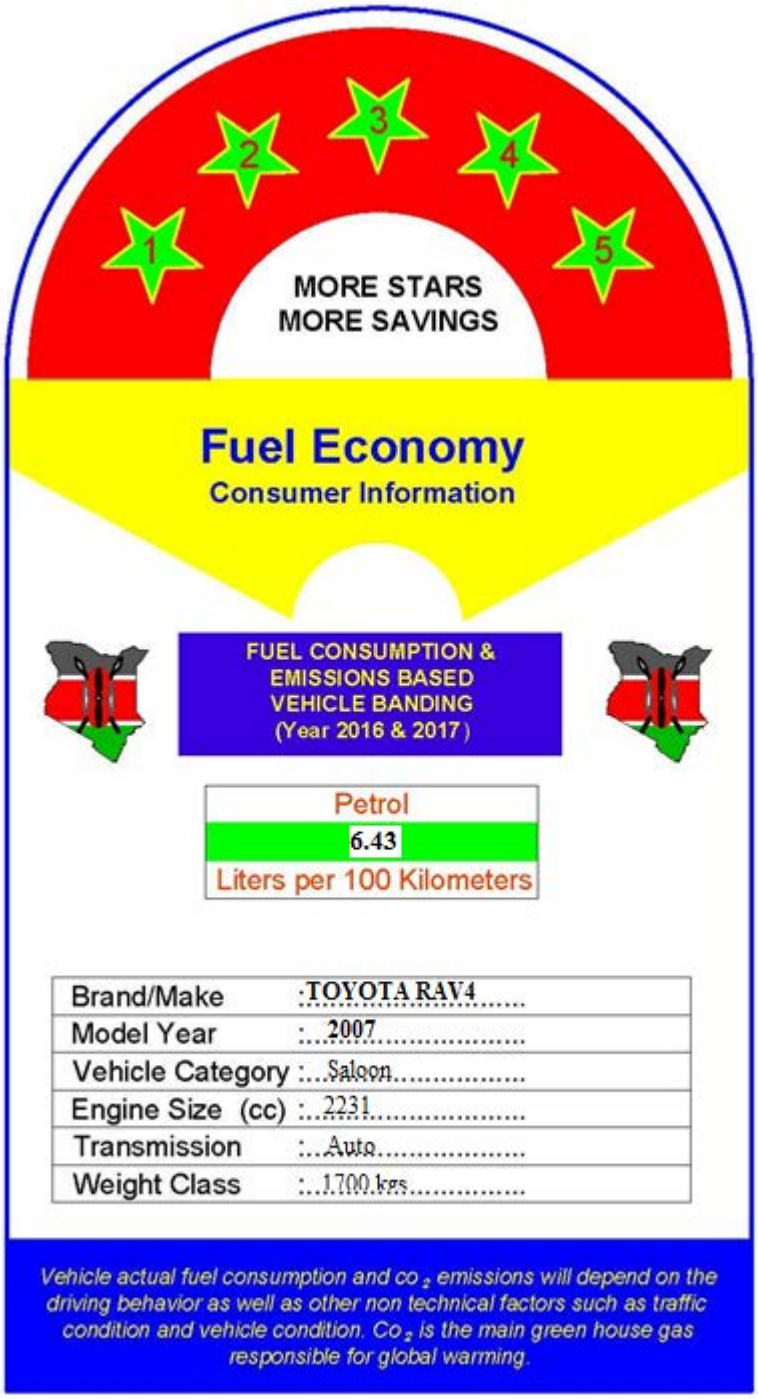

Figure 3-3: Proposed Vehicle Fuel Label (Option 3)

3.3. Implementation of Vehicle Labeling Program

To ensure smooth implementation of the Vehicle fuel labeling program at the initial stage it should be voluntary, it should be followed by mandatory full LDV fleet labeling after at least one year of introduction. Sections 3.3.1 to 3.3.6 highlight the proposed roles of key stakeholders.

3.3.1 Kenya Bureau of Standards

The Kenya Bureau of Standards (KEBS) being the government agency responsible for governing and maintaining the standards and practices of metrology in Kenya should ensure quality inspection of imported vehicles. At the point of inspection KEBS should ensure that data on fuel consumption and vehicle emission is captured. It should be the custodian of all required information on all vehicles coming into the country. The vehicle attributes that should be captured include:

a) Year of Manufacture
b) Fuel Consumption (l/100km)
c) CO_2 Emission (g/km)
d) Engine Capacity (cc)
e) Make
f) Vehicle Model
g) Tare weight

KEBS should ensure that future contracts with motor vehicle inspectors mandates the inspectors to capture and record information on fuel consumption and carbon dioxide emissions for all vehicles coming into the country.

An online database should be created by KEBS where vehicle buyers and auto dealers can log in to access vehicle information. There should also be a provision in the website where by auto dealers and citizens can download printable vehicle fuel labels. To ensure implementation of an agreed fuel label KEBS should develop a vehicle fuel labeling standard and ensure strict compliance to the standard. It should also train auto dealers on the importance of vehicle fuel label and on how they can access information on vehicle fuel economy and on the standards.

3.3.2 Kenya Revenue Authority

Kenya Revenue Authority being the auto dealers licensing authority should ensure that dealers comply with standards for motor vehicle labeling. Where an auto-dealer does not comply with regulations on vehicle labeling such a dealer should be barred from doing business.

3.3.3 Auto Dealers

To ensure that all vehicles on sale have vehicle labels displaying fuel consumption and CO_2 emissions, the labels have to be self-adhesive and removable and of a type applicable to windscreens. Again dealers should display fuel economy information for any motor vehicle offered or displayed for sale on websites, where the principal purpose is to offer goods for sale.

3.3.4 Energy Regulatory Commission

The Energy Regulatory Commission should take part in the development of a policy document on vehicle fuel economy. They conduct public awareness campaigns to promote the use of fuel economy vehicles and educate the public and auto dealers on the need for vehicle labeling program.

3.3.5 Ministry of Energy

The ministry of Energy and Petroleum should spearhead development of a vehicle fuel economy policy. To ensure that this is achieved, the ministry should bring together all relevant stakeholders.

3.3.6 Ministry of Transport and Infrastructure

The ministry of transport should take part in the development of a vehicle fuel economy policy promoting implementation of feebate and vehicle fuel labeling. The policy should pave way for creation of regulations and standards to legalize implementation of the programs.

3.4 Policy Suggestions

The Ministry of Energy and Petroleum should review the current draft National Energy and Petroleum Policy to include matters on vehicle fuel economy. The revised policy document should support the introduction of a vehicle feebate program, vehicle labeling program and among other vehicle fuel economy initiatives. Revision of the policy document should pave way for amendment and enactment of the proposed Energy Bill. The proposed law should consolidate energy standards and regulations.

The policy document should take note of recommendations in the initial Global Fuel Economy Initiative (GFEI) Kenya Study report. The process of revising the document should bring together all relevant stakeholders.

There is need to lobby support for enactment of a revised energy bill of 2015. The bill proposes establishment of an energy efficiency and conservation agency, in relation to vehicle fuel efficiency the proposed agency should perform the following:

(a) Make, in consultation with the Kenya Bureau of Standards, and other statutory authorities requirements for vehicle fuel labels.
(b) Promote, in collaboration with the Energy Regulatory Authority and the Kenya Bureau of Standards, importation of energy efficient vehicle.
(c) Promote use of Fuel efficient vehicles.
(d) Propose to ERC and KEBS the particulars required to be displayed and manner of their display.
(e) Take all measures necessary to create awareness and disseminate information on vehicle fuel efficiency.
(f) Arrange and organize training of personnel and specialists in the techniques for efficient use of fuel.
(g) Promote research and development in the field of fuel efficiency and
(h) Make all measures necessary to create awareness and disseminate information for efficient use of fuel

3.5 Foreseen Challenges

3.5.1 Challenges in Data Management

The implementation of the program requires a robust data management system. Data collected by Motor Vehicle inspectors should be stored by a government agency e.g. KEBS to ensure credibility of vehicle information to auto dealers. Many government agencies have challenges in ensuring that data intended for large population is accessible all year round without system failure. It is highly likely that KEBS will face challenges in online data management e.g. challenges in data security and internet reliability.

3.5.2 Misrepresentation of Vehicle Information

Some dealers may display wrong information about a particular vehicle on sale. One reason for displaying wrong information maybe to boost sale of a less efficient vehicle.

3.5.3 Non Compliance

There is likelihood that some auto dealers will not fully comply with set standards for mandatory vehicle labeling. There is need to educate the general public regarding fuel consumption impacts on vehicle's practical usage. If well-educated on the need for labeling, citizens will help in ensuring that auto dealers comply with regulations.

3.5.4 Ignorance

The importance of having vehicle fuel labels is to inform potential vehicle buyers on fuel efficiency of vehicles they intend to buy. Some people may not pay attention to such labels, in such situations the objective of the labels is not achieved.

3.5.5 Slow Implementation of Proposed Program

The process of making laws that mandates vehicle labeling may take long, coupled by slow implementation of such laws will derail the process of ensuring that all LDVs on sale have fuel labels. Currently there is a bill in Parliament, Energy Bill of 2015, which propose establishment of an energy efficiency and conservation agency. If enacted as law it may pave way for establishment of the agency which will play a crucial role in ensuring mandatory vehicle labeling for all LDVs.

4 NEW VEHICLE PURCHASE SCHEME

The purchase of new and more efficient vehicles serves to protect the environment, stimulate the automotive industry and reduce vehicle abandonment. Typical vehicle purchase schemes include trade-ins, scrappage and credit schemes.

a) Trade–ins

A trade-in refers to a vehicle that a car buyer intends to sell to the dealership as part payment in acquiring another vehicle. It offers convenience to the car buyer as they do not have to advertise, locate a buyer, arrange test drives and wait for financing. However it is to a dealer's advantage to pay as little as possible to the trade-in customer, so that they make more profit on selling the used vehicles. It is therefore advisable to obtain an estimate of the value of one's vehicle beforehand.

b) Scrappage schemes

These programmes are designed to accelerate retirement of older more polluting vehicles so that newer, cleaner vehicles could be put to use sooner than would occur naturally. The schemes are typically funded by the Government and industry. The premise of the car scrappage scheme is that car owners could trade their existing vehicle and be awarded a bonus on their purchase of a new vehicle. The influence of the scrappage scheme has been incredibly strong in Europe and accounted for as many as a fifth of all new car sales in UK.

Eligibility in UK requires an individual to trade in a car that is at least 10 years old for scrapping in exchange for £ 2000 discount off the price of a new vehicle. The government and the manufacturer of the car each provided half of the £ 2000 outlay. The government allocated £ 400 million for up to 400,000 new vehicles in 2009/2010.

In Germany, the government paid $3,320 to people who scrap a car that is at least nine years old and buys a new car instead. The scheme has more than offset the effects of the global down turn on domestic auto sales, preserved factory jobs and encouraged people to replace gas-guzzling, exhaust spewing old vehicles with the latest technology.

In France, new car sales increased by 10% in 2008 due to the scrappage scheme which had £ 900 subsidy on trade-in of old cars for new ones. The main beneficiaries of the car scrappage subsidy were the French car manufacturers Renault, Citroën, and Peugeot whose share in the market increased substantially.

In Egypt, a new law was enacted to replace taxi cabs of more than 20 years old. The trade-in of old cabs for new vehicles was through regular monthly payments. Five car companies Russia Lada, China's speranza, France's Peugeot, Korea's Hyundai and US's Chevrolet participated in the scheme and provided vehicles at a reduced price. The project was supported by World Bank carbon financing.

In the listed cases vehicle scrappage schemes were primarily intended to boost ailing automobile industry. The present study will however review the multiple goals of vehicle scrappage namely:

a) As stimulator of vehicle industry
b) As a tool to preserve employment and
c) As a promoter of green economy

c) Credit schemes

The automotive industry plays a huge role in economic development, job creation and technical advancement. For example the automotive industry of South Africa, contributes 7% of GDP and 12% of exports and is the second largest employer of labor after agriculture.

Governments create schemes to sustain the industry, for example in Nigeria, the National Automotive Council floated a fund to support the purchase of vehicles made in the country.

Repayment was by installment through a credit purchase scheme over a period of three to four years at low interest rates.

Others Models of New Vehicle Purchase Schemes

The common new car buying schemes in the market for vehicles include:

a) Personal loans from banks are considered as one of the cheapest way to finance a car.

b) Logbook loans where a lender will temporarily own your vehicle until loan is settled.

c) Dealer finance/Hire purchase which are arranged by the car dealer and secured against the car. Most car manufacturers have their own schemes. The arrangements are also a big source of profit for car dealers.

5 FEEBATE PROGRAMME

5.1. Introduction

Fuel economy of a vehicle refers to the fuel efficiency relationship between the distance traveled and the amount of fuel consumed. It is expressed in volume of fuel to travel specified distance (litre to travel 100km). One of the fuel economy instruments under the category of fiscal measures and economic instruments is feebate. Feebate is a combination of fees and rebates in which a 'fee' is levied on inefficient vehicles and a 'rebate' is rewarded to efficient vehicles. A Feebate system consists of a set bench mark emission (for instance, in gCO_2/km), above which a fee is levied on the inefficient vehicles and a rebate system through which less polluting vehicles (efficient vehicles) are rewarded. A feebate system is basically a "transfer" system, not a "tax", since the fee paid by inefficient vehicles is transferred to efficient vehicles. Figure 5-1 presents a generalized depiction of a feebate system

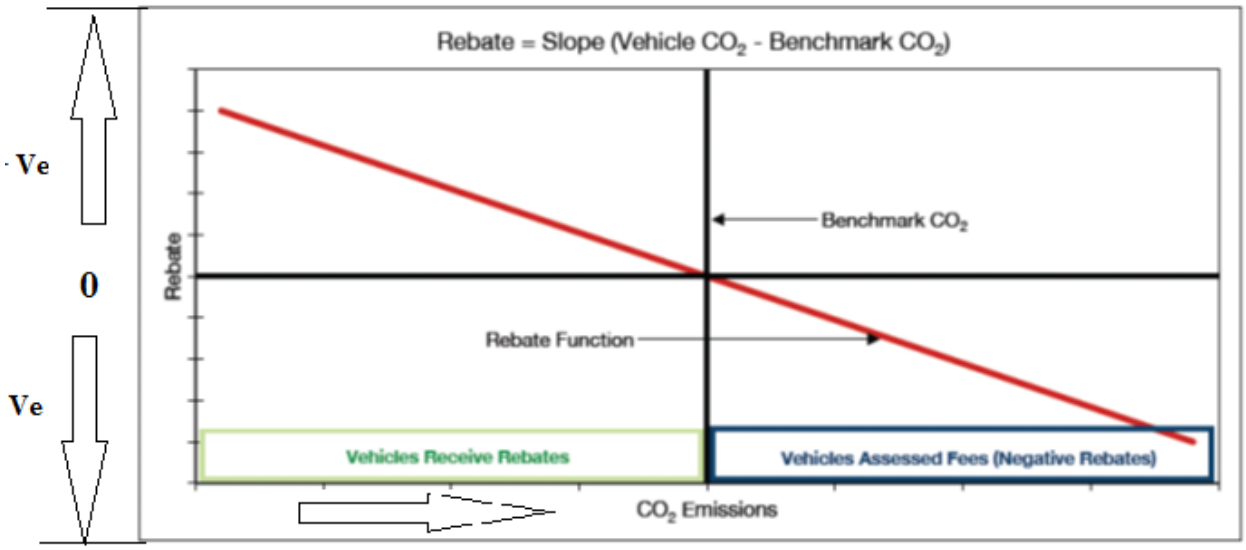

Figure 5-1: Generalized Depiction of a Feebate System

Source: German and Meszler (2010)

The figure presents a benchmark for CO_2 emissions which separates the efficient and inefficient vehicles. If the CO_2 emission of a new purchased vehicle exceeds the benchmark (falls to the right half of the figure), it would be required to pay a fee on top of the purchase price. Since the rebate function is linear, the fee would be directly related to the amount by which the emissions exceed

the benchmark and a direct function of this amount. On the other hand, new purchased vehicles with CO_2 emission below the benchmark (the left half of the figure), would be rewarded by a rebate depending on how their CO_2 emissions are below the benchmark. This is a continuous feebate program where the rebates decline continuously with increase in CO_2 emissions. We also have non-continuous feebate programs (with piecewise linear function and step-wise functions). Figure 5-2, provides a depiction of one of the non-continuous feebate programs.

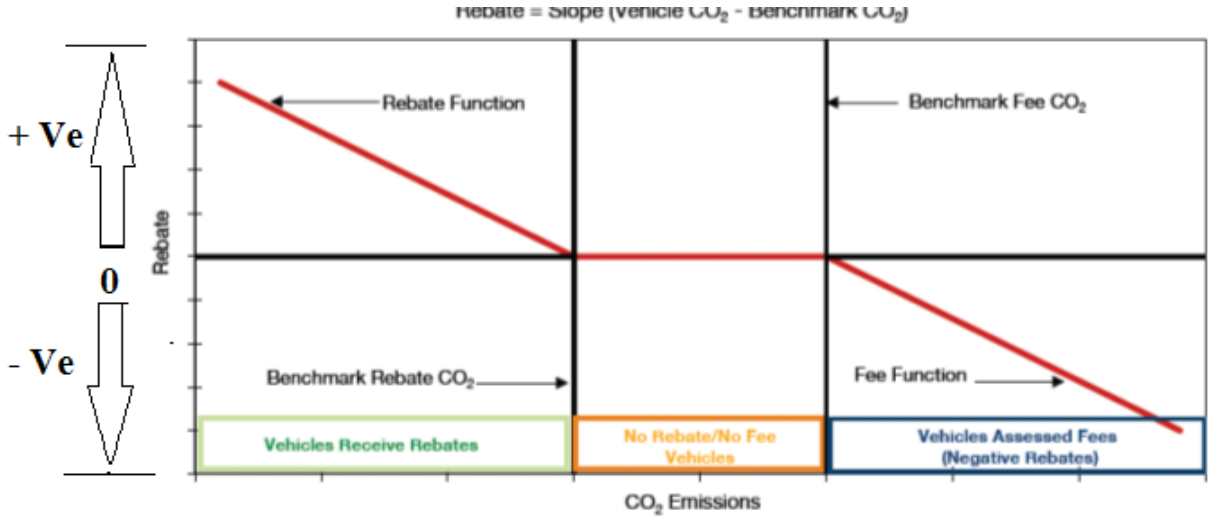

Figure 5-2: Depiction of Non-Continuous Feebate Program

Source: German and Meszler (2010)

The non-continuous feebate programs has a zero slope range where vehicles with differing CO_2 emission rates are evaluated equally within the range vehicles are exempted from both fees and rebates.

5.2. Models of Feebate Systems implemented worldwide

There are a number of global programs that include one or more aspects of a feebate program, however, but are not considered as 'true feebate programs' since they do not provide rebates/subsidies in conjunction with fees/taxes. Countries such as Germany, Spain, Sweden, UK, Canada, Austria, Finland, Portugal, USA, South Africa have applied various types of vehicle-related taxation schemes to control the emissions of greenhouse gases. For this study, we focus on countries that have applied 'true feebate systems' which are also referred to as 'bonus/malus'

programs. These countries include Denmark, France, Netherlands, and Norway. A summary review of their functional design features is as follows:

France

The French 'bonus/malus' program was introduced in December 5, 2007, starting with rebate only. The fee part was added in January 1, 2008. France employed a single benchmark system with the benchmark in 2009 having a donut hole from 130-160 g/km (193 – 257 g/mi) while the 2012 benchmark had a donut hole from 130-140 g/km (193 – 225 g/mi). A donut hole is zone where vehicles would neither be charged fees nor awarded rebates. The argument for the donut hole is that consumers are likely to accept a feebate system if there is a range of vehicles that is unaffected by the feebate policy. The rebate functional form is a step function with 9 levels and the shape of step function yields an approximate rate of £18.1 per g/km.

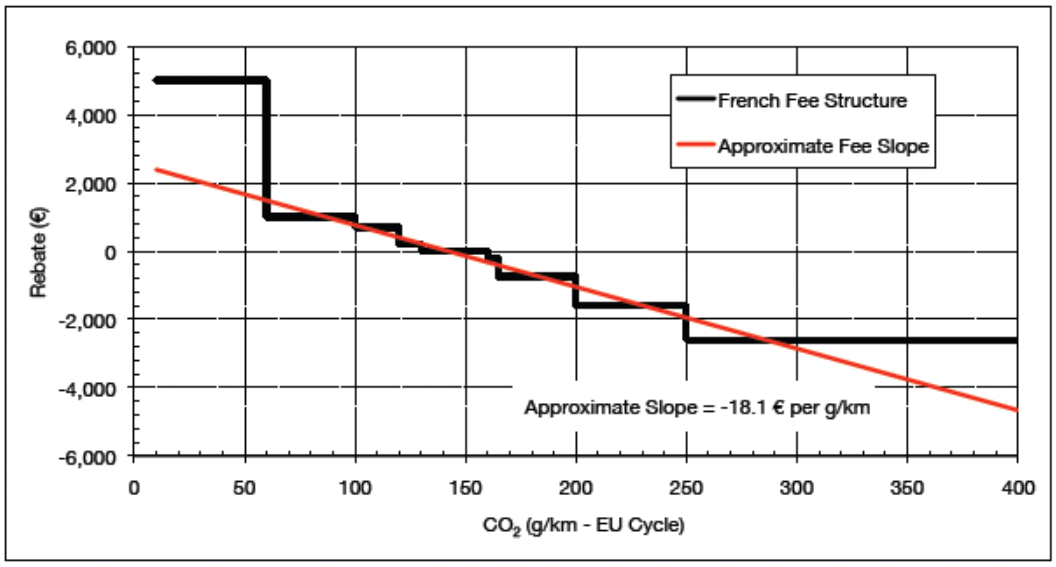

Figure 5-3: Depiction of the French Feebate Program

Source: German and Meszler (2010)

It is only the French program that has many of the proper features of an effective feebate program. However, some of the challenges to the French feebate system are that due to the step functions, vehicles of differing CO2 emissions are subject to identical rebates or fees and those with CO_2 emissions below 60 g/km and above 250 g/km are both in zero-bands. Another issue is that the large step at 60g/km disproportionately rewards vehicles for a potentially small decrease in CO_2

which seems unfair to other bands. Additionally, France's single benchmark system created concerns about fairness to large families that needed larger vehicles and the system has since been modified to include subsidies to address this issue. Table 5-1 presents a comparison of the French program (which is argued to have many of the proper features of an effective feebate program) and other countries which have applied a feebate program.

Table 5-1: Summary of Feebate Programs Implemented Worldwide

Country	Benchmark	Functional Form	Feebates Rate	Year of Introduction
France	Single benchmark system: 2009 Benchmark with a donut hole from 130-160 g/km (193 – 257 g/mi) and 2012 Benchmark with a donut hole from 130-140 g/km (193 – 225 g/mi)	Step function with 9 levels	Approximate rate of £18.1 per g/km	December 5, 2007, starting with rebate only. Fee part added in January 1, 2008.
Denmark	Single benchmark of 150 g/km (241 g/mi).	Two straight line function with different rates for fees ($13/g/mi) and rebates ($50/g/mi)	Based on km/l and is equivalent to $320 US per MPG (Miles per Gallon).	June 2007 as a modified registration tax
Netherlands	Footprint/class of vehicle	Step function with 7 steps	-	July 2006 and revised in February 2008
Norway	Single benchmark = 120 g/km (193 g/mi)	Four line segments with different rates	Rebate =$52/g/mi Initial fee rate = $55/g/mi Fee increases to a maximum rate of $259/g/mi	-Began taxing CO2 in January 2007, with a rate change in January 2008 - Rebate added in January 2009
Chile	Proposed Benchmark = 175 grams of CO2 per kilometer	Based largely on the French system but with a constant CO2 price rather than a step function	-	-July 2011. Its adoption is still under review, as of June 2013 -Based on the feebate proposal, a Chilean Auto Fuel Economy Label was developed for the national market and adopted in April 2013
Mauritius	Proposed Benchmark = 158gCO_2/km.	-	-	-

Source: KIPPRA'S compilation, 2014.

It is worth noting that the Netherlands has since abandoned the footprint-based system for a single benchmark in view of the feedback they obtained from the consumers which indicated that the foot-print system was complicated. Single benchmarks are considerably fair since they provide an absolute standard that is the same for all vehicles.

5.3. Current taxation of motor vehicles and fuels efficiency in Kenya

Fuel taxes in Kenya

The taxes levied on petroleum based fuels are as follows:

Table 5-2: Taxes levied on Fuel in Kenya

Type of tax	Amount	Incidence
Road maintenance levy	Kshs 9.00 per litre	Fuel consumption
Petroleum development levy	Kshs 0.40 per litre	Fuel consumption
Fuel tax (excise duty)	Kshs 10.31 per litre	Fuel consumption
Value Added Tax (VAT)	16%	Value of sale

Source: World Bank Group – Doing Business (Paying taxes 2015)

Motor Vehicle taxes

Transport is one of the major consumers of fuel in Kenya and with vehicle acquisition a desire for majority of the citizenry, there are several duties that are related to vehicle importation and purchase. The duties that imported vehicles attract are listed in Table 5-3.

Table 5-3: Duties Imported Vehicles Attract in Kenya

Type of tax
Import Duty: 25% of the CIF value of the vehicle
Excise Duty: 20% of the (CIF value + Import Duty)
VAT: 16% of the (CIF Value + Import Duty + Excise Duty
IDF: 2.25% of the CIF value or Ksh. 5,000, whichever is higher, is payable.
Advance motor Vehicle tax of Kshs 1500 per ton is charged based on vehicle weight

Source: KRA, 2014

It is important to note that CIF is the customs value of the vehicle i.e. the Cost, Insurance & Freight paid for the vehicle. However KRA uses the Current Retail Selling Price (CRSP) rather than the CIF of a vehicle

5.4. Best practices for Feebate programs

Some of the best practices in designing and implementing a feebates program include:

a) Linear and continuous feebates functional forms which creates a consistent incentive to improve on all vehicles' efficiencies and long-term value for CO_2 emission reductions.

b) Revenue neutrality: The basic function of feebate program is to influence consumers choices for use of clean and efficient vehicle technologies. By design it is expected to cover its own administrative costs from revenue flow associated with it. Its main impact is to increase demand for non-prestige cars and vehicle types.

c) A system that treats all vehicles equitably, without any attribute adjustments. If an attribute adjustment is adopted it should be based on vehicle size, not weight or some other attribute. Vehicle size adjustments preserve incentives for weight and performance reduction and minimize the loss in program effectiveness.

d) Simplest possible feebates policy is to use a single benchmark for all vehicles, combined with a single rate parameter.

e) A linear metric, such as CO_2 emissions or fuel consumption (liters/km). Non-linear metrics, such as MPG, create different incentives for different types of vehicles and lead to less cost-effective investments by manufacturers and consumers.

f) Collection of fees and granting of rebates: Consumer based programs have more impact on consumer purchase choice but have large administrative costs. The preferred method is to administer the program at the manufacturer level; however, this is more applicable to countries which are motor vehicle manufacturers.

g) There should be a range of vehicles that is unaffected by the feebate policy.

5.5. Key drivers for success and failures

Some of the key drivers for success and failures in designing and implementing a feebates program are described herein:

a) The design of the feebates program: a well-defined benchmark, acceptable functional form and rates, and a clear determination of how and when rebates and fees are actually transferred at the time a new vehicle is purchased. Depending on the choice of benchmark, feebates can produce revenue, be revenue neutral or be a net subsidy to car purchases.

b) The way that the feebates policy is introduced (abrupt, delayed, in phases or gradually). Delaying the implementation would enable the concern parties to prepare for the feebates policy, however, it could also lead to the consumers purchasing the inefficient vehicles in large quantities during the grace period or waiting for the policy to be effective so that they can purchase the efficient vehicles and benefit from the rebates. The feebate policy can also be implemented in phases (starting with rebates or fees first, and then enforcing the other later on) or gradually increasing the type of vehicles included in the program.

c) How the revenue flows are managed: This should be sensitive to the prevailing market conditions (fuel prices, change in technology). Accountability and transparency in management of the revenues is also important.

d) Point of regulation and administration of the feebates: feebates may be enforced at the level of the vehicle manufacturer or could be made a part of the transaction between dealers and customers or the consumers may be required to process their feebates transactions directly with a government agency.

The existence of vehicle purchase taxes: the design and implementation of the feebates policy must take into consideration the existing vehicle-related taxes and other fiscal measures in place to incentivize a reduction in CO_2 emissions for the new vehicles.

5.6. Proposed Legislation

In guiding the feebate analysis, the following list of taxes and fees were observed to be applicable to vehicle imports as illustrated in Table 5-4. More recently, the Excise Duty applicable to vehicle imports has been proposed for revision. According to the Excise Duty Bill, 2015, the duty will be applicable for vehicles of tariff heading *87.02; 87.03 and 87.04* as follows: -

a) Vehicles less than three years old from the date of first registration the tariff will be a flat rate of Kshs 150,000.00
b) Vehicles over three years old from the date of first registration the tariff will be a flat rate of Kshs 200,000.00
c) While for motor cycles of tariff 87.11 other than motor cycles ambulances the tariff will be Kshs 10,000 per unit.

The current regime of taxes and fees will therefore be analyzed in this section to take into account the GFEI objectives of fuel economy in relation to: fuel consumption benchmarks L/100Km; and vehicle emissions benchmarks CO_2g /km.

Table 5-4: List of variables for baseline analysis

Tax / Fee Taxes	Application /rate
1. Import Duty	25% of the Custom value
2. Excise Duty*	20% of the (Custom value + Import Duty)
3. VAT Duty	16% of the (Custom value + Import Duty + Excise Duty
Fees and levies	
4. Import license (IDF fee)	2.25% of the Custom value or Ksh. 5,000, whichever is higher, is payable.
5. Motor vehicle Registration fee	Kshs 1, 500 per ton is charged based on vehicle weight
6. Railways Development Levy (Ksh)	1.5 of customs value

5.7. Baseline analysis

Data on vehicle imports for the years 2010-2014 was obtained from KRA and used to build the baseline indicators that would guide the analysis of the impacts of a feebate policy in Kenya. The main variables guiding the analysis are listed Table 5-5.

Table 5-5: Main Variables Guiding the Analysis

• Vehicle condition	• Production year
• Body	• Year of first registration
• Make	• Fuel type
• Model	• Engine Size
• Description	• Estimated Value of New Vehicles (CRSP)
• Fuel economy L/100KM	• CO_2
• Revenue before feebate	• Revenue after feebate

The data obtained from Kenya Revenue Authority show that in 2011, there were a total 96,000 registered vehicles; out of this, 90,766 were selected for analysis. Revenues were computed using the respective fees and taxes in 2011 and applied to the vehicle inventory data, the total computed stood at Kshs 51.6 billion. Table 5-6 and Figure 5-4 presents the 2011 revenues by vehicle engine size category. Figure 5-5 shows the vehicle population by engine capacity..

Table 5-6: Revenues by vehicle engine size category 2011

Engine size category cc.	No. of Vehicles	%market share	Avg. CO_2 emissions (g/Km)	Avg. Fuel economy L/100Km	Revenue 2011 (taxes and fees)
0-1000	800	0.9	113.94	6.34	180,628,222
1001-1300	7,658	8.4	148.63	6.55	2,146,922,765
1301-1500	23,176	25.5	146.86	6.47	7,207,013,732
1501-2000	34,010	37.5	167.35	7.18	15,660,320,115
2001-2500	10,524	11.6	194.27	7.78	7,394,036,820
2500-3500	9,410	10.4	214.66	8.39	8,149,763,218
3500+	5,188	5.7	279.08	12.10	10,889,717,520
TOTAL	90,766				51,628,402,391

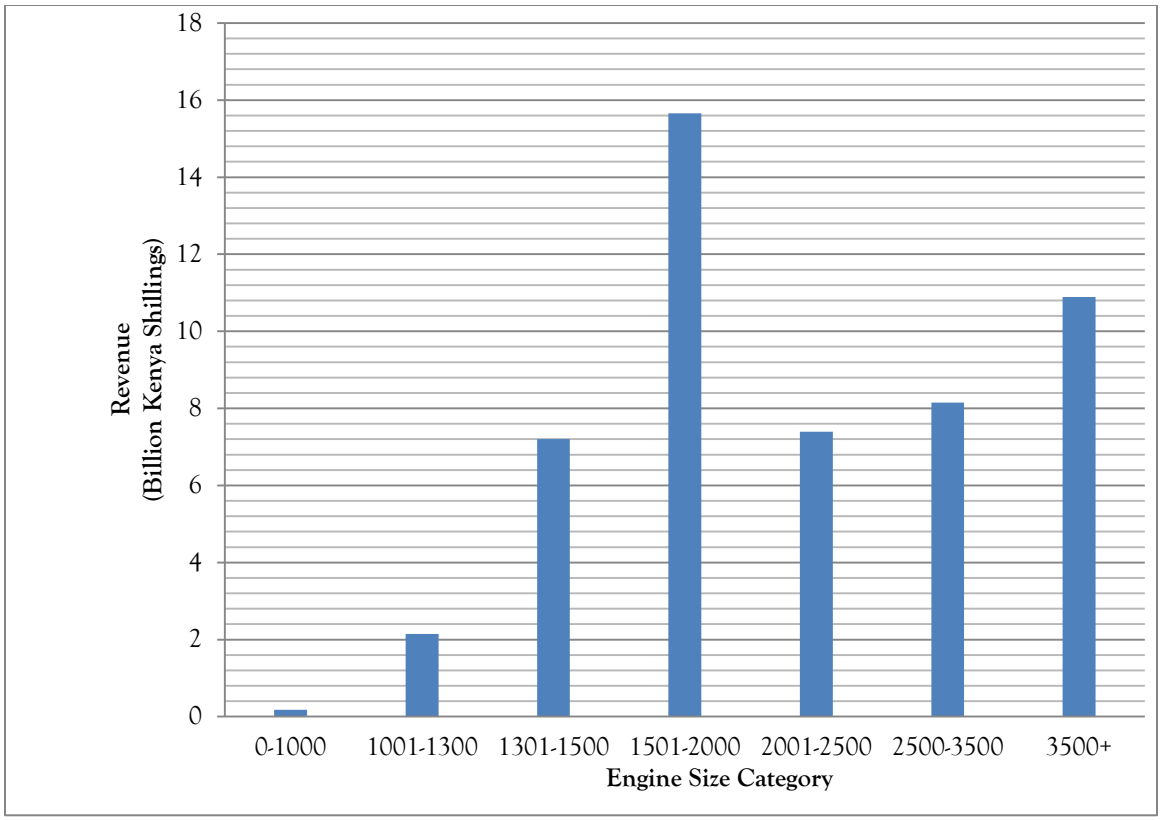

Figure 5-4:Revenues by vehicle engine size category 2011

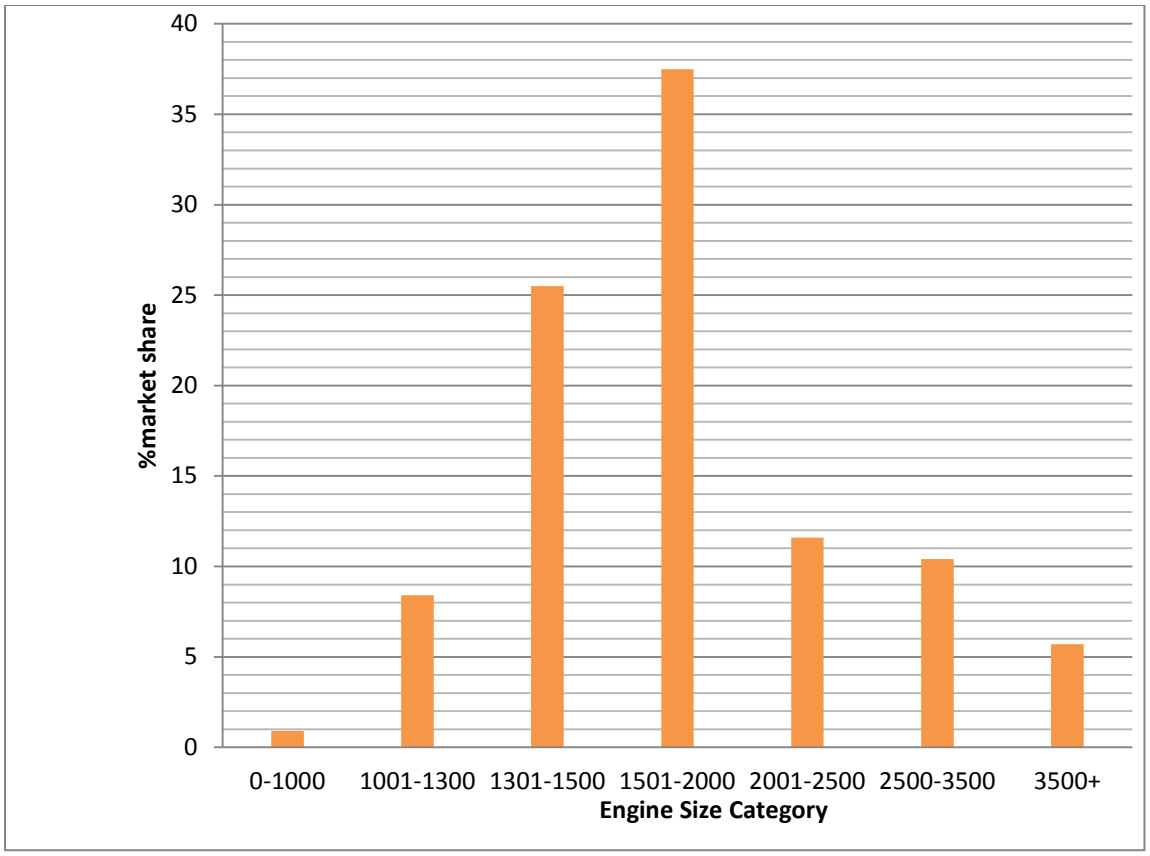

Figure 5-5: Percentage Vehicle Population by Engine Capacity in 2011

Table 5-7 and Figure 5-6 presents the average revenues per vehicle by engine size category.

Table 5-7: Average Revenues Per Vehicle by Engine Size Category.

Category	%market share	Avg. CO_2 emissions (g/Km)	Average Fuel Economy L/100Km	2011 Average Revenue Per Unit (taxes and fees)
0-1000	0.9	113.94	6.34	225,785.28
1001-1300	8.4	148.63	6.55	280,350.32
1301-1500	25.5	146.86	6.47	310,968.84
1501-2000	37.5	167.35	7.18	460,462.22
2001-2500	11.6	194.27	7.78	702,588.07
2500-3500	10.4	214.66	8.39	866,074.73
3500+	5.7	279.08	12.1	2,099,020.34

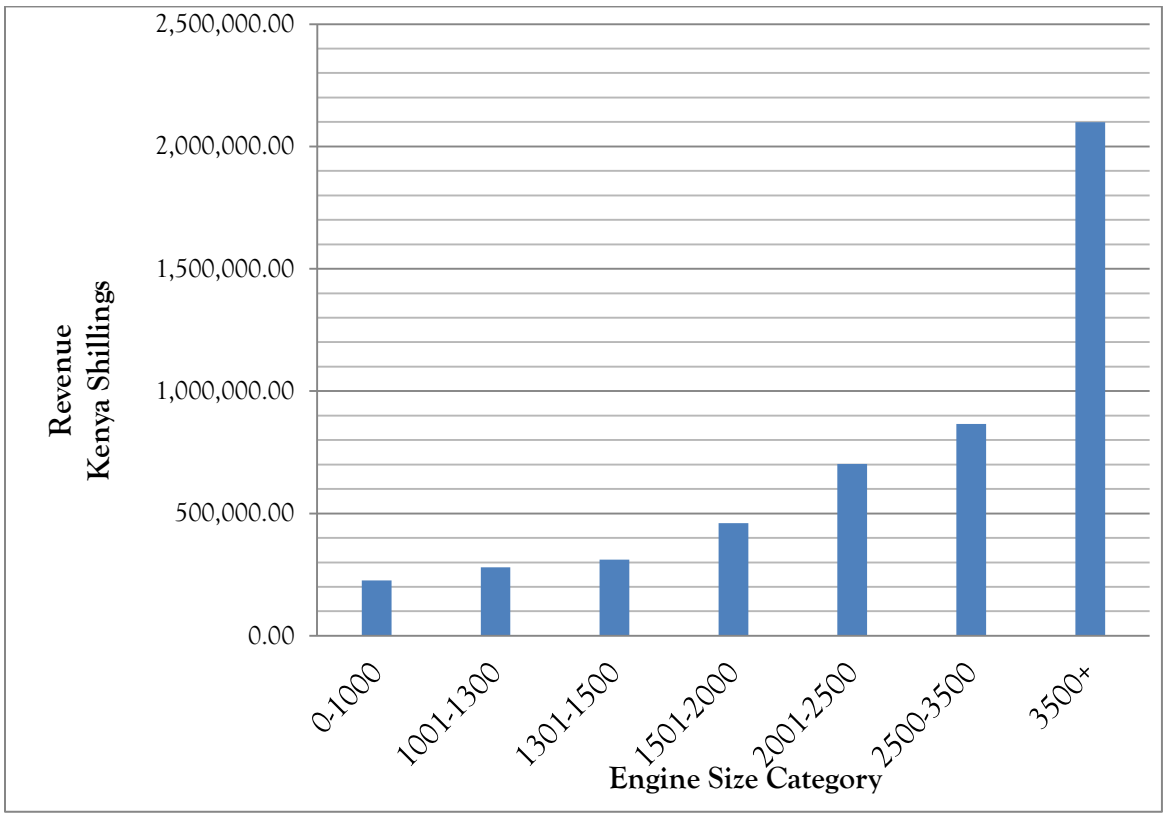

Figure 5-6: Average Revenues Per Vehicle by Engine Size Category.

5.8. Revenues by age of vehicle

Table 5-8 and Figure 5-7 presents revenues by vehicle age category in 2011.

Table 5-8: Revenues by Vehicle age Category in 2011

Age of vehicle	No. of Vehicles	Avg. CO_2 emissions (g/Km)	Avg. Fuel economy L/100Km	Revenue 2011 (taxes and fees)
Less than 1 year	762	181.28	8.27	1,629,577,658
1	808	199.93	8.78	2,454,055,466
2	180	201.81	8.00	565,361,527
3	434	208.98	8.63	1,282,481,776
4	444	220.54	8.83	1,049,055,546
5	2,290	202.93	8.40	3,778,311,669
6	18,580	187.57	7.83	11,914,711,727
7	61,492	177.29	7.45	27,620,311,740
8	5,774	177.23	7.36	1,334,377,056
10	2	167.85	6.25	158,226
Total	**90,766**			**51,628,402,391**

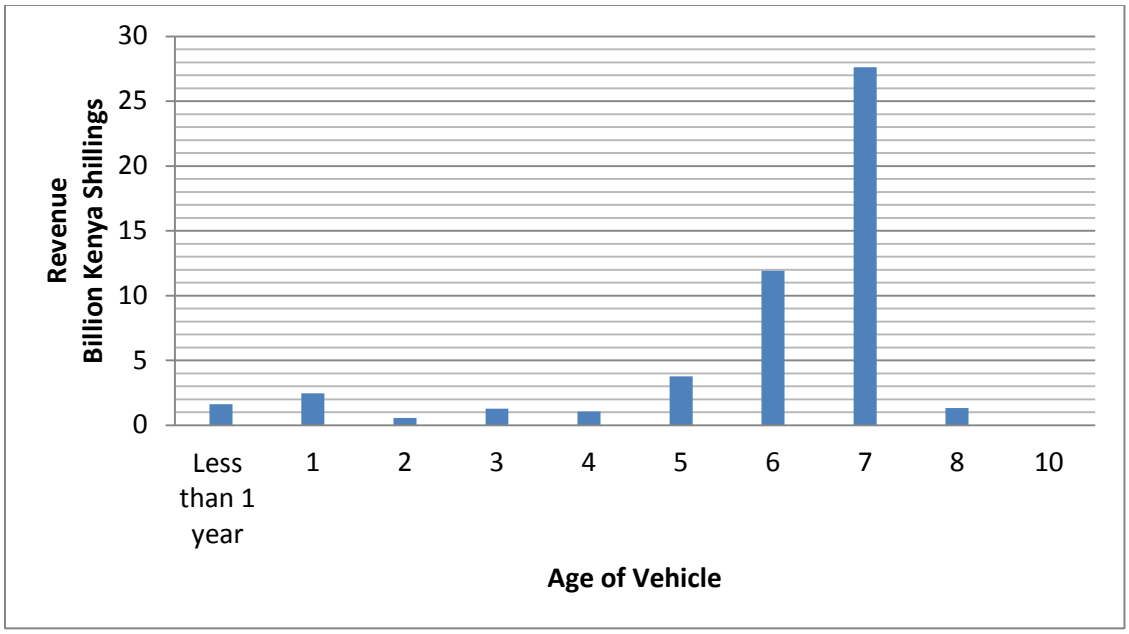

Figure 5-7: Revenues By Vehicle Age Category 2011

Table 5-9 and Figure 5-8 presents Average Revenues Per Vehicle by Age Category

Table 5-9: Average Revenues Per Vehicle by Age Category

Age of vehicle	Avg. CO_2 emissions (g/Km)	Avg. Fuel economy L/100Km	Revenue 2011)taxes and fees
Less than 1 year	181.28	8.27	2,138,553
1	199.93	8.78	3,037,197
2	201.81	8	3,140,897
3	208.98	8.63	2,955,027
4	220.54	8.83	2,362,738
5	202.93	8.4	1,649,918
6	187.57	7.83	641,265
7	177.29	7.45	449,169
8	177.23	7.36	231,101
10	167.85	6.25	79,113
Total			**16,684,979**

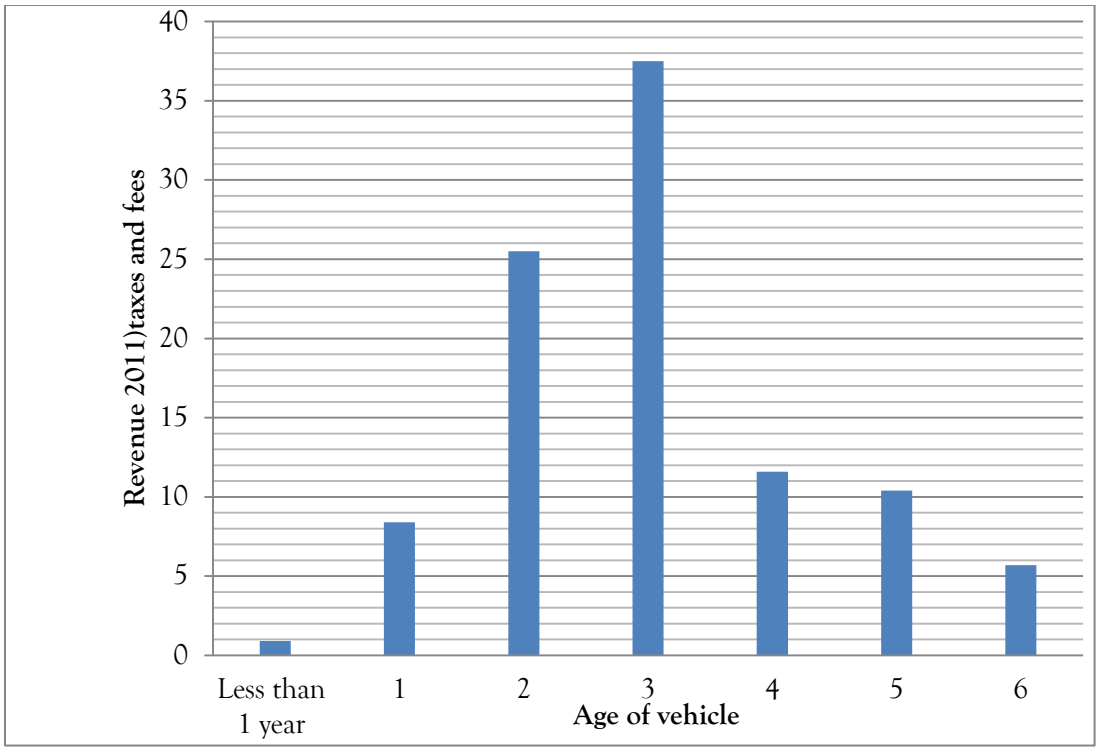

Figure 5-8: Average Revenues Per Vehicle by Age Category

Table 5-10 and Figure 5-9 presents revenue by vehicle condition (new/used)

Table 5-10: Revenue by vehicle condition

	Avg. CO_2 emissions (g/Km)	Avg. Fuel economy L/100Km	Volume	Percentage (%)	Age	Revenue
New	172.56	8.10	888	1.00	3.81	1,025,336,920
Used	182.021	7.61	89878	99.00	6.59	50,603,065,471

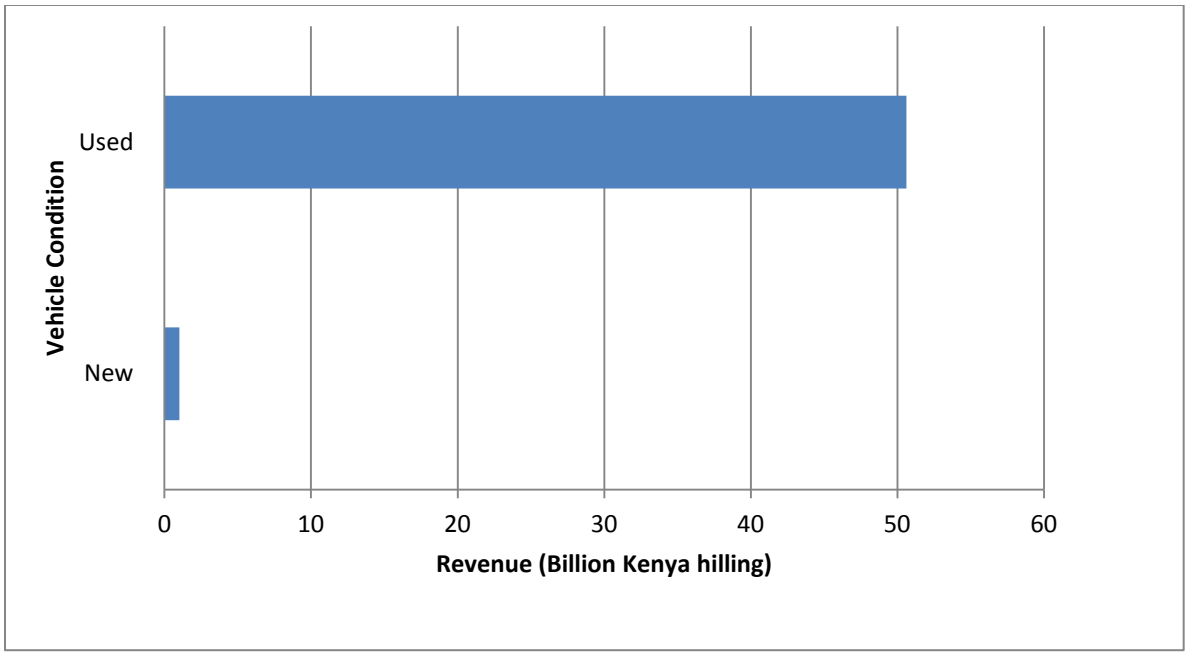

Figure 5-9: Revenue by vehicle condition

5.9. Determination of Kenya's Fuel Economy Benchmarks –pivot points

The Global Fuel Economy Initiative (GFEI) set out the global fuel economy (FE) target at 4L/100Km to be attained by the year 2050. In terms of vehicles emissions, the global target is to achieve a reduction of 50% by the year 2050. Based on the inventory data for Kenya between 2010 and 2014, the average fuel economy stood at 7.12 L/100Km, while the average emissions were 169.88 gCO_2 / Km. This indicates that Kenya needs to establish benchmarks and for local Fuel Economy (FE) and emissions targets to align with the global initiative. However, taking into account local social and economic circumstances, the benchmarks should be realized rationally and gradually.

Literature presents examples of feebate programmes implemented in countries around the world. The review reveals that benchmarks for CO_2 emissions ranged from 120 to 160gCO_2/KM. The primary focus of most programs reviewed focused on vehicle emissions as opposed to fuel economy. The fees and rebates are applied variously, for example, as a constant price, as a step wise

function, as a straight-line function, and with varying rates for a fee and rebate. The Kenyan situation was assessed in this study through interaction with sector stakeholders. A questionnaire was administered to motor vehicle dealers and assemblers to establish their views on the feebate program structure and appraise their proposals.

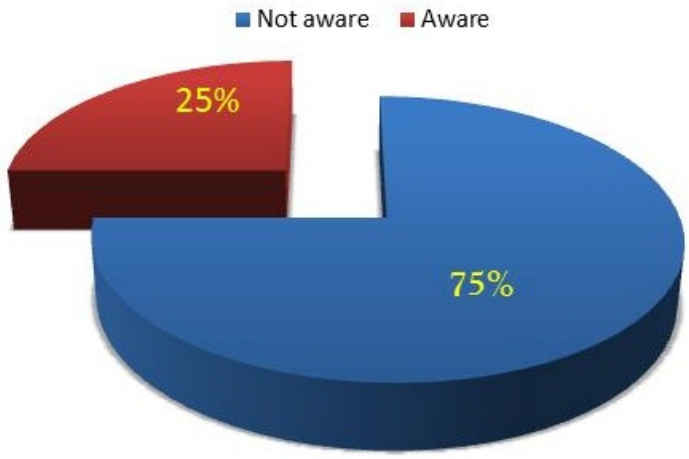

Figure 5-10: Respondent's Awareness of Feebate Programs

Figure 5-11: Respondent's Willingness to Pay Emission Fees

The level respondent's awareness of feebate programs was limited, out of 20 respondents, 15 were not aware of the program. However, despite this, majority of respondents strongly agreed and supported the program in reducing the rate of climate change on account of vehicle emissions. It was noted that the program is fair since the people who choose to buy higher-emitting vehicles would pay more for those emissions.

Respondents indicted willingness to pay emission fees ranging from Kshs 1,000 to Kshs 50,000. While the range for rebates were between Kshs 10,000 to 100,000. The figures stated by respondents were a lump sum amount that does not take into account the effect of charging a fee or rebate based on degree of variation from the benchmark. Literature reviewed reveals that the fee/rebate should be charged as a unit cost/g/Km. It was also noted that majority of respondents held the view that feebates would adversely affect their business by reducing the volume of sales.

5.10. Scenarios for benchmarks and feebate rates

Scenarios for feebate benchmarks (pivot points) and feebate rates derived from literature and country statistics were developed. Based on recommended practice, the objective of the analysis was to run the scenarios to achieve revenue-neutrality, aimed at designing a self-financing mechanism. Determination of the benchmark can be determined through various factors, such as , attributes of the vehicle fleet –fuel economy and market shares (Rivers and Schaufele, 2014). A study by Zachariadi and Clerides (2015), found that revenue neutrality can be achieved by low feebate rates and a pivot point that is *slightly* lower than the baseline average CO_2 emissions. However, the study notes that in order to maximize welfare improvement, the pivot point needs to be set at a level considerably lower than the current average gCO_2/Km and the marginal feebate rate not too high (less than 100Euros per tonne of CO_2. In essence, the recommended feebate rates should assume an asymmetrical form, meaning there is a difference in the rate for fees and rebates in relation. Although symmetrical fee bates are theoretically more appealing, evidence shows that asymmetrical schemes have been implemented in most cases.

In 2015 Zachariadi and Clerides developed the simpler symmetrical function for feebates as;

$$Aj = t\,(Ej - PP), \quad \text{.....[5.1]}$$

Where;

A_j is the total tax in euros per car of model $_j$,

E_j is the CO_2 emissions level of model $_j$ and

PP is the pivot point, both expressed in gCO_2/Km .

t is the tax rate, Euros/g/Km.

The preliminary analysis for this study is driven by the scenarios and assumptions as shown in Table 5-11. The pivot point is selected as a targeted reduction of average fleet CO_2 emissions from the baseline levels. The low variant scenario of PP $127gCO_2$/ Km follows the path of a 30% reduction in average CO_2 emissions in the first phase of implementation (2-5 years). The target is set to achieve a considerable improvement in welfare, following the social planners perspective in Rivers and Schaufele, (2014). Asymmetrical low feebates are selected to run the scenario based on ratios determined from global practice. The High variant scenario PP of 170g CO_2/ Km is derived partly from the approach applied in López *et. al.* (2011)[2] and a lower national target of 5% reduction. The fees and rebate rates are adjusted upwards to achieve revenue neutrality and effective policy impact imperatives.

It is noted that the feebate rate is more instrumental in achieving the objectives Fuel Economy with a more impact than the pivot point. Altering the pivot point has no effect on the imposed value of CO_2 emissions. Rather, the feebate rate is more instrumental in having an effect on the value of choosing a lower CO_2 vehicle over a higher CO_2 vehicle (German and Mezsler, 2010).

The analysis applied the selected scenarios to the baseline data to establish the effect on revenues.

2 Lopez.G., Castillo.M., & Vladivia.J.(2011): Incentives for cleaner vehicles and fuel economy for the vehicle fleet of Chile. Centro Mario Molina Chile.

Table 5-11: Scenarios for analysis of emissions related feebates

Scenarios	Benchmark emissions g CO_2/Km	Fee (Kshs/g/Km)	Rebate (Kshs/g/Km)
Low variant	127	3,000	2,000
High variant	170	5000	3000

5.11. The Scenarios

Table 5-12: Scenario 1 : Low variant

	Mean	Std. Dev	Min	Max	Sum
Revenue 1	5,643,065	59,632,530	73,727	4,590,828,182	51,628,402,391
Fees	1,498,171	19,150,018	4071	1,582,189,714	13,098,515,571
Rebates	272,015	1,178,318	857	15,123,458	110,438,285
Revenue 2 (with feebates)	7,062,682	77,420,404	(7,001,028)	6,173,017,896	64,616,479,677*

*Revenue gain 12,988,077,286

Table 5-13: Scenario 2: High variant

	Mean	Std. Dev	Min	Max	Sum
Revenue 1	5,643,065	59,632,530	73,727	4,590,828,182	51,628,402,391
Fees	1,650,826	29,366,275	5,357	203,1542,857	8,704,808,929
Rebates	1,031,692	6,956,524	2,142	259,237,500	3,998,841,214
Revenue 2 (with feebates)	6,157,434	79,575,588.67	(25,914,742)	6,622,371,039	56,334,370,105 *

*Revenue gain 4,705,967,714

5.12. Further descriptive statistics

The data is divided into two sets, that is 2010 – 2012 and 2013 – 2014 motor vehicle inventory containing a total 344,648 vehicles. The Tables 5-13 and Table 5-14 shows a descriptive summary of important variables in the dataset used in the study.

Table 5-14: Means of selected variables for 2010 – 2012 dataset

Engine size category	Count	Ave. g/CO2 emission	Ave. Fuel Cons/100Km
1001 - 1300	19,078	147.61	6.49
1301 - 1500	85,794	145.71	6.41
1501 - 2000	101,538	167.91	7.19
2001 - 2500	32,644	195.18	7.79
2501 - 3500	32,862	214.88	8.35
3500 +	10,878	275.57	11.77

Source: Kenya Revenue Authority Data (KRA)

From the summary, it is evident that the higher the engine capacity, the more fuel consuming and high carbon emissions from a vehicle. This would suggest the need for suitable incentives that encourage purchase of low carbon emitting and highly fuel efficient vehicles within the user category of preference. The same results can be seen in the 2013–2014 dataset shown in Table5-15.

Table 5-15: Means of selected variables for 2013 – 2014 dataset

Engine size category	Count	Ave. g/CO2 emission	Ave. Fuel Cons/100Km
1001 - 1300	5,160	134.43	5.89
1301 - 1500	24,025	150.07	6.48
1501 - 2000	20,269	163.19	7.89
2001 - 2500	7,167	194.18	8.15
2501 - 3500	2,913	232.42	9.69
3500 +	2,320	259.16	10.24

Source: Kenya Revenue Authority Data (KRA)

It important to note that vehicles in the 0 – 1000cc category have been omitted due to the relatively low numbers which are susceptible to measurement errors.

5.13. Econometric Analysis

To estimate consumer behavior and motor vehicle demand, the study employs the discrete choice models that are widely used in transportation, telecommunication and energy studies where selection of an alternative from a set of choices is common. For instance, in telecommunication one may chose a particular media to communicate radio, television, newspaper and mobile phones whereas in the field of energy a consumer may chose fuel supplier from a pool of providers.

Koppelman and Chieh-Hua (1998) suggest that the most widely used discrete choice model is the Multinomial Logit model suggested by (McFadden 1973) due to ease of estimation and simple mathematical formulation.

5.14. The model

The study utilizes the multinomial logit model to estimate motor vehicle demand in Kenya using the motor vehicle inventory given that we consider the engine size as the set of choices that the consumer has to make.

$$Ui = \alpha i + f[\beta i Xi] + \varepsilon i \quad \text{.....[5.2]}$$

Where; Ui = utility derived from a set of alternatives

X_i = a vector of variables that influence the choice of vehicle to purchase.

αi = an intercept term

βi = a vector of respective variable coefficients, and lastly

ε= is an error term

In the MNL equation is a model where regressors are likely not to vary over choices and coefficients are estimated for any choice. MNL requires identification: one of the choices, say *j*, is treated as the base category (correspondent β_j is constrained to equal 0). The log-likelihood function to be maximized over parameters β is specified as follows in equation 5.3.

$$\ln L(\beta) = \sum_{n=1}^{N} \sum_{j=1}^{J} y_{nj} \ln \frac{e^{x_n^J \beta_i}}{\sum_j e^{x_n^J \beta_j}} \quad \text{.....[5.3]}$$

In this study we assume that, given a set of car characteristics, price and taxes, the Kenyan consumer faces a decision problem of purchasing a motor vehicle at any given time in a year. A decision to purchase a vehicle will be dependent upon use, purchase price, the body, engine size, make and model among other set of criteria. However, import duty was used in the estimation as the proxy to represent government action (taxes) and also as it is based on the customs value which in the data set represents the Cost, Insurance and Freight (CIF). The study considered two estimations, the first one with petrol powered vehicles and the second one with diesel powered vehicles. In each estimation, a random sample size of 2,000 vehicles using the data sets from 2010 – 2014 was used.

Table 5-16: Estimation of Petrol vehicles

Coefficients:	Estimate	Std. Error	Pr. (>|t|)	Marginal Effect	Significance codes
3501+cc: (intercept)	-1.354	0.139	< 2.2e-16		***
2001-2500cc: (intercept)	0.704	0.077	< 2.2e-16		***
1501-2000cc: (intercept)	-0.143	0.097	0.137962		
1001-1300cc: (intercept)	-1.511	0.165	< 2.2e-16		***
1301-1500cc: (intercept)	0.189	0.100	0.059155		.
3501+cc: Import duty	0.000	0.000	0.639149	0.00%	
1501-2000cc: Import duty	-0.009	0.000	0.07475	-0.12%	.
2001-2500: Import duty	-0.001	0.000	0.086721	-0.22%	.
1001-1300:import_duty	-0.002	0.000	0.250938	-0.01%	
1301-1500: Import duty	-0.003	0.000	0.000422	-0.39%	***

Log-Likelihood: -3122.6 McFadden R^2: 0.0027132 Likelihood ratio test: chisq = 16.991 (p.value = 0.0045177)

Table 5-16 shows that taking with reference to the engine size 2501 – 3500 cc category, a unit increase in the level of import duty would be associated with a reduction of purchase of all engine size categories particularly the engine category 1301 – 1500 cc which would register 0.39 per cent decline.

The second estimation was done with a sample of 2,000 vehicles using diesel for the period 2010 – 2014, and the results are as shown in the Table 5-17.

Table 5-17: Estimation of Diesel powered vehicles

Coefficients:	Estimate	Std. Error	Pr(>|t|)	Marginal Effects	Signif. codes
3501+cc: (intercept)	-1.606	0.134	< 2.2e-16		***
2001-2500cc: (intercept)	0.112	0.078	0.155077		
1501-2000cc: (intercept)	-0.229	0.091	0.011468		*
1001-1300cc: (intercept)	-1.736	0.149	< 2.2e-16		***
1301-1500cc: (intercept)	-0.281	0.088	0.001323		**
3501+cc: Import duty	0.001	0.000	0.026548	0.03%	*
1501-2000cc: Import duty	0.013	0.000	0.000281	0.02%	***
2001-2500: Import duty	0.000	0.000	0.707413	-0.01%	
1001-1300: Import duty	0.000	0.000	0.523123	-0.07%	
1301-1500: Import duty	0.079	0.000	0.04666	0.04%	*

Log-Likelihood: -3217.4, McFadden R2: 0.0037544 Likelihood ratio test: chisq = 24.249 (p.value = 0.00019442)

Table 5-17 shows that a unit increase in the level of import duty would be associated a marginal increase of 0.04 per cent in purchase of vehicles with engine size 1,301 – 1,500 category, 0.02 per cent increase in vehicles with engine category 1,501 – 2,000 cc and a 0.03 per cent increase of purchase of vehicles above the 3,501cc engine category.

The results suggest that increase in taxes levels or penalties based on engine size (as earlier indicated, higher engine size category the higher the level of CO_2 emission), has marginal effects on the level of vehicle purchase and to some extent there could be increase in purchases. We can argue that one buys a vehicle not because it is expensive but because it delivers a level of utility to the consumer.

5.15. Determining the benchmark and rate

Using the parameters and the combined dataset of the five year period (2010 – 2014), we conduct simulations to determine the rate to be charged as a fee and as an incentive in the implementation of the feebate programme. The average CO_2 emission for the vehicles in the dataset was determined to be 169.88 gCO_2/Km. This was useful in establishing the benchmark CO_2 emission which we recommend to be a band of 169.00 - 169.99 gCO_2/km based on the vehicle population for the 5 years. Consequently, the study considered the vehicles with CO_2 emission of below

169.00 gCO_2/km to be fuel efficient and those with CO_2 emissions of 170 gCO_2/km and above to be fuel inefficient. The benchmark proposed is relatively higher that the Denmark single benchmark of 150 gCO_2/km and Mauritius 158 gCO_2/km but relatively lower than the benchmark for Chile which is 175 gCO_2/km

The categorization of the fuel efficient/non-efficient vehicles population for the 5 year period is presented in Table 5-18.

Table 5-18: categorization of the fuel efficient/non-efficient vehicles

Category (gCO2 /km)	Number of Vehicles
0 - 168.99	192,154.00
169.00 - 169.99	1,693.00
170+	138,919.00
	332,766.00

Source: Authors compilation

Considering the vehicle population and their CO_2 emission, simulations were carried out to determine the near optimal rate for the fees and the rebates. The simulation results indicate that a rate of Kshs 1,500 per gCO_2 /km would have generated a fee of approximately Kshs 7.8 billion and a total rebate payment of Kshs 7.4 billion over the five year period. This translates to an annual average of about Kshs 1.56 billion revenue from fees charged on fuel inefficient vehicles and annual average compensation of about Kshs 1.48 billion for the purchase of fuel efficient vehicles.

The annual average for the 5 year period is as indicated in Table 5-19

Table 5-19: Annual average for the 5 year period

Description	Five year period	Annual Average
Fee	7,840,850,610	1,568,170,122.00
Rebate	(7,401,047,209.29)	(1,480,209,441.86)
Difference	(439,803,400.71)	(87,960,680.14)
Recommended rate	Kshs 1,500 per gCO_2 /km	

Source: Authors computation

The recommended rate of Kshs 1,500 gCO_2/km for both fee and rebate would be near revenue neutral considering the fact the actual administrative costs for the feebate programme have not been determined at this point. We recommend that the rebate rate be reviewed once the actual administrative costs are determined. However, the rate for the fee should remain at Ksh 1,500 gCO_2/km as supported by the analysis and results for the 5 year period data. The rate compares favorably with the French rate of £18.1 gCO_2/km which is about Kshs 2,860 per gCO_2/km.

The depiction of the proposed system for Kenya is presented in Figure 5.12

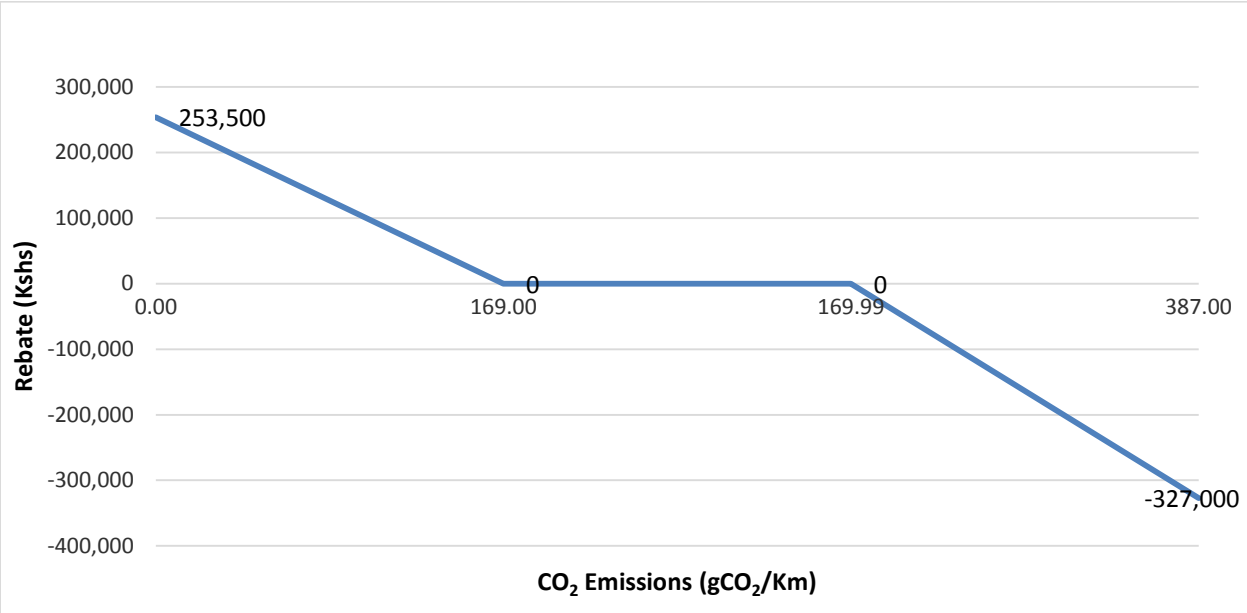

Figure 5-12: Depiction of the Proposed Feebate System for Kenya

Source: Authors computation

The proposed feebate system for Kenya is a non-continuous with a range between 169.00 gCO_2/km to 169.99 gCO_2/km where there will be no fee or rebate for vehicles with emissions falling within this range. The slope represents the proposed rate of Kshs 1,500 per gCO_2/km for both fee and rebate. The area above the x-axis represents the rebate while the area below the x-axis represents the fees. According to the dataset used in the analysis, the maximum rebate for the most fuel efficient vehicle (91.96 gCO_2/km – Toyota Prius) that would have been paid is Kshs 115,560. The maximum fee that would have been charged on the most fuel inefficient vehicle (387 gCO_2/km – Bentley) is Kshs 327,000.m

6 CONCLUSION

Vehicle Labeling Program

The proposed vehicle fuel labels indicate both the fuel consumption and CO_2 emission of the vehicle. With expected implementation of a feebate program the proposed labels (option 1) provides information on rebates or fees to be awarded or charged on a vehicle on sale. Information to be placed on proposed label will be a guide to prospective vehicle buyers. It should help car buyers compare different vehicles, makes and models. The proposed vehicle labels have information indicating that fuel economy and emissions may be different due to a number of factors, such as how you drive and maintain your vehicle, how much the vehicle is loaded and other factors.

Feebate Program

The study established that increases in duties and fees is likely to have some marginal effects in vehicle purchase and thus influence choice based on engine size. Secondly, it was established that the average CO_2 emission using the 2010 – 2014 dataset is 169.88 gCO_2/km and the average fuel consumption is 7.12 L/100km. Therefore, implementation of feebate programme is likely to have an impact in influencing purchase of fuel efficient and less carbon emitting vehicles. Additionally, the proposed benchmark of between 169.00 gCO_2/km to 169.99 gCO_2/km and a rate of Kshs 1,500 would not significantly differ from countries that have feebate programs initiated.

7 RECOMMENDATIONS

Labeling Program

To ensure that the proposed vehicle labeling is implemented, Kenya Bureau Standards (KEBs) in consultation with Energy Regulatory Commission (ERC) and other stakeholders should develop a standard on vehicle labeling. ERC should hold consultative forums with key stakeholders to come to an agreement on proposed vehicle labels.

The consultant proposes a development of a web site that would be launched in conjunction with the new label. This consumer-focused web site should provide more detailed information, along with access to tools, applications, and social media. The online database should be created by KEBS where vehicle buyers and auto dealers can log in to access vehicle information. There should also be a provision in the website where by auto dealers and citizens can download printable vehicle fuel labels.

ERC should lobby support for enactment of a revised energy bill of 2015. The bill proposes establishment of an energy efficiency and conservation agency, in relation to vehicle fuel efficiency the proposed agency will be instrumental in implementing vehicle labeling program. .

Feebate Study

The study recommends that should a fee-bate system be initiated in Kenya, a range between 169.00 gCO_2/km to 169.99 gCO_2/km be used as a benchmark level where there will be no fee or rebate for vehicles with emissions falling within this range. Secondly, vehicle purchases with emissions below 169.00 gCO_2/km be considered efficient and an incentive of Kshs 1,500 per gCO_2/km be established as the rebate. On the other hand, the study recommends that be there be a fee of Kshs 1,500 per gCO_2/km for vehicles with emissions above 170 gCO_2/km. Additionally, for the program to register success and meet the intended objectives, the rebate fee should be lower than the fee upon determining the administrative costs involved with a view of ensuring that there are revenues generated from the program.

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www.unep.org/transport/gfei/autotool

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9 APPENDICES

Appendix A1: Data collection tools (Automobile Dealer / Automaker Interview Questions)

Study to Develop a Fuel Economy Labeling and Feebate Program for Motor Vehicles in Kenya

MOTOR VEHICLE DEALERS/ASSEMBLERS INTERVIEW QUESTIONNAIRE

Questionnaire Identification (*To be completed by UNES Researcher*)

Questionnaire Number | | | | | Town/City……

Name of Interviewer and code …….....

Date of interview: (day / month / year)	d	d	m	m	2	0	1	5

INTRODUCTION

The Energy Regulatory Board (ERC) and United Nations Environment Programme (UNEP) have engaged the University of Nairobi Enterprises and Services Ltd (UNES) to undertake a study on fuel economy labeling and feebate program for Kenya. The proposed program will be applied at the time of purchase of new/used light duty vehicle, and would give incentive to consumers purchasing more fuel efficient vehicles while those purchasing less fuel efficient than a set target would pay a fee. Your perceptions and responses are very important for this study since they will be instrumental in designing the envisioned feebate program. There is no right or wrong answers, as the responses are considered as expressions of perceptions, so please be

honest and tell us what is true for you. The information being collected is for purposes of the program development only and there are no personal risks or benefits to your participation.

CONFIDENTIALITY

UNES protects the confidentiality of information collected. Note that the information you provide will be kept confidential and reported only in the aggregate and not for individual attribution. UNES advises you that there is no risk of disclosure of any information whatsoever, and guarantees that the information will be used for the purpose of this study ONLY.

Notes

- Please indicate any provisional or estimated data with an asterisk (*) and an explanatory footnote.
- Please do not leave any space blank. Use the following symbols if you do not have the data requested:

N/A = *Category Not Applicable;* ***M*** = *missing data (or not available)*

PART A: COMPANY PROFILE

Name of Company: .....

Postal Address .....

Physical Location .....

Telephone Nos. .....

Email Address .....

Website .....

Nature of Business .....

Respondent's Position in the Organization/Business .....

Year of Business Establishment: .....

PART B: FAMILIARITY WITH FEEBATE PROGRAM

I would like to describe a feebate program for NEW vehicle buyers. Under this program, when a new vehicle is FIRST purchased, it could be subject to either a one-time fee or a one-time rebate. The program sets a target for vehicle emissions. If you buy a vehicle with emissions higher than the target you have to pay a fee. If you buy a vehicle with emissions lower than the target you get a rebate. The amount of the fee or rebate depends on the vehicle's greenhouse gas emissions. Vehicles with the lowest emissions (highest km/litre) get the biggest rebates. Vehicles with the highest emissions (lowest km/litre) get the biggest fees. The program is being designed to help reduce greenhouse gas emissions (air pollution) in Kenya.

1. **A) Are you familiar with Motor Vehicle Feebate Program?**
   a. Yes ☐ b. No ☐

   B) What is your view about the establishment of such a program in Kenya?

   ……
   ……
   ……
   ……
   ……

2. **Would you be generally supportive of this kind of program to help slow the rate of climate change (air pollution)?**
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

3. **A) Have you had any previous experience with a feebate program, or any other motor vehicle incentive or fee program?**

   a. Yes ☐ b. No ☐

   B) What are the positive or negative experiences/challenges from such a program that you can highlight?

   ……
   ……
   ……
   ……

……

……

4. **It makes sense for public policy to reward people for buying vehicles that produce fewer greenhouse gas emissions. Do you,**
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree?
5. **This program is fair because the people who choose to buy higher-emitting vehicles would pay more for those emissions. Do you,**
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree?
6. **Suppose you were shopping for a new vehicle, and one that you were considering had an EMISSION FEE on the window sticker. The vehicle costs more and also has higher emissions. With that in mind, tell me how much you agree or disagree with the following statement.—The increased cost of the vehicle will influence my decision more than the increased emissions impact. Do you,**
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree?
    e. Don't know

7. **Suppose you were shopping for a new vehicle, and the one that you were considering had an EMISSION REBATE on the window sticker. The vehicle costs less and also has lower emissions. With that in mind, tell me how much you agree or disagree with the following statement. —The reduced cost of the vehicle will influence my decision more than the reduced emissions impact. Do you,**
    a. Strongly agree
    b. Agree
    c. Disagree
    d. Strongly disagree?
    e. Don't know

PART C: FEEBATE PROGRAM STRUCTURE & VEHICLE LABELLING

8. If a new vehicle that you were planning to purchase increased in price due to an emission fee, what do you think you would do? Please select one response.

a. Buy the vehicle anyway
b. Buy a different new vehicle
c. Buy a used vehicle
d. Save money to buy the same vehicle later
e. I would never consider a vehicle with an emissions fee
f. Don't know

9. What is the maximum EMISSION FEE that you will be willing to pay to purchase a vehicle of your choice which has higher emissions than the required standards?

a. KSh……..
b. Won't pay any fee (Go to NEXT Question)
c. Don't know

10. **What is your reason for not willing to pay a fee to cover for your motor vehicle emissions?**

……
……
……
……
……
……

11. **In your opinion, what is the maximum amount of EMISSION REBATE that should be awarded to fuel efficient vehicles?** KSh……per vehicle

12. How do you think the implementation of the feebate program would impact on your vehicle inventory and sales?

a) Increase the inventory and sales	
b) Reduce the inventory and sales	
c) Have no impact on inventory and sales	
d) Other, please specify	

13. Any suggestions for how the program should be structured? (e.g. applied to different vehicle classes rather than one scale for all vehicles?)

……
……
……
……

14. In your opinion, would the provision of information on vehicle fuel economy using vehicle labels influence the choices consumers make on the purchase of second-hand and new vehicles?

a. Yes ☐ b. No ☐

Please explain your answer

……
……
……
……
……

15. In your opinion, how would the provision of information regarding the vehicle fuel economy using vehicle labels impact on the number of vehicles purchased each year?

e) Increase the number of vehicles purchased	
f) Reduce the number of vehicles purchased	
g) Have no impact on the number of vehicles purchased	
h) Other, please specify	

16. In your opinion, which is an effective way of measuring and labeling the level of pollutant emitted by the motor vehicles? (*Multiple responses allowed***)**

a) Vehicle's fuel consumption in kilometers per litre	
b) Emissions of carbon dioxide (CO_2) in grams per kilometer (gCO_2/km)	
c) Both – km/litre and gCO_2/km	
d) Other, please specify	

17. A) Do you think that both the vehicle emissions and fuel economy are critical information to be provided on the vehicle's label?

a. Yes ☐ b. No ☐

B) Would this enhance the sales of vehicles that are associated with low emissions?

a. Yes ☐ b. No ☐

Please explain your answer in 16B

……
……
……

18. Do you think that the vehicle labeling in respect to fuel economy is an effective measure to curbing air pollution from motor vehicles in Kenya?

a. Yes ☐ b. No ☐

Please explain your answer

……
……
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……

19. In a recent Global Fuel Economy Initiative Study it was established that only 1% of LDV vehicle imported to Kenya are new. In your opinion what should the government do to promote purchase of new vehicles?

……
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PART D: IMPLEMENTATION AND ADMINISTRATION OF THE FEEBATE PROGRAM

20. Is the assignment of a specific range of CO_2 emissions or fuel economy(what is considered less or more than the set benchmark)for a particular class of vehicles (light vehicles, heavy vehicles or Sports Utility Vehicle among others), a range that is different from another class of vehicles, a critical aspect of success in implementing the vehicle labeling system? Or do you think all vehicles should be treated equally (in terms of the level of emissions) regardless of the class of each vehicle.

a. Yes ☐ b. No ☐

Please explain your answer

……
……
……
……

21. In your opinion, what will be the best way to roll out the Feebate Program?

	Indicate Suitability
a) Start by charging the fees first then the rebates to follow later (Indicate after how long the payment of rebates should start …….months)	
b) Start by charging fees and giving rebates at the same time	
c) Others (Please specify) ……	

22. What would be the suitable minimum amount of lead-time for information on the structure of the feebate program to be shared before it becomes implemented?
……*Months*

23. What challenges can you foresee in the implementation and administration of the feebate program in Kenya?

……
……
……
……
……
……
……

24. What role do you think your organization can play in the implementation of the feebate program in Kenya?

……
……
……
……
……
……

25. Suppose the desired structure is to have the fees and rebates administered at the dealership level, where records would need to be kept and net fees or rebates returned to or obtained from the government, potentially on a monthly basis. What level of financial compensation would your dealership require to help to administer such a program? (Assume that the feebate program applies to every vehicle sold)

i. KSh ……per month
ii. Don't Know

26. Any other suggestions for the structure or administration of the feebate program? (*Are there any features of the program that could be included to make it easier to administer?)*

……
……
……
……
……
……

SIGNATURES

	Name	Signature
Interviewee		
UNES Representative		

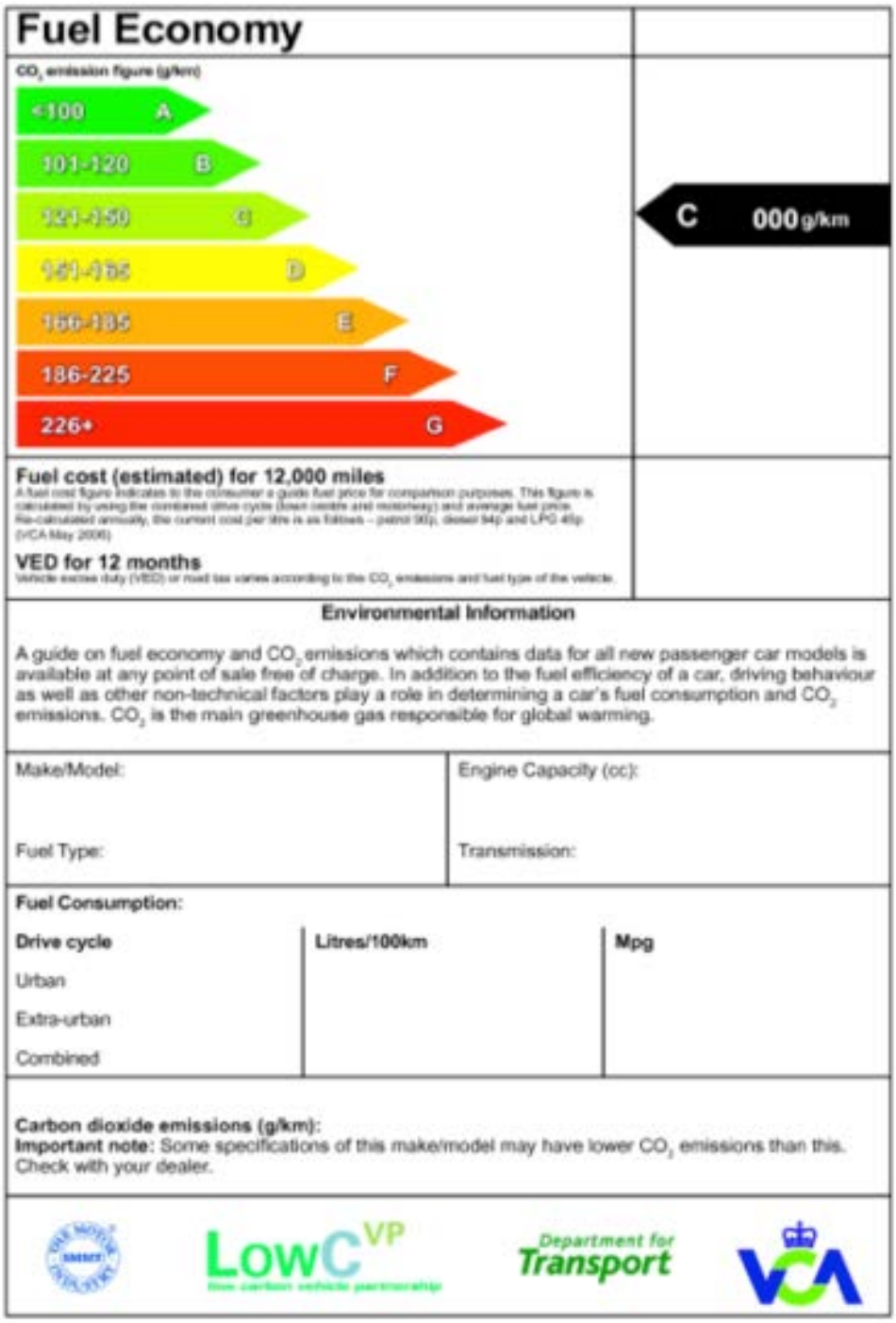
Thank you for participating in this survey

Appendix A.2 List of Motor Dealers Consulted

No.	Name of Company:	Telephone Nos.	Email Address
1.	World Automobile (K) Ltd	0720733556	world.automobile.ltd@gmail.com
2.	Wakila Traders	0707384524	walalatraders@gmail.com
3.	Brightway Motors	0720881999	
4.	TeeTee Motors		
5.	Mobius Motors (K) Limited	0719582470	sales@mobiusmotors.com
6.	Hot Flames Motors	0734797640	
7.	Kangtels Trading Limited	0712066588	kangtels@gmail.com
8.	Clyde Motors Company Ltd	0725734870	clydemotors@gmail.com
9.	Maridady Motors	0729177356 0720648478	financing@maridadymotors.co.ke
10.	New Alama Trading Co. Ltd	0705646968	alamertraders2011@hotmail.com
11.	Honda Nairobi	0718111111	info@hondanrb.co.ke
12.	Alpha Automobile Ltd	0719052000	alphaautocars@gmail.com
13.	Motor Scope Kenya	0722772276	info@motor scopekenya.com
14.	Riri Group of Companies	0722510775	riricars@yahoo.com
15.	Gigi Motors		
16.	Al Hussains Motors	0720-650606, 0750360818	alhusnainnairobi@yahoo.com
17.	Motorise Limited	07270634476	info@motorised.co.ke
18.	Silverline Motors Ltd	0720286398	www.ke2b.silverline
19.	Motor Express	020 2622272	Karuku2000@yahoo.com
20.	Subru Motors Ltd	0773-254447	subrumotors@yahoo.co.uk

Appendix A.3 Vehicle Labels of Selected Countries

a) The EU Fuel Efficiency Label



Fuel Economy

CO_2 emission figure (g/km)

<100 A

101-120 B

121-150 C

151-165 D

166-185 E

186-225 F

226+ G

C 000 g/km

Fuel cost (estimated) for 12,000 miles

A fuel cost figure indicates to the consumer a guide fuel price for comparison purposes. This figure is calculated by using the combined drive cycle (town centre and motorway) and average fuel price. Re-calculated annually, the current cost per litre is as follows – petrol 90p, diesel 94p and LPG 46p. (VCA May 2006)

VED for 12 months

Vehicle excise duty (VED) or road tax varies according to the CO_2 emissions and fuel type of the vehicle.

Environmental Information

A guide on fuel economy and CO_2 emissions which contains data for all new passenger car models is available at any point of sale free of charge. In addition to the fuel efficiency of a car, driving behaviour as well as other non-technical factors play a role in determining a car's fuel consumption and CO_2 emissions. CO_2 is the main greenhouse gas responsible for global warming.

Make/Model:	Engine Capacity (cc):
Fuel Type:	Transmission:

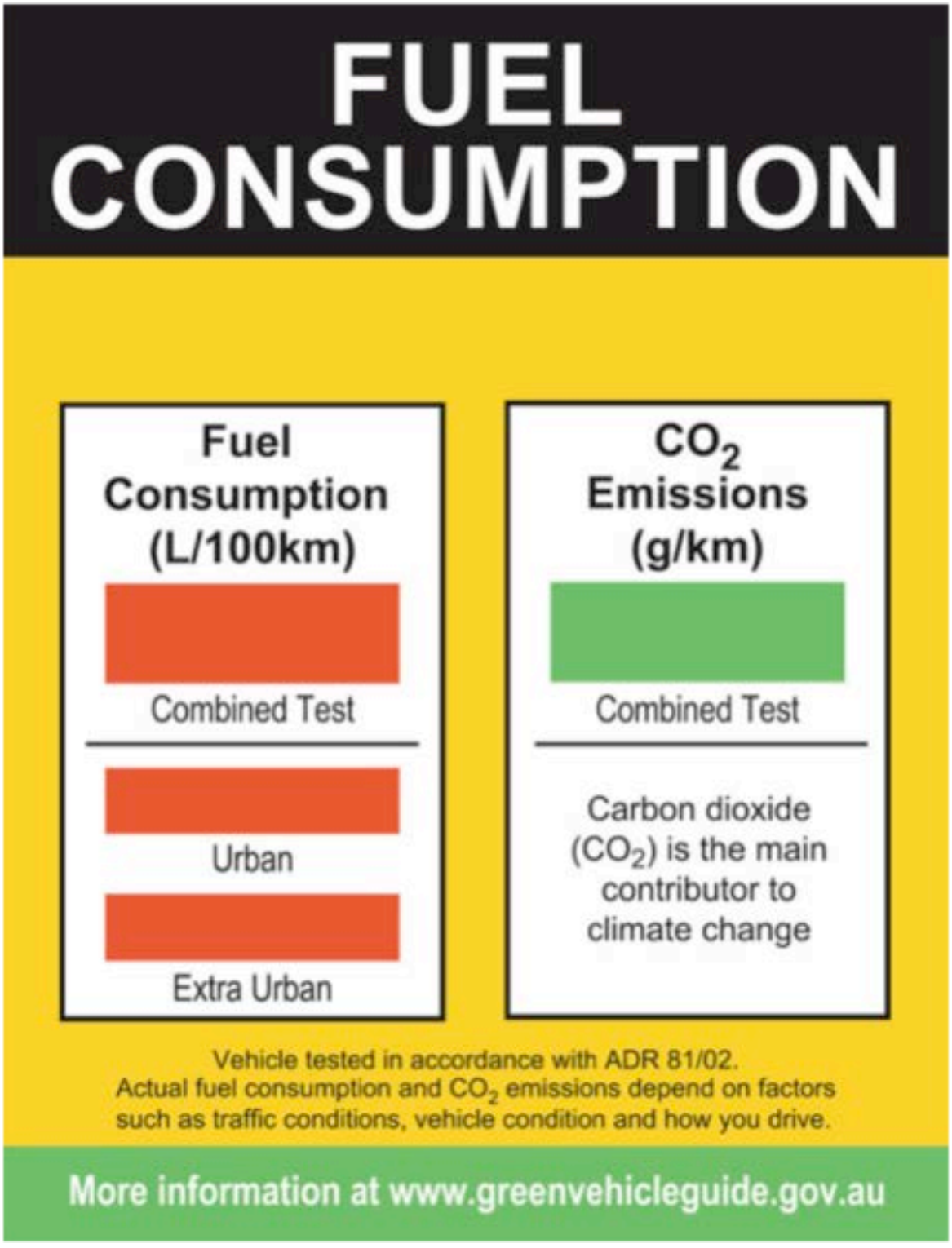
Fuel Consumption:

Drive cycle	Litres/100km	Mpg
Urban		
Extra-urban		
Combined		

Carbon dioxide emissions (g/km):
Important note: Some specifications of this make/model may have lower CO_2 emissions than this. Check with your dealer.

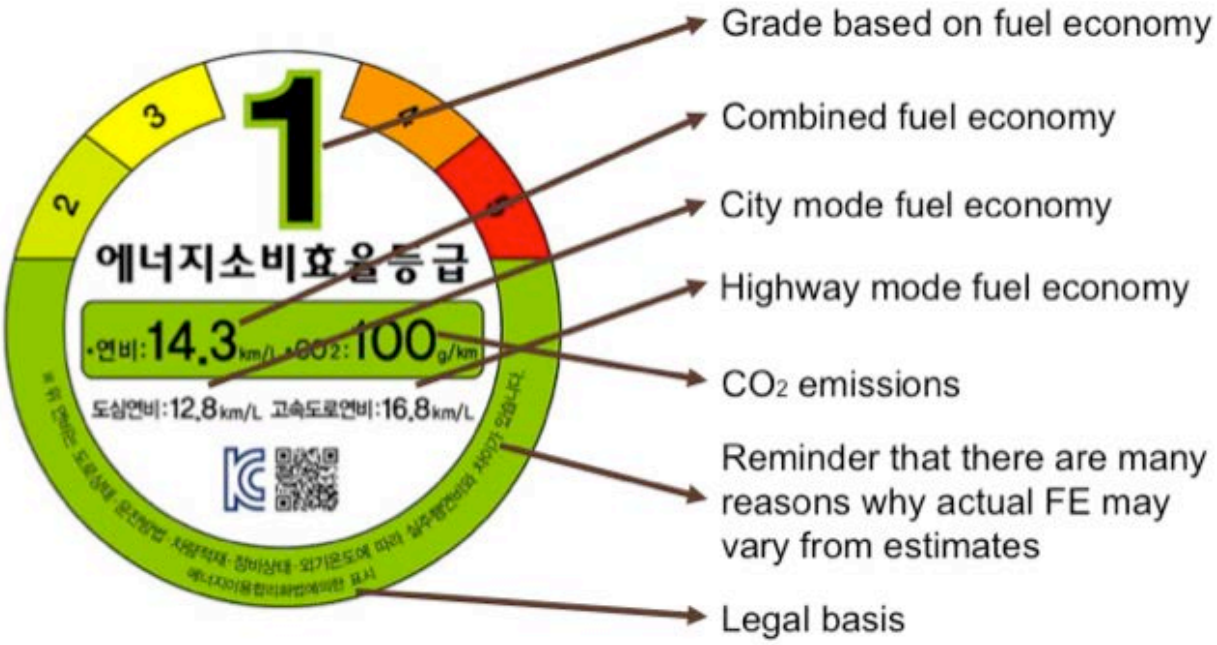
LowCVP Department for Transport VCA

b) Australia Fuel Efficiency Label

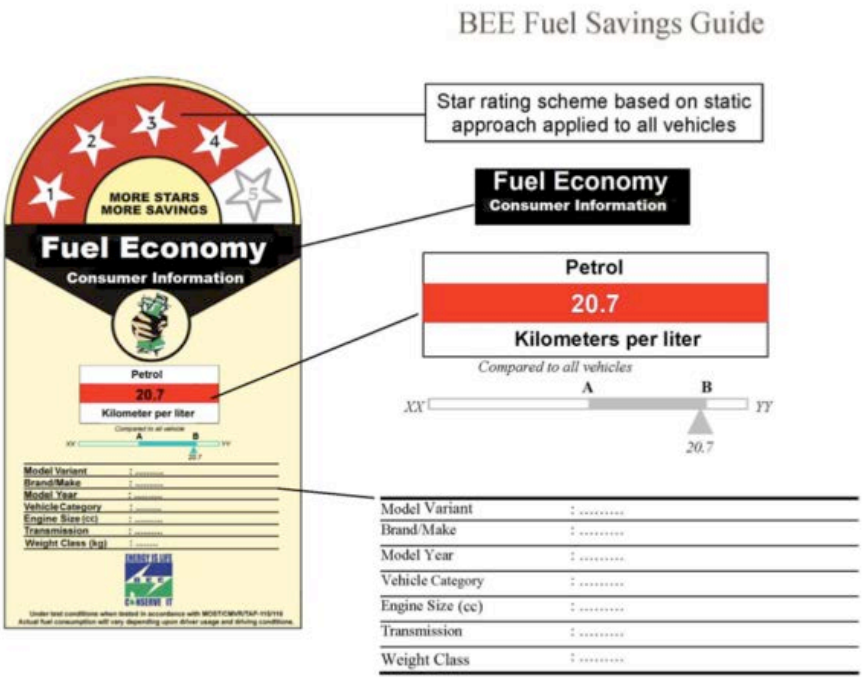


c) South Korea Fuel Efficiency Label

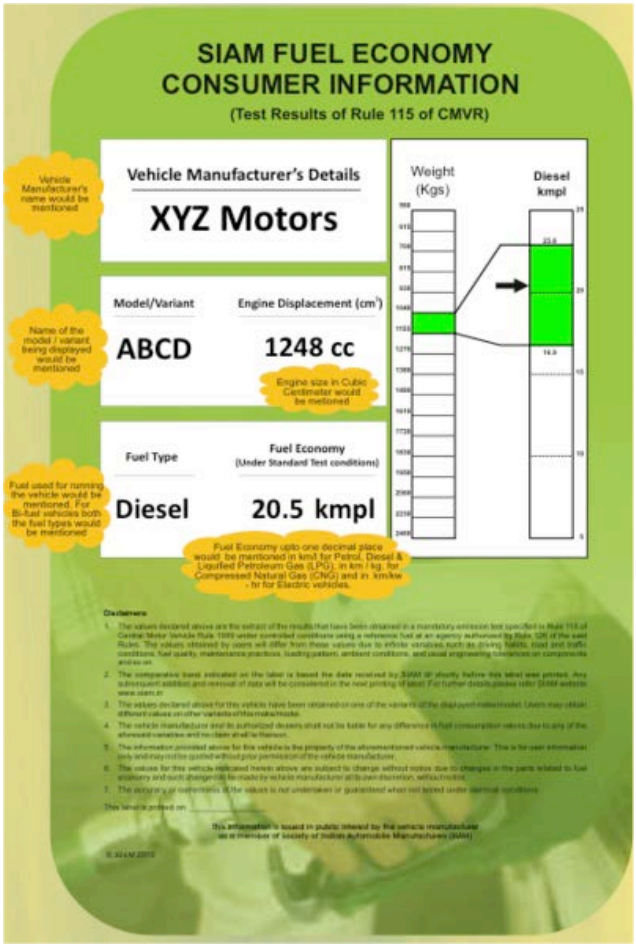
GRADE	1	2	3	4	5
~2011 (FTP-75)	≥ 15	14.9~12.8	12.7~10.6	10.5~8.4	≤ 8.3
2012~ (US Combined Mode adjusted)	≥ 16	15.9~13.8	13.7~11.6	11.5~9.4	≤ 9.3
Label					



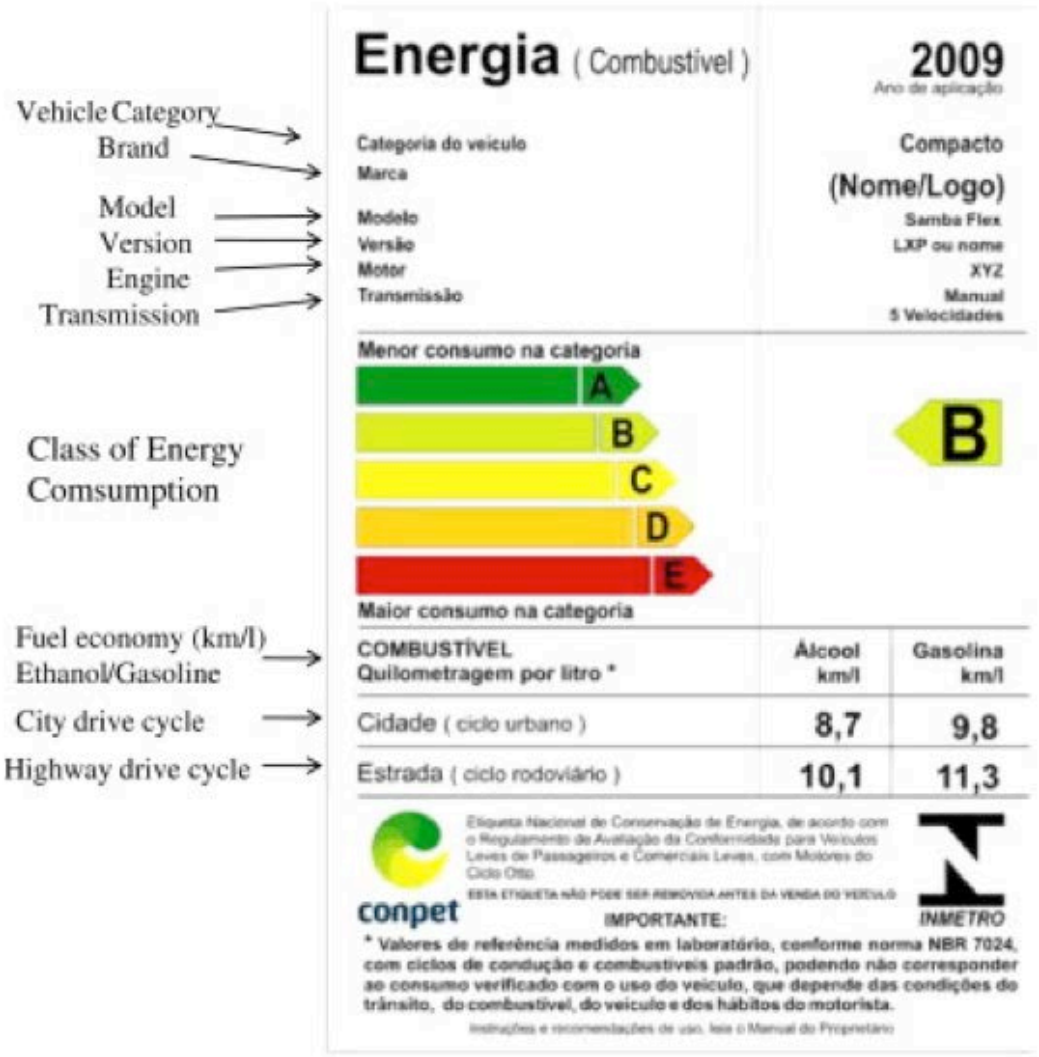
d) India Fuel Efficiency Label 1



e) India Fuel Efficiency Label 2



f) Brazil Fuel Efficiency Label



g) Chile Fuel Efficiency Label

h) China Fuel Efficiency Label

汽车燃料消耗量标识

AUTOMOBILE FUEL CONSUMPTION LABEL

Note: The logo for the virtual display, and paste data and vehicle identification consistent, but the format there are some differences.

Manufacturer:	GAC Toyota Motor Co., Ltd.	Vehicle Type:	Passenger car category M1
Vehicle type:	GTM7251GB	Common name:	Toyota Camry
Engine Model:	5AR	Fuel type:	Gasoline
Displacement:	2494	Rated power:	135
Transmission type:	AT	Driving type:	Front-wheel drive
Curb weight:	1490	Maximum design quality:	2000

燃油消耗量

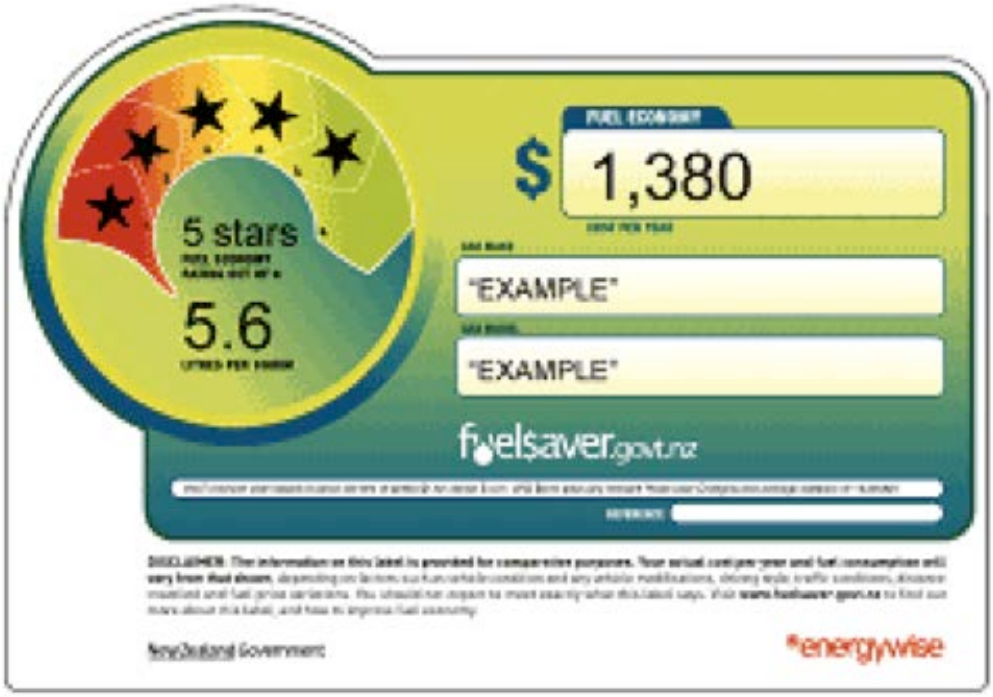
Urban driving conditions:	10.8	L/100km
Integrated operating condition:	7.6	L/100km
Suburban conditions:	5.8	L/100km

Applicable national standard number limit requirements and implementation date (click to enter)

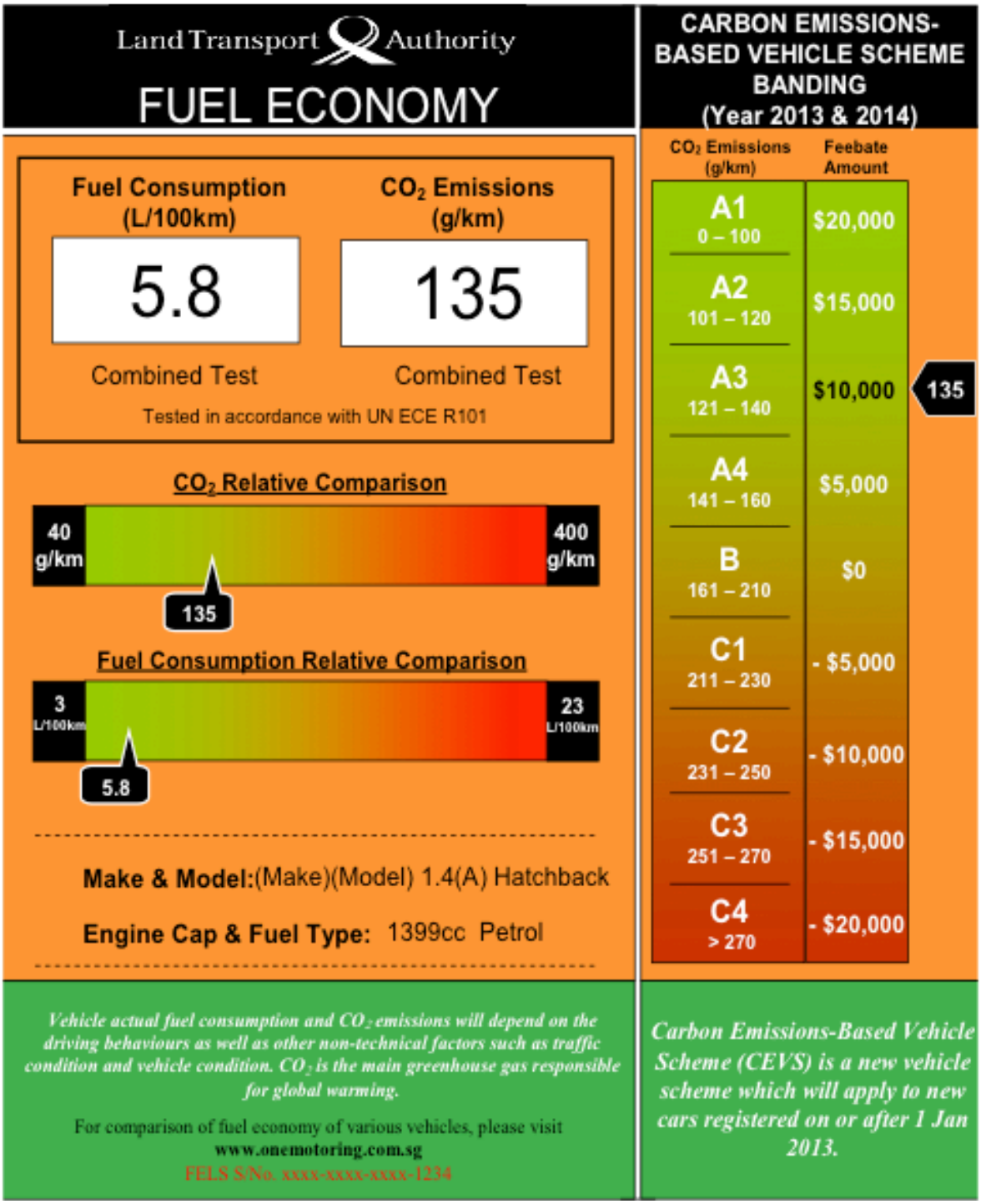
The identification using the fuel consumption data is measured according to GB / T 19233-2008 "light vehicle fuel consumption test methods".
Due to the impact of driving habits, road conditions, weather conditions, and fuel quality and other factors, the actual fuel consumption may fuel consumption with the logo. In order to avoid identification affect vision, after the purchase of the vehicle to remove the logo.

Record No.: 20111115029105

New Zealand Fuel Efficiency Label



i) Singapore Fuel Efficiency Label



j) The US Fuel Efficiency Label

Appendix A.4 Attendance List of Consultative Meetings Held

UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES (UNES) LTD

DEVELOPMENT OF FUEL ECONOMY LABELLING AND FEEBATE PROGRAMME IN KENYA

CONSULTATIVE MEETING WITH STAKEHOLDERS

DATE: 21st April 2015

NO.	NAME	DESIGNATION	ORGANIZATION	TELEPHONE	EMAIL	SIGN
1.	Julius Korir	Industrialization Secretary	Min of Industrialization Ent. Dev.	722606228	jkorir@industrialization.go.ke	
2.	Charles Nyaangaya	"	UNES	0723891004	janyangaya	
3.	Robert M. Mathenge	Project officer	UNES	0720459526	Mathenge@uonbi.ac.ke	
4.						
5.						

UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES (UNES) LTD

DEVELOPMENT OF FUEL ECONOMY LABELLING AND FEEBATE PROGRAMME IN KENYA

CONSULTATIVE MEETING WITH STAKEHOLDERS

DATE: 23rd April 2015.

NO.	NAME	DESIGNATION	ORGANIZATION	TELEPHONE	EMAIL	SIGN
1	Prof. James Nyangaya	Consultant	UNES	0723891004	janyangaya@uonbi.ac.ke	
2.	Dr Joseph Kipkagat	Director Ind. Polytech	MoED	0722578718	jkkiplagat@yahoo.co.uk.	
3.	D. M. Mathenge	Project officer	UNES	0733632604 0720459526	Mathenge@uonbi.ac.ke	

UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES (UNES) LTD

DEVELOPMENT OF FUEL ECONOMY LABELLING AND FEEBATE PROGRAMME IN KENYA

CONSULTATIVE MEETING WITH STAKEHOLDERS

DATE: 24th April 2015.

NO.	NAME	DESIGNATION	ORGANIZATION	TELEPHONE	EMAIL	SIGN
1.	Zachariah Kavenge Mungai	Egineering Mgr.	General motors East Africa	0720 611540	Zacharia.Kavenge @gm.com	
2.	Lewis Murimi	Product Engm Vehicle validation	GMEA	0720973383	Lewis.Murimi @gm.com	
3	Phillip Odhiambo	Product Planner	GMEA	0720236697	Philip.Odhiambo @gm.com	
4.	James Nyaangaya	Consultant	UNES	0723891004	Janyangaya @uonbi.ac.ke	
5.	Robert M. Mathenge	Consultant	UNES.	0720409526	Mathenge @ uonbiac.ke	

UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES (UNES) LTD

DEVELOPMENT OF FUEL ECONOMY LABELLING AND FEEBATE PROGRAMME IN KENYA

CONSULTATIVE MEETING WITH STAKEHOLDERS

DATE: 25th April 2015.

NO.	NAME	DESIGNATION	ORGANIZATION	TELEPHONE	EMAIL	SIGN
1.	W Kangangi	GM	Toyota Kenya (Ltd)	0708231391	Wanjohi.Wanjohi@toyotakenya.com	
2.	J.A.Nyaangaya	Ceeeultaat	UNES	0723891004	Janyangaya@uonbi.ac.ke	
3.	Peter Kimani	Consultant	UNES	0722260693	peter.Kangethe@gmail.com	
4	Robert M. Mathenge	Consultant	UNES.	0720459526	Mathenge@uonbi.ac.ke	
5.						

UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES (UNES) LTD

DEVELOPMENT OF FUEL ECONOMY LABELLING AND FEEBATE PROGRAMME IN KENYA

CONSULTATIVE MEETING WITH STAKEHOLDERS

DATE: 28th April 2015

NO.	NAME	DESIGNATION	ORGANIZATION	TELEPHONE	EMAIL	SIGN
1	ALEX OGUSO	RESEARCH ASSISTANT	KIPPRA	0720964337	aoguso@kippra.or.ke	
2.	Mwai Wanjohi	PCO	NEMA	0722760292	mwmwai@nema.go.ke	
3.	Peter Kimani	Consultant	UNES	0722260693	pkimani@uonbi.ac.ke	
4	R. M. Mathenge	Consultant	UNES	0720 459 526	Mathenge@uonbi.ac.ke	

UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES (UNES) LTD

DEVELOPMENT OF FUEL ECONOMY LABELLING AND FEEBATE PROGRAMME IN KENYA

CONSULTATIVE MEETING WITH STAKEHOLDERS

DATE: 29/04/2015.

NO.	NAME	DESIGNATION	ORGANIZATION	TELEPHONE	EMAIL	SIGN
1.	Robert M. Mathenge	Consultant	UNES	0720459526	Mathenge@uonbi.ac.ke	
2	MARTIN ESHIWANI	DS	MOTI	0720031220	meshiwani@transport.go.ke	
3.	Peter Kimani	Consultant	UNES	0722260693	pkimani@uonbi.ac.ke	

REF: F-30-7-2

KNBS
KENYA NATIONAL BUREAU OF STATISTICS
Keeping you informed

MEETINGS ATTENDANCE FORM (with External Participants)

Meeting title: MEETING WITH UNES - UNIVERSITY OF NAIROBI **Date:** 14TH MAY, 2015

S/No	Name	Sex	Institution	Designation/Title	Email	Tel No.	Signature
1.	Peter Kimani	M	UNES	Consultant	pkimani@uonbi.ac.ke	0722260693	
2.	ALEX OGUSO	M	KIPPRA	RESEARCHER	aoguso@kippra.or.ke	0720964337	
3.	J.A. Nyaangaya	M	UNES	"	jaayangaya@uonbi.ac.ke	0723891004	
4.	James Gathigu	M	KNBS	Director/DPS	jgathigu@knbs.or.ke	0722691154	
5.	Vivianne Nyarunda	F	KNBS	Manager	vnyarunda@knbs.or.ke	0722 494820	
6.	John Makau	M	KNBS	Manager	jyala@knbs.or.ke	0729482620	
7.							
8.							
9.							
10.							

EFFECTIVE DATE: 13th November, 2014 ISSUE/REV: 2/0 SUPERSEDES: Issue/Rev:1/01

UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES LTD

Study to develop a fuel economy labeling and feebate programme for motor vehicles in Kenya
Consultative Meeting Attendance Form

Date: 19th May 2015

No.	Name	Institution	Designation/title	Email	Tel no.	Signature
1.	Peter Kimani	UNES	Consultant	pkimani@uonbi.ac.ke	0722 260693	
2.	James Nyaagaya	"	"	janyangaya.@uonbi.ac.ke	0723891004	
3.	Paschal Musa	KEBS	Manager Petroleum	musapo@kebs.org	0722822589	
4.						
5.						
6.						
7.						