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UNIVERSITY OF NAIROBI ENTERPRISES AND SERVICES LTD

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

FINAL REPORT

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LIST OF ABBREVIATIONS

CBD	Central Business District
CIF	Cost Insurance and Freight
CO_2	Carbon Dioxide
CRSP	Current Retail Selling Price
ERC	Energy Regulatory Commission
EU	European Union
FE	Fuel Economy
FIA	Federation Internationale de Automobile
GFEI	Global Fuel Economy Initiative
GHG	Greenhouse Gas
GMEA	General Motors East Africa
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 Model
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
EPA	Environment Protection Agency
GVW	Gross Vehicle Weight
FTP	Federal Test Procedure (U.S.A)
NEDC	New European Driving Cycle
ADR	Australian Design Rules

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 kilograms 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 to recommendations proposed in the Global Fuel Economy Initiative (GFEI) study carried out in 2014.

In the GFEI study it was established that, the average age of registered LDVs was 7.5 years over 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 encourage purchase of low fuel consumption/emission vehicles and ensure that all vehicles undergo regular inspection for road worthiness and emissions.

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 are levied on vehicles that pollute more than average and credited to the more efficient vehicles that pollute less than average.

Vehicle fuel labeling is the provision of information on vehicle fuel economy using stickers (on the windscreen) to enable prospective buyers easily view the information and consider the additional criteria as they choose a vehicle.

A Labeling and Feebate program is a public and private partnership entity that contributes effectively to reducing the levels of emissions from vehicles. In the feebate and labeling study, a comparative analysis, was conducted of various programs in the world and their success factors identified. The study also undertook feasibility assessment through interaction with stakeholders. A survey was conducted and analysis of consumer behavior carried out through car dealers for perception of attitudes that would help in design of the program. Relevant government institutions were consulted and their inputs incorporated. Economic and financial analyses were carried out to assess the resultant effects of implementing the program.

Three fuel labels were proposed for consideration by the client. These differ on the amount of information given, layout of design, physical size and colors used. It was considered most significant that the label conveys the information through a brief view and not a studious perusal of several minutes.

Analysis of revenue generation from vehicles was based on data covering the past five years from Kenya Revenue Authority. Multi-criteria and econometric analysis carried out considered two estimations, the first one with petrol powered vehicles while the second was with vehicles using diesel. Each estimation used a random sample size of 2000 vehicles of the data sets for the period 2010 to 2014.

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. It was noted that using the engine size of 2501 – 3500 cc for reference, 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 based on engine size category. The estimations and the dataset of the five years were used in simulations to yield an average CO_2 emission of 169.88 gCO_2/km which was consequently used to establish the benchmark CO_2 emission of 169.00 - 169.99 gCO_2/km.

The study established that increase in duties and fees will have marginal effects in vehicle purchase and thus will influence choice on the basis of size of engine. It was also established that the average CO_2 emission using the 2010 – 2014 dataset was 169.88 gCO_2/km as reported above and the average fuel consumption as 7.17 L/100km. The proposed benchmark of 169.00 gCO_2/km to 169.99 gCO_2/km and a rate of Kshs 1,500 for both Rebate and Feebate compares well with other countries that have implemented similar programs.

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1. INTRODUCTION

1.1. Background

In March 2009, the United Nations Environment Programme (UNEP), the International Energy Agency, the International Transport Forum and the Federation Internationale de Automobile (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 (ERC) 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 annual registration of LDV's 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 7.62L/100 km while the average CO_2 was 181.8g/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;

a) Most of the vehicles are concentrated in cities, with the largest number in the capital city of 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 pollution 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 exposures above 46.1 µg/m^3 increases the risk of respiratory diseases (Omwenga, 2011).

b) 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.

c) 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 90% exists and increased risk of infection in children of less than 5 years old was reported.

d) The economic survey of 2015 estimated the country's expenditures on petroleum products in 2014 at Kshs. 333.1 billion.

The recommendations of the study included the following:

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) Provision of incentives to 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.

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.

1.3. Vehicle Labeling

Provision of information on vehicle fuel economy using vehicle labels is important for consumers' consideration of additional performance characteristics as they make their choices. Where fiscal regimes incentivize fuel economy, vehicle labeling helps consumers compare these in addition to others like government duties and taxation.

Provision of information on fuel economy and emissions enlightens customers on these as social and financial running costs. Stickers on the windscreen inform the prospective buyers of the fuel consumption and carbon dioxide emissions and hence the extent to which the vehicles they are buying contribute to the global climate change.

Approaches to vehicle labeling differ in terms of the metrics, amount and type of information provided and graphical presentation. There are three basic types of labels, namely:

a) Graphical rating as is used in the UK and New Zealand;
b) Direct information disclosure, by providing the value of CO_2 emissions or fuel economy. This is the most common system and used in the US, South Africa, Australia, Singapore, Chile and India and
c) Relative vehicle performance compared to the fuel economy standard, as is used in Japan.

1.4. New Vehicle Purchase Scheme

The predominant scheme in most countries for purchase of new vehicles is that of scrappage which 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 vehicles. 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 a specific amount and the seller guarantees to buy it back at another amount. The options and guidelines are typically available on line for the details of the purchase price, cost of insurance and registration and buy back amount. It is also a requirement of the buy-back programme that the vehicle be initially tested and assessed by Accredited Motor Vehicle Assessor/Valuer at the buyers cost.

2. METHODOLOGY

2.1 Terms of reference

The methodology is structured as per the terms of reference which is as follows;

2.1.1 Fuel Economy Labeling Programme

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

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

b) Identification of the key success factors for vehicle labeling programmes.

c) Applicability / feasibility assessment based on interaction with 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 stakeholders.

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

2.1.2 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 establish attitudes on fees and rebates on vehicles.

c) Identification of key success factors for feebate system.

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

e) Economic /Financial modelling to select possible rates.

f) Analysis of financial incentives (rebates) that promote the sale and use of cleaner vehicles.

g) Establish implications to government and the public and evaluate effectiveness for GFEI targets

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

i) Proposal of resources (institutional and human capacity) and regulatory framework for implementation.

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

k) Preparation report with fiscal policy proposals for implementation of feebates and rebates.

2.1.3 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.

2.2 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 eg. 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 (MNL) suggested by (McFadden 1973) due to ease of estimation and simple mathematical formulation.

The dependent variable y = j in the multinomial logit model is a categorical, unordered variable and an individual may select only one alternative. The choices are called alternatives and are coded as j = 1, 2... n. The numbers are only codes and cannot be interpreted. Therefore, $y_j = 1$ if

the alternative j is the observed outcome and the remaining $y_j = 0$. For each observation, only one of the $y_1, y_2....y_n$ is a non-zero.

$y_j = 1$ if $y = j$ and 0 if $y \neq 0$ ..... **[2.1]**

The multinomial density for one observation is defined as;

$f(y) = p_1^{y}x$ ..... $x\ p_n^{yn} = \Pi^{n}_{j=1} p_j^{yj}$ ..... **[2.2]**

The functional form selected is such that the probabilities lie between 0 and 1 and sum over j to one expressed as;

$\Sigma_{nj=1} P_{ij} = 1$ ..... **[2.3]**

The independent variable used in the multinomial logit model are called alternative invariant or case specific regressors meaning that the variable X_j vary over the individual i but do not vary over the alternative j. In this study it is assumed that individual choses to purchase a vehicle based on the engine size category and in as much as individual vehicle characteristics vary, there are no variations in this case.

3. VEHICLE LABELING PROGRAM

3.1. Literature Review

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 windscreen of vehicles on sale at dealerships in order to inform consumers.

A labeling program integrating all classes of vehicles encourages the consumer to purchase a vehicle with higher fuel economy regardless of the vehicle type and category. Similarly, for consumers decided on a type of vehicle such as an Sports Utility Vehicle (SUV) the label still functions to differentiate their fuel efficiency.

Some countries have labeling programs that include some form of comparative information (eg. New Zealand, Singapore, Japan, the EU, Brazil, and the US). Others like that of China and Australia do not include comparative information.

The following are the key features of global labeling programs:

a) New Zealand uses stars in rating (half a star to six stars).
b) 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 other vehicles in the same size class.
f) Chile is the only Latin American country with emission standards displayed on the label.

3.1.2 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 issued in 2012 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 and the average yearly fuel cost.

c) **Brazil**

In 2009, 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. In the programme vehicles are 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 1st 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**

Labeling was established in 2006 by the Energy Use Rationalization Act. Fuel economy is displayed on a label for all passenger vehicles, buses with 15 seats or less and trucks with GVW of 3.5 tons of less. Vehicles are graded 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 created by the Society of India Automobile Manufacturers (SIAM). 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. A highlighted box in the scale gives 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.

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) **Japan**

Japan has already gained more than 10 years' experience in vehicle emissions/fuel consumption policy with its "Top Runner" fuel efficiency standard. This has contributed to a decline of passenger fuel emissions in Japan, accounting for 9.5 % of total CO_2 emissions in 2008. Tax incentive is applied for customers attaining green, blue, or both labels. The Japanese government has extended the tax break through April 2015. 75% reduction of tax is applied for gasoline vehicles complying with 2015 fuel efficiency standards.

Japan's Top Runner Programme, introduced in 1999, is a set of energy efficiency standards for energy intensive products, such as home appliances and motor vehicles. As of 2014, the programme involved 23 product categories. Products are included due to either their high energy or widespread use or their substantial scope for improving energy efficiency. Energy efficiency targets are set to be achieved within a given number of years on the basis of the most efficient model on the market (the 'Top Runner').

Products which do meet the energy efficiency standard receive a Top Runner label at the point of sale; those which do not are labelled differently. This drives companies to try to make ever more efficient models to compete for the award of Japan's 'Top Runner'.

The Minister of Environment (METI) can disclose the names of companies that fail to meet the targets, as well as issue recommendations, orders and fines. This also drives companies to avoid negative publicity. To date, no enforcement actions have been taken, as targets have been systematically met or exceeded. Manufacturers highly support the programme, since they are directly involved in setting the targets and energy efficiency is considered to be a competitive advantage

l) **South Africa**

Fuel labeling in South Africa started in 2008. Car dealers are currently required to display stickers on the windscreens of new cars, informing prospective buyers how fuel efficient each vehicle is and the 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 are as determined by i.e. SANS 20101: 2006 and 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	2006
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	2011
	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. The background to this is that 27% of total CO_2 emissions within OECD come from transport and of that road based transport accounts for approximately 80%.

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

Information on fuel consumption and CO_2 emissions on vehicle labels will reduce the current fuel consumption and greenhouse gas emission through awareness. This measure is aimed at improving fuel efficiency by providing consumers with additional awareness of financial and social costs of vehicle ownership.

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 are more conscious of the impact on the operating cost of their vehicle and seek vehicles with 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. The full implication of buying fuel efficient vehicles is hence made more apparent and any

incentive distinct. 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 purchase of a vehicle.

3.1.3.5 Highlight on the Influence of driving style and vehicle use

The fuel-efficiency of a vehicle is only the first step towards achieving good fuel economy. Vehicle labels should also point out that driving habits significantly influence vehicle fuel consumption. The following driving habits further 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 90 km/h and driving within the speed limits improve fuel efficiency.

c) **Avoid excessive idling:** Idling when stopped in traffic consumes fuel unnecessarily. Engines should be switched off if one is likely to be stopping for more than three minutes.

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

e) **Plan ahead:** It is advisable that one check the latest traffic conditions for the route that they plan to use. Planning and combining trips is best 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). Vehicle purchase is also influenced by how a vehicle satisfies the practical and emotional needs of the consumer which is in turn based on gender, income, household size, urban or suburban living, as well as availability of other travel options.

Through market research information on the drivers of consumer behavior could provide important insight on how to better design vehicle labels. Behavioral economics, which uses social, cognitive and emotional factors to understand the economic decisions of consumers, recognizes that consumers are strongly influenced by emotional factors, habits and by the behavior of the people around them.

3.1.3.7 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, where by lower fuel consumption earns more stars.

3.1.3.8 Presentation of information in a clear and concise manner

Good labels should not contain excessive information and should use familiar units.

3.2. Proposed Vehicle Labels for Kenya

The fuel label options were developed on the basis mentioned earlier with consideration of the short time that they are viewed.

3.2.1 Proposed Label - I

This sample fuel label in Figure 3-1 indicates both the fuel consumption and CO_2 emission. With expected implementation of a feebate system, the cost savings Information on potential savings in running costs, which is considered as a strong motivator to consumers will also be indicated. The running cost per year, star rating and liters per 100 km are displayed.

The lower part of the label has a cautious 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 among other factors.

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

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). Figure 3-2 shows a label for a vehicle with best fuel economy rating of 1. Consumers may note that higher fuel economy is associated with a better GHG emissions profile.

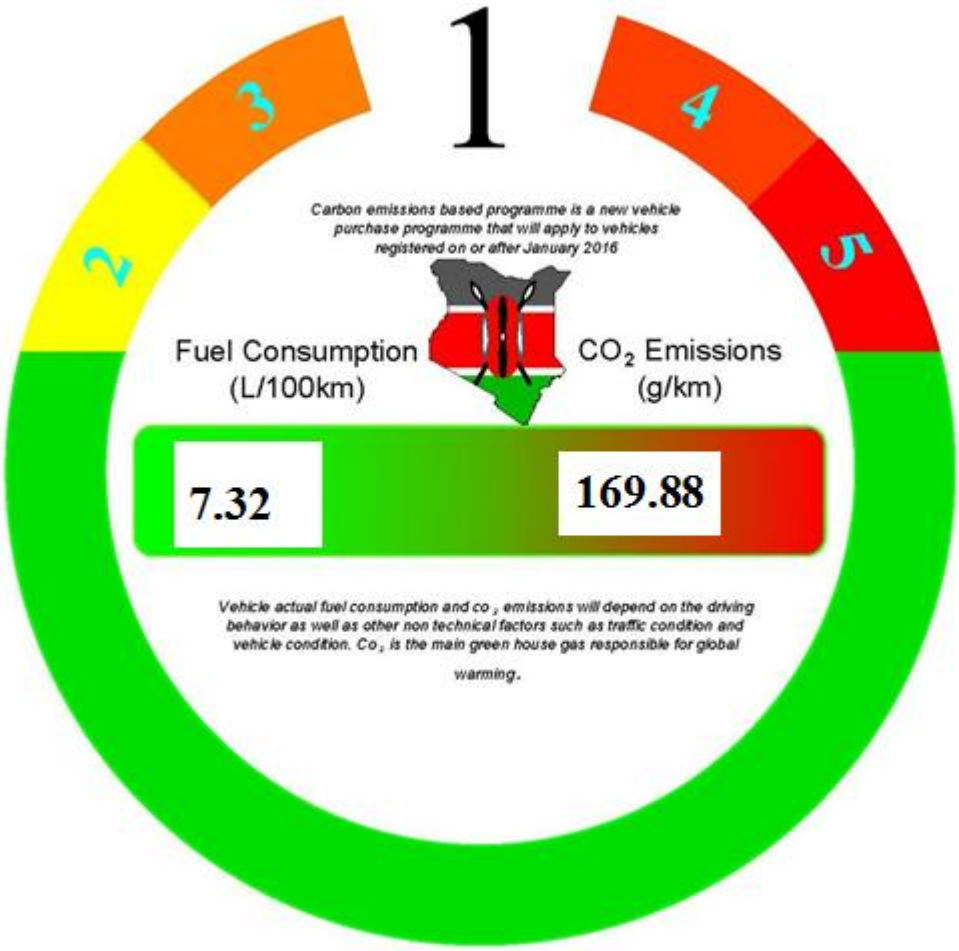

Figure 3-2: Proposed Vehicle Fuel Label (Option 2)

3.2.3 Proposed Label - III

Option 3 shown in Figure 3-3 assigns each vehicle a star rating for fuel economy and greenhouse gas (GHG) emissions ranging from 1 to 5, with more stars indicating better savings on the part of the consumer.

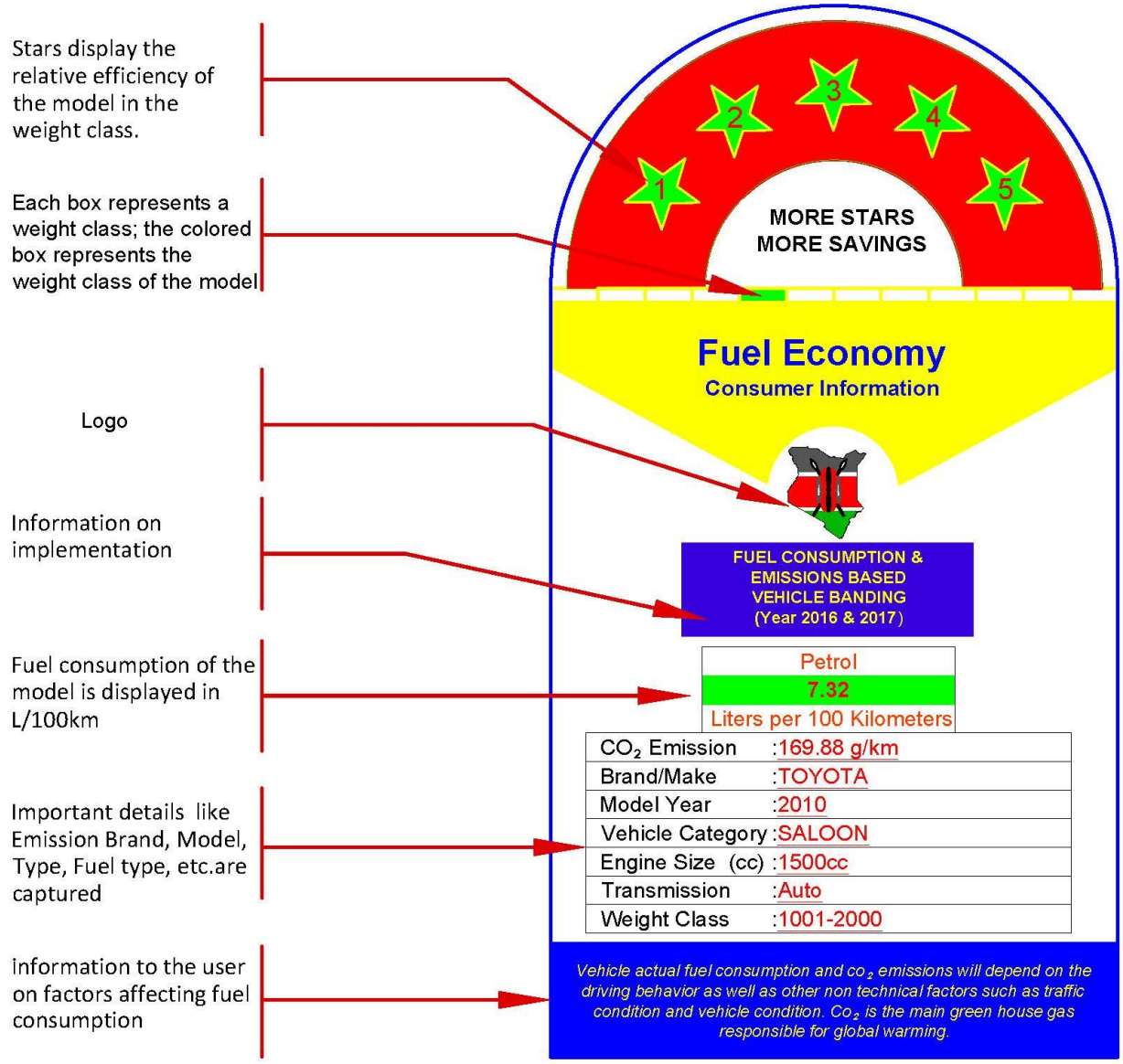

Figure 3-3: Proposed Vehicle Fuel Label (Option 3)

It is also proposed that the information on labels be available on a consumer-focused web site that could provide more detailed information, along with access to tools, applications and social media.

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 3.3.8 highlight the proposed roles of key stakeholders.

3.3.1 Ministry of Transport and Infrastructure (MoTI)

The Ministry of Transport and Infrastructure through NTSA (being the auto dealers licensing authority) should take part in the development of a vehicle fuel economy policy, creation of regulations for implementation of feebate and vehicle fuel labeling. The Ministry should also take part in legalizing implementation of the programs, participate in the development of a vehicle fuel economy policy and ensure strict compliance to vehicle fuel labeling. The Ministry should also oversee the training of 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 National Transport and Safety Authority (NTSA)

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

3.3.3 Kenya Bureau of Standards (KEBS)

The Kenya Bureau of Standards, 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.

KEBS should ensure that data on fuel consumption and vehicle emission is captured at the point of inspection.

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.

3.3.4 Kenya Revenue Authority (KRA)

KRA will be responsible for administration of fees and rebates.

3.3.5 Ministry of Energy and Petroleum (MoEP)

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 Energy Regulatory Commission (ERC)

The Energy Regulatory Commission should take part in the development of a policy document on vehicle fuel economy and emissions. They should 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.

3.3.7 National Environment Management Authority (NEMA)

The EMCA created several statutory bodies which include the National Environment Management Authority (NEMA) and Standards Enforcement and Review Committee (SERC). NEMA was established to exercise general supervision and co-ordination on all matters relating to the environment. Standards Enforcement and Review Committee (SERC) in consultation with the relevant lead agencies is supposed to advise NEMA on how to establish criteria and procedures for the measurement of air quality and also to recommend to the authority: ambient air quality standards, occupational air quality standards, emission standards for various sources, criteria and guidelines for air pollution control for both mobile and stationary sources and any other air quality standards. Section 9 (i) of EMCA mandates NEMA to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of the Government of Kenya in the implementation of all policies relating to the environment.

3.3.8 Auto Dealers

To ensure that all vehicles on sale have vehicle labels displaying fuel consumption and CO_2 emissions as a regulation from the Ministry of Transport and Infrastructure and NTSA. 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.

3.4 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 Global Fuel Economy Initiative (GFEI) Kenya Study report. The process of revising the document should bring together all relevant stakeholders.

The Energy Bill proposes establishment of an Energy Efficiency and Conservation Agency to be responsible for the following:

(a) Make, in consultation with the Kenya Bureau of Standards (KEBS) and other statutory authorities requirements for vehicle fuel labels.
(b) Promote, in collaboration with the Energy Regulatory Commission (ERC) and the KEBS 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 Registrar of Motor vehicles which is a department of NTSA is the official repository of vehicle registration data and has maintained a digital and searchable data base of vehicles registered in the country since 2005. The additional vehicle characteristics of fuel economy and CO_2 emissions should be managed by the established systems.

3.5.2 Misrepresentation of Vehicle Information

Display of wrong information on a vehicle will be discouraged through fines and penalties.

3.5.3 Non Compliance

Vehicle labeling will be mandatory and full compliance of auto dealers enforced. However, general public awareness on fuel consumption impacts on vehicle's practical usage must be made as informed citizenry will enhance compliance 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 high fuel consuming vehicles, 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 that are more than 20 years old. The trade-in of old cabs for new vehicles was through regular monthly payments. Five car companies Russia's 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 promoting socio economic development.
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 depending on the interest rate.

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. Literature Review

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. Fee-bate 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

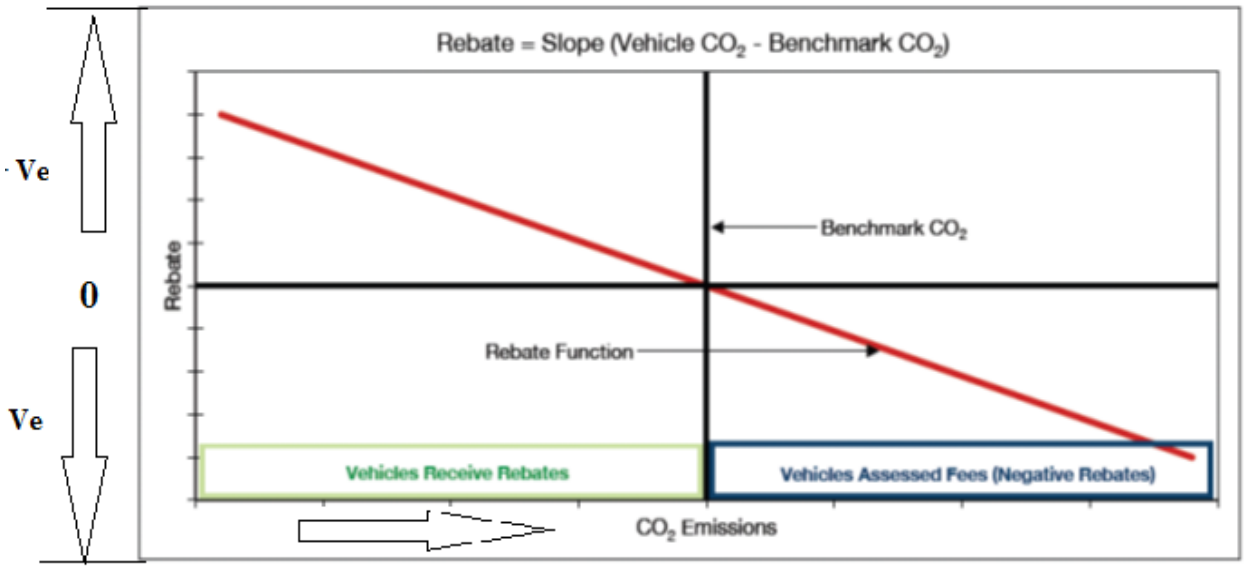

Figure 5-1: Generalized Depiction of a Feebate System

Source: German and Meszler (2010)

Figure 5.1 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 CO_2 levy on top of the purchase price. Since the rebate function is linear, the CO_2 levy 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 far 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.

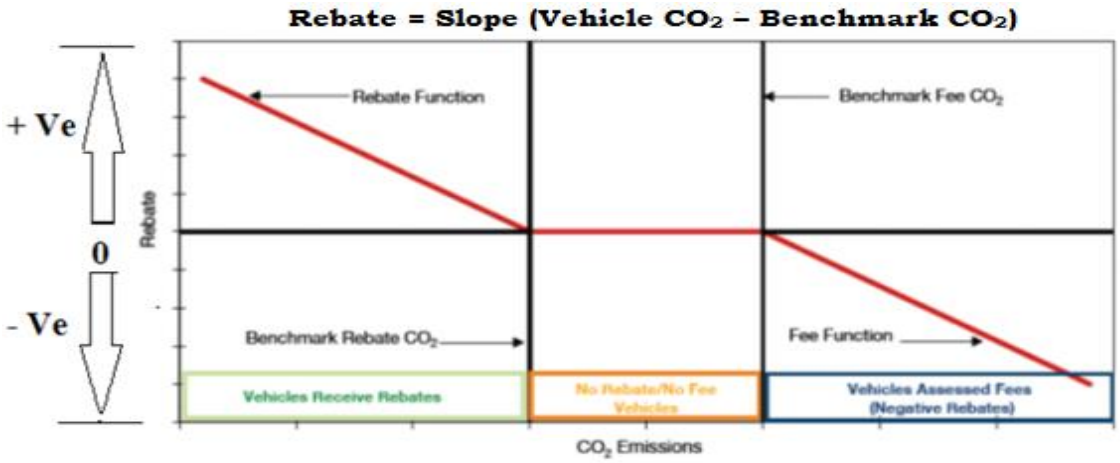

Figure 5-2: Depiction of Non-Continuous Feebate Program

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.

5.1.1 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 CO_2 levy 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 CO_2 Levy 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.

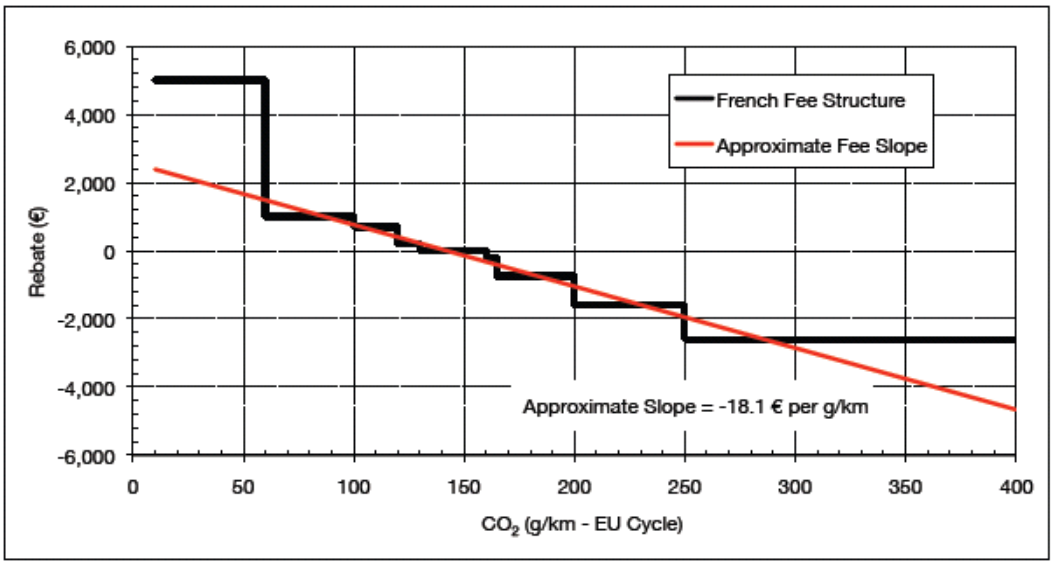

Figure 5-3: Depiction of the French Feebate Program

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 CO_2 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. -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.	It is a CO_2 levy and Rebate system similar to the French system of *'bonus/malus écologique'*	CO_2 levy/ Rebate at a benchmark of 150g/km.	July 2011

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.

5.1.2 Current taxation of motor vehicles and fuels efficiency in Kenya

Fuel taxes in Kenya

The taxes levied on petroleum based fuels are as indicated in Table 5.2.

Table 5-2: Taxes levied on Fuel in Kenya

Type of tax	Amount	Incidence
Road maintenance levy	Kshs 12.00 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: KRA

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 section 5.2.

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

5.1.3 Best practices for Feebate programs

The following list contains what is considered as some of the best practices in designing and implementing a feebate program.

a) Linear and continuous feebate 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 consumer's 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 CO_2 levies 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.

5.1.4 Key drivers for success and failures

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

a) The design of the feebate program: a well-defined benchmark, acceptable functional form and rates and a clear determination of how and when rebates and CO_2 levies 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 CO_2 levy 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.

5.2. Proposed Legislation

In guiding the feebate analysis, the following list of taxes and CO_2 levies were observed to be applicable to vehicle imports as illustrated in Table 5-3. More recently, the Excise Duty applicable to vehicle imports has been proposed for revision. According to the Excise Duty Act, 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 CO_2 levies 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 5-3: 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

5.3. 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 in Table 5-4.

Table 5-4: Main Variables Guiding the Analysis

1. Vehicle condition (New or Used)	2. Year of first registration by KRA
3. Body (Saloon, Station Wagon etc.)	4. Fuel type (Diesel, Petrol, etc)
5. Make (Toyota, Nissan etc.)	6. Engine Size (cc)
7. Model (Nissan X trail etc.)	8. Estimated Value of New Vehicles (CRSP)
9. Fuel economy (L/100km)	10. CO_2 Emissions (g CO_2/km)
11. Revenue before feebate	12. Revenue after feebate
13. Production year	

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 CO_2 levies and taxes in 2011 and applied to the vehicle inventory data, the total computed stood at Kshs 51.6 billion. Table 5-4 and Figure 5-4 presents the 2011 revenues by vehicle engine size category. Figure 5-5 shows the vehicle population by engine capacity.

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

Engine size category cc.	No. of Vehicles	%market share	Average CO_2 emissions (g/Km)	Average 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

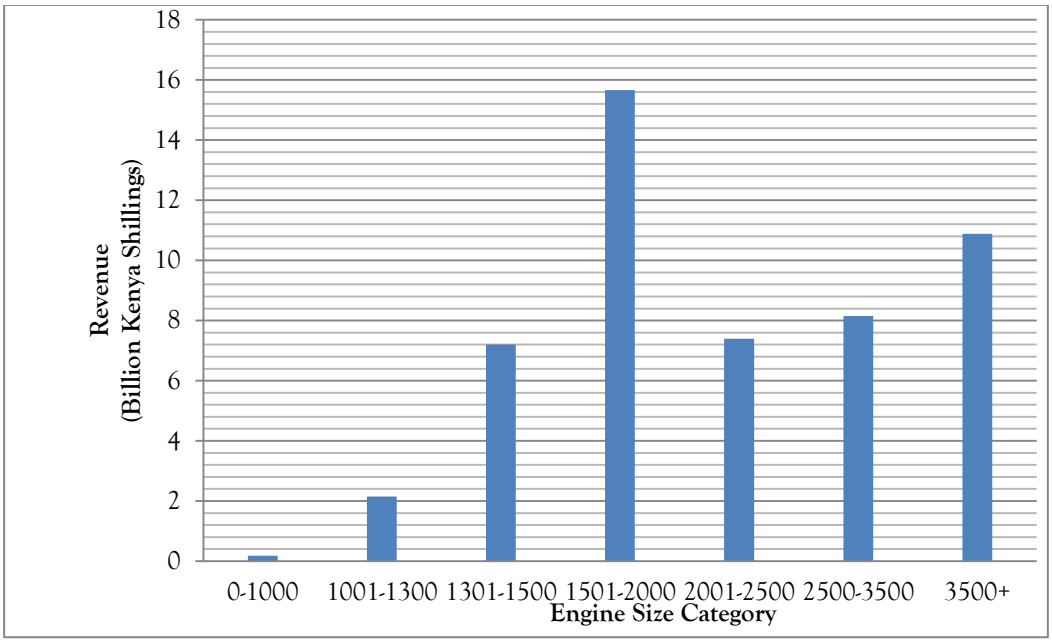

Figure 5-4:Revenues by vehicle engine size category 2011

Prominent observation in Figure 5.4 is that the highest revenue of over 15.5 Billion was generated by 1501-2000 cc engine category which constitutes 37% of the vehicles. This is followed by the engine category above 3500 cc.

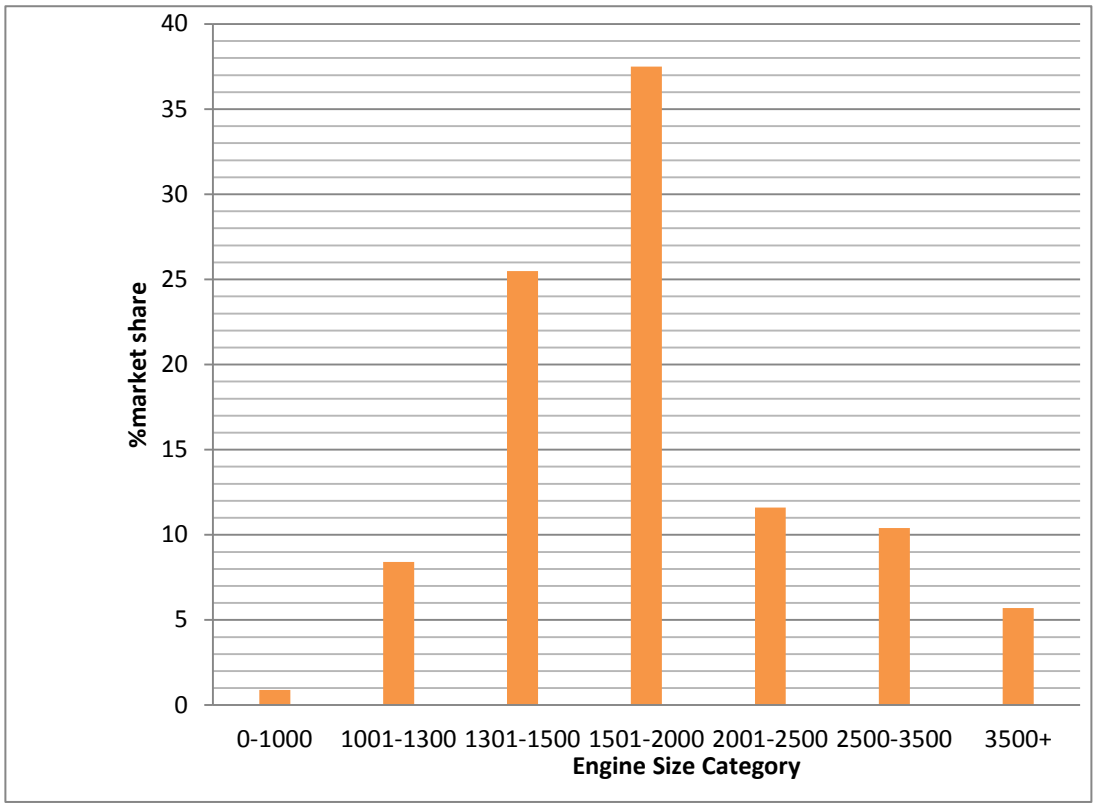

Figure 5-5: PercentageVehicle Population by Engine Capacity in 2011

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

Table 5-6: 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

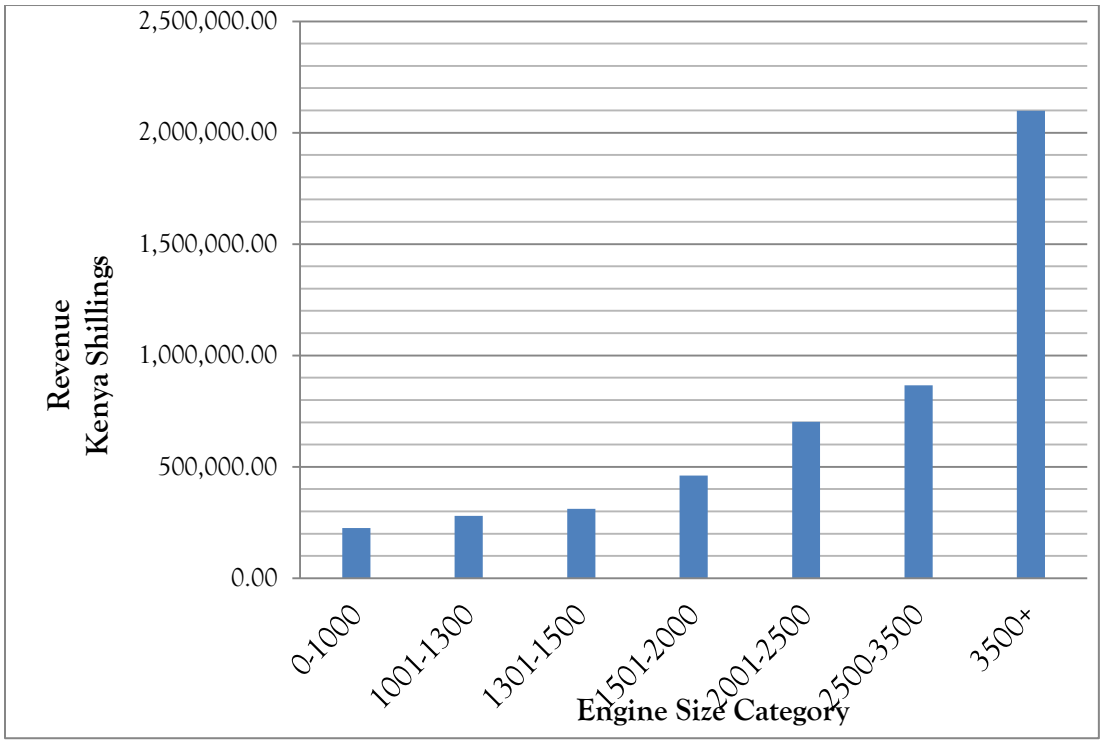

Figure 5-6:Average Revenues Per Vehicle by Engine Size Category.

5.4. Revenues by age of vehicle

Table5-7 and Figure 5-7 presents revenues by vehicle age category in 2011.

Table 5-7: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**

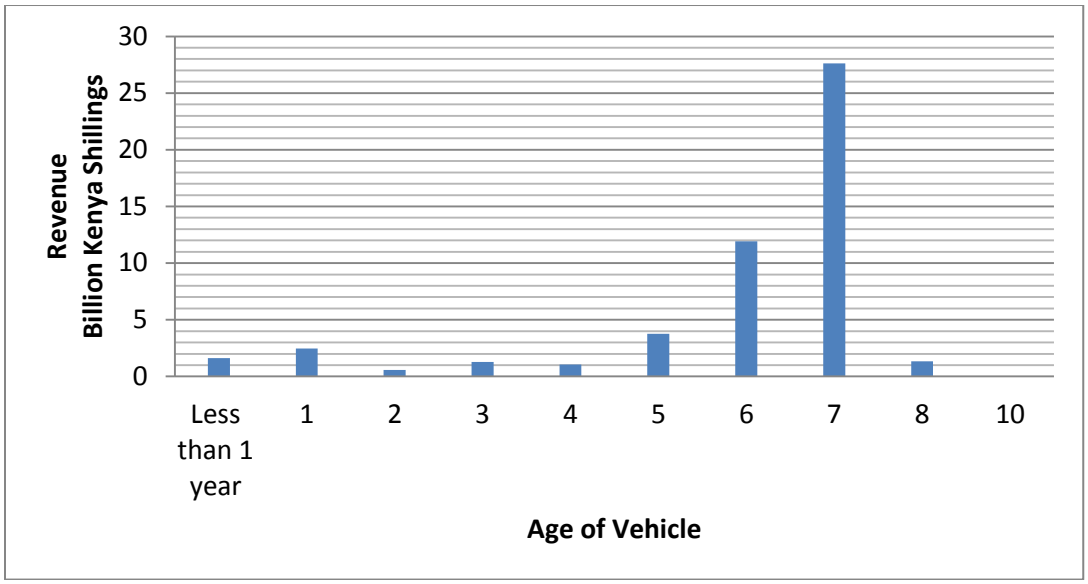

Figure 5-7: Revenues By Vehicle Age Category 2011

Most revenue is generated by the seven-year-old vehicles which form 67% of the total and this is followed by the six-year-old vehicles which constitute 20% of the total. This signifies that most vehicles are purchased just before the end of the eight-year-old limit. It is also noted that the revenue generation from new vehicles is comparatively small.

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

Table 5-8: 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**

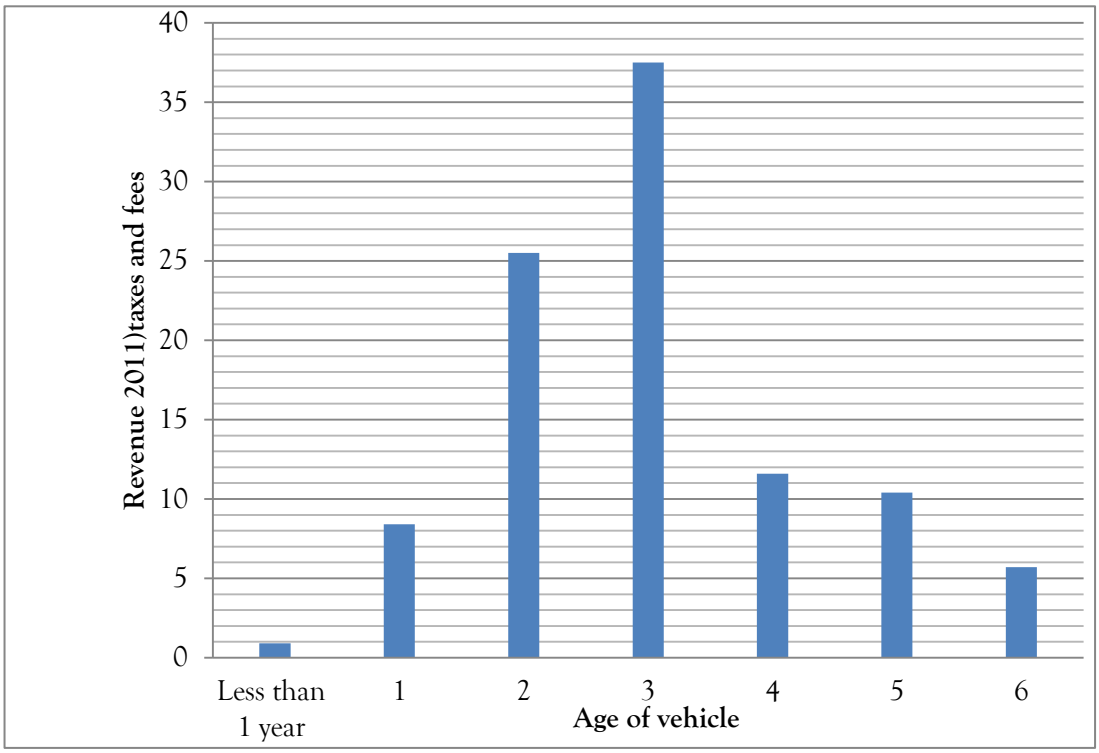

Figure 5-8:Average Revenues Per Vehicle by Age Category

Table 5-9 and Figure 5-9 presents revenue by vehicle condition (New/Used)

Table 5-9: Revenue by vehicle condition

	Average CO_2 emissions (g/Km)	Average Fuel economy L/100Km	No. Of Vehicles	Percentage (%)	Age	Revenue (Kenya Shillings)
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

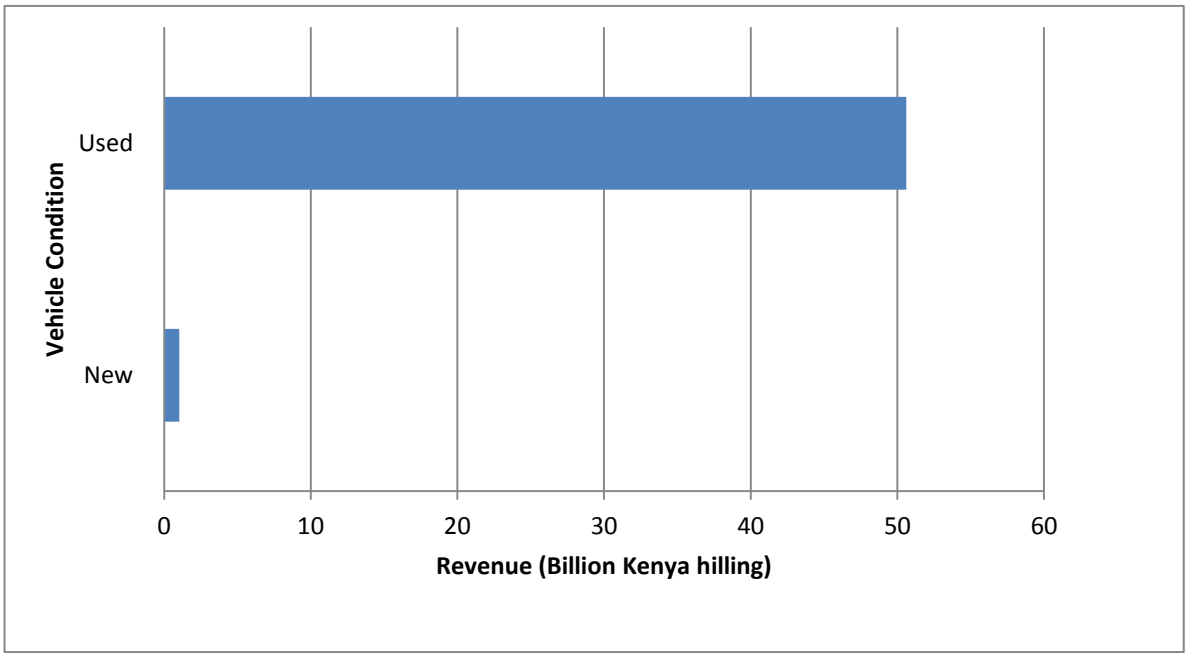

Figure 5-9:Revenue by vehicle condition

5.5. 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. Kenya like other countries is experiencing increasing levels of air pollution problems. The street level pollution is attributed to the traffic density especially in the cities and

this has prompted consideration of feebate as an effective measure whose effectiveness can be enhanced by public participation.

Literature review for this study presented examples of Feebate programs in several countries and this indicated typical benchmarks for CO_2 emissions to range from 120 to 160g CO_2/km. it was also noted that the programmes have been implemented mostly in vehicle manufacturing countries where the average age of vehicles is lower and the vehicle technology more advanced. However, the basic function of the feebate is independent of the benchmark in that it serves to create sensitivity for fuel efficiency and in turn motivate for improvement in air quality and reduction of Greenhouse Gases. The concept of Feebate is new to the local vehicle buying public and it was necessary to assess awareness through a survey. A questionnaire was administered to motor vehicle dealers and assemblers to establish their views on the feebate program structure and appraise their proposals.

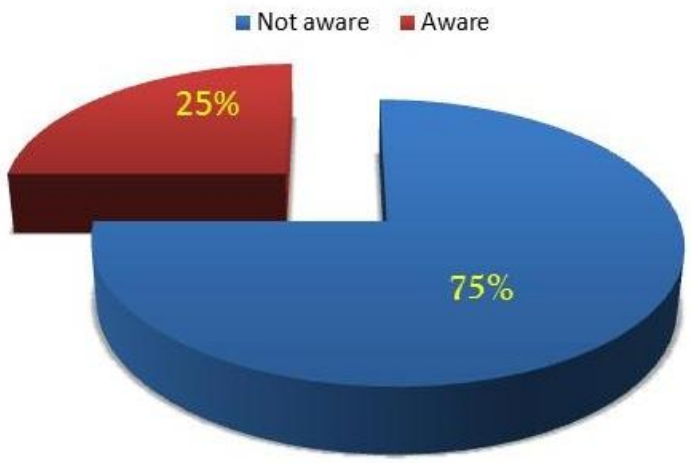

Figure 5-10: Respondent's Awareness of Feebate Programs

Figure 5-11: Respondent's Willingness to Pay Emission Fees (CO_2 Levy)

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 indicated willingness to pay CO_2 Levy 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 CO_2 Levy or rebate based on degree of variation from the benchmark. Literature reviewed shows that the CO_2 Levy/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.

5.6. 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 obtained 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 ton of CO_2. In essence, the recommended feebate rates should assume an asymmetrical form, meaning there is a difference in the rate for CO_2 Levy and rebates in relation. Although symmetrical feebates 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;

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

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 analysis for this study is driven by the scenarios and assumptions as shown in Table 5-10. 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 170gCO_2/ Km is derived partly from the approach applied in López *et. al.* (2011)[2] and a lower national target of 5% reduction.

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

The CO_2 Levy 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.

Table 5-10: Scenarios for analysis of emissions related feebates

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

5.7. The Scenarios

Table 5-11: 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
CO_2 Levy	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 5-12: 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
CO_2 Levy	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

5.8. 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. Tables 5-13 and Table 5-14 shows a descriptive summary of important variables in the dataset used in the study.

Table 5-13: Means of selected variables for 2010 – 2012 dataset

Engine size category	Count	Ave. g/CO_2 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 Table5-14.

Table 5-14: Means of selected variables for 2013 – 2014 dataset

Engine size category	Count	Ave. g/CO_2 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.

5.9. The model

The study utilizes the Multinomial Logit (MNL) 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.

$$U_{ij} = \alpha_{ij} + f[\beta_i j X_{ij}] + \varepsilon_{ij} \quad \text{.....[5.4]}$$

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

The probability that an individual chose the j^{th} alternative is;

$$P_{ij} = pr[y_i = j] = Fj(X_i, \beta) = \frac{\exp(Xi,\beta j)}{\sum_{j=1}^{n} exp(Xi,\beta j)} \quad \text{..... [5.5]}$$

As mentioned earlier, 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 5.6.

$$\ln L(\beta) = \sum_{n=1}^{N} \sum_{j=1}^{J} y_{nj} \ln \frac{e^{x_n^J \beta_i}}{\sum_j e^{x_n^J \beta_j}} \quad \text{..... [5.6]}$$

In estimating the model, one set of coefficients need to be normalized to zero to estimate the model, (usually β = 0) so that there are (j – 1) set of coefficients to be estimated. The coefficients of other alternatives are interpreted in reference to the base or the reference outcome.

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 5-15: 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 5-15 shows that, 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 5-16.

Table 5-16: 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 5-16 shows that unit increase in the level of import duty would be associated with marginal increase of 0.04 per cent in the 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.

5.10. Determining the benchmark and rate

Step 1

Using the vehicle inventory; establish the gCO_2 emitted for each vehicle model and the number of units. Thereafter, determine the total CO_2 emission for all the vehicles based on the make and model.

Such that; g = units per model x gCO_2

Step 2

Determine the weighted average CO_2 which is the average for all the vehicle models in the inventory.

$WAvgCO_2$ = Total emission/number of units

Table 5-17: Total emission for 2010 – 2014 dataset

Range	Units	Total Emission
0-168.99	192,154.00	27,539,994.53
170+	138,919.00	28,704,544.74
169.00 - 169.99	1,693.00	287,205.34
	332,766.00	**56,531,744.60**

Source: Authors' Analysis of Kenya's LDV Motor Importation Data (2010-2014)

Based on the assumption that the vehicle population is normally distributed, the weighted average CO_2 Emission is taken as the threshold CO_2 emission which is further used to determine the feebate rate.

Step 3

To determine the near optimal feebate rate, we first compute the deviation (D) between the weighted average CO_2 (our presumed threshold CO2 emission) and the individual emission per vehicle;

$D = WAvgCO_2 - gCO_2$ ..... **[5.7]**

Step 4

Using the individual vehicle deviations, we carry out simulations to determine the near optimal feebate rate that will ensure that the Feebate program is revenue neutral (self-financing). In doing this, the administrative costs must be put into consideration. The key assumption is that at the point of purchase, the consumer chooses between fuel efficient and fuel inefficient vehicles whereas the government selects the rate for CO_2 Levy and rebate with the objective of maximizing welfare. For Fuel efficient vehicles (vehicles with emissions below the threshold CO_2 emission), they are awarded rebates whereas fuel inefficient vehicles pay CO_2 levy. The rebate and CO_2 levy are paid per vehicle according to

the vehicle's deviation from the threshold CO_2 emission and the feebate rate. The feebate rate is determined by the following model based on the revenue neutrality proposition:

Fr eVp D = Fr inVpD .....(5.8)

Where Fr = Feebate Rate

eVp = is the population of fuel efficient vehicles

inVp = is the population of fuel inefficient vehicles

D = the deviation from threshold CO_2 emission

If Fr eVp D > Fr inVp D, then the rebates provided are more than the CO_2 levy received by the government which is not desirable.

If Fr eVp D < Fr inVp D, then the rebates provided are less than the CO_2 levy received by the government which is desirable.

Step 5

Determine the monthly/annual administrative costs that will be incurred in running the feebate program. With this information, the adjusted model taking care of the administrative costs (Admin. Cost) is given by:

Fr eVp D + Admin. Cost = Fr inVpD .....(5.9)

Using simulations in R Statistical software and excel, the model in equation (5.9) is used to compute the near optimal feebate rate. The analysis made use of the vehicle importation data for the period 2010-2014. The data was 'cleaned' and presented in excel sheets. Note that the analysis made use of the LDVs (see the next section for a breakdown of the vehicle population per year) which had all the complete information required for the analysis. Further, the following CO_2 Levy proposals obtained from the consumer interviews, that is, Ksh 800, 1200, 1500, 2500 and 5000 were used in the analysis. From the simulations, a CO_2 Levy of Ksh 1500 yielded near optimal revenue feebate when we considered a special

case where there is no extensive margin adjustment and the feebate does not change the total amount of vehicles purchased.

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 within a band of 169.00 - 169.99 gCO_2/km based on the vehicle population for the 5 year period. 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 5-17.

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

Category (gCO_2 /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' Analysis of Kenya's LDV Motor Importation Data (2010-2014)

The simulation results indicate that a rate of Kshs 1,500 per gCO_2 /km would have generated a levy 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 levies charged on fuel inefficient vehicles and annual average compensation (rebate) 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 5-18

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

Description	Five-year period	Annual Average
CO2 Levy (Ksh)	7,840,850,610	1,568,170,122.00
Rebate (Ksh)	(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' Analysis of Kenya's LDV Motor Importation Data (2010-2014)

The recommended rate of Kshs 1,500 gCO_2/km for both CO_2 levy 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. Using the recommended rate of Kshs 1,500 gCO_2/km and the benchmark of 169 gCO_2/km with a band between 169.00 - 169.99 gCO_2/km, we carried out a scenario analysis on the annual data to determine the total annual CO_2 levy and rebate for each year in the study period. The results are presented in Table 5-19.

Table 5-20: Scenario Analysis of the Application of Proposed Rate and Benchmark

Year	Vehicle Population	Rebate (Kshs)	CO_2 Levy (Kshs)	Surplus (+) /Deficit (-)
2010	90,878.00	(2,076,527,732.14)	1,852,389,267.86	(224,138,464.29)
2011	88,036.00	(1,809,631,928.57)	2,616,691,500.00	807,059,571.43
2012	100,452.00	(2,120,615,357.14)	2,461,104,642.86	340,489,285.71
2013	17,295.00	(299,274,595.71)	421,301,001.43	122,026,405.71
2014	52,989.00	(1,434,105,996.43)	756,703,847.14	(677,402,149.29)

Source: Authors' Analysis of Kenya's LDV Motor Importation Data (2010-2014)

The results in Table 5-19 indicate that during the five-year period, the government could have had a surplus in 2011, 2012 and 2013. However, in 2010 and 2014, there could have been a surplus in the feebate program. This can be attributed to the dynamics in the vehicle population below and above the threshold CO_2 emission which is expected with the implementation of the program. This calls for an annual review of the threshold and/or the feebate rate. It is also worth noting that the vehicle population used on the analysis depended largely on the 'cleaned' data obtained from

KRA thus is not the exact total vehicle population for each year. However, considering the sample size of the vehicle population used in the analysis, the sample is quite representative and reliable for making policy decisions. Going forward, one of the recommendations is to improve on the data capture at the ports for more accurate analysis.

The vehicle population below and above the benchmark as a percentage of the respective year total vehicle population (used in the study) are presented in Figure 5-12.

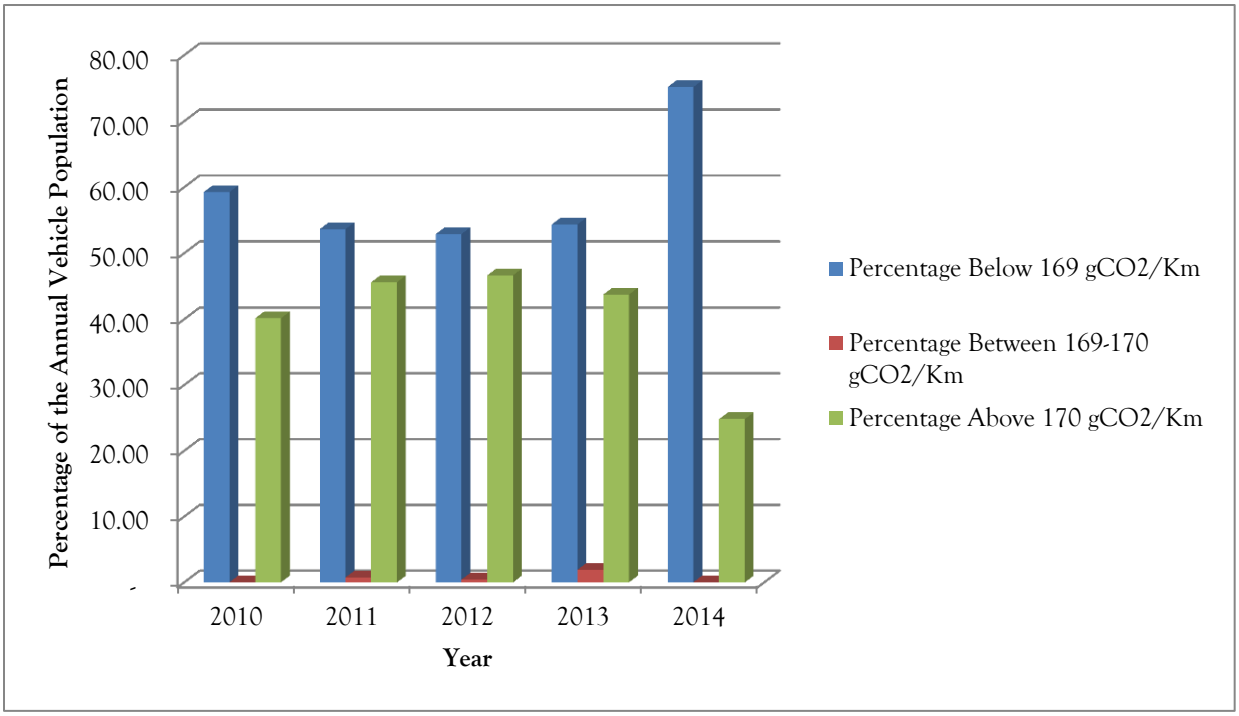

Figure 5-12: Population of Vehicles Above & Below the Benchmark

Source: Authors' Analysis of Kenya's LDV Motor Importation Data (2010-2014)

Figure 5-12 show that while the percentage of the vehicle population below the proposed benchmark have been on an upward trend, the population above the benchmark have been on a downward trend since 2012. Since the vehicle population below or above the benchmark is a major determinant of the total CO_2 levy collected and rebate paid, the benchmark need to be reviewed regularly (annually or semi-annually) to take care of the vehicle population dynamics.

In view of the preceding analysis, it is recommended that the benchmark and the rate be reviewed regularly putting into consideration the changes in the vehicle population and the actual administrative costs.. However, at this point we recommend the rate of Kshs. 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 5.13.

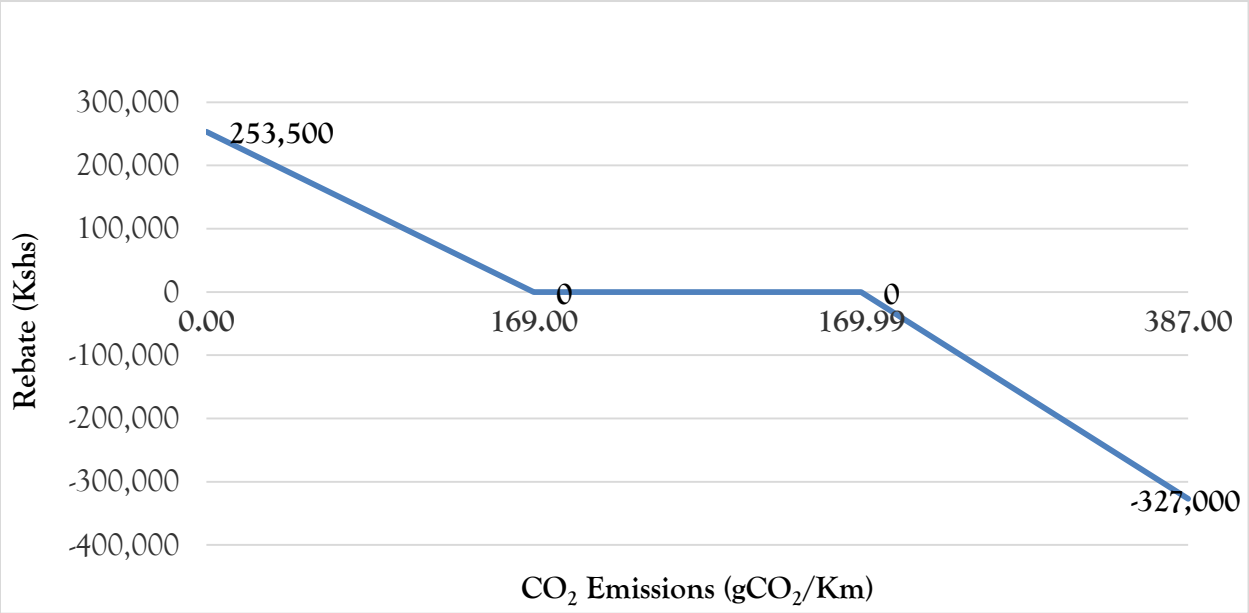

Figure 5-13: Depiction of the Proposed Feebate System for Kenya

Source: *Authors computation*

The proposed feebate system for Kenya is a non-continuous with a range between 169.00gCO_2/km to 169.99 gCO_2/km where there will be no CO_2 levy 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 CO_2 levy and rebate. The area above the x-axis represents the rebate while the area below the x-axis represents the CO_2 levy. 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 CO_2 levy that would have been charged on the most fuel inefficient vehicle (387 gCO_2/km – Bentley) is Kshs 327,000.

5.10.1 Additional Analysis of Other Benchmarks and Rates

Based on the annual vehicle population growth rate of 12 per cent per annum, further sensitivity analysis and calculations were carried out on the proposed benchmark of 169gCO_2/km to determine the effect of reduced benchmark and rates. Subsequently, a reduced benchmark of 148.72gCO_2/km and 126.75gCO_2/km as shown in the Table 5.21 were obtained for comparison.

Table 5-21: Scenario Analysis of the Application of the Proposed Feebate Rate & Benchmark

Benchmark = 148 gCO_2/km

Description	Kshs. (1500)	Kshs. (1000))	Kshs. (500)	Kshs. (300)
CO_2 Levy ('000)	(13,066,839.850)	(8,711,226.56)	(4,355,613.28)	(2,613,367.97)
Rebate ('000)	2,198,236.95	1,465,491.30	732,745.65	439,647.39
Revenue +/-	(10,868,602.90)	(7,245,735.26)	(3,622,867.63)	(2,173,720.58)

Benchmark = 126 gCO_2/km

Description	Kshs. (1500)	Kshs. (1000)	Kshs. (500)	Kshs. (300)
CO_2 Levy ('000)	(22,208,044.90)	(14,805,363.27)	(7,402,681.63)	(4,441,608.98)
Rebate ('000)	414,033.00	276,022.00	138,011.00	82,806.60
Revenue +/-	(21,794,011.90)	(14,529,341.27)	(7,264,670.63)	(4,358,802.38)

Source: Authors' Analysis of Kenya's LDV Motor Importation Data (2010-2014)

From the Table 5.21, it is evident that the implementations of the feebate program can yield desired results depending on the benchmark selected and the rebate given or fee charged. For instance, a benchmark of 148.72gCO_2/km can raise revenues of upto Ksh 2 billion if a rate of Kshs 300 is selected and 126.75gCO_2/km can yield up to Kshs 4 billion if a rate of Kshs 300 is selected. This indicates that a lower benchmark and levy can raise enough revenues to finance the program. This is important as it will guide the implementation of the program. We further recommend that any reduction on the benchmark rate of 169gCO_2/km be guided by the principle that lower CO_2 levy and benchmark rates yield higher revenue gains.

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 CO_2 Levy 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 a vehicle is driven and maintained, vehicle loading, road conditions among other.

Feebate Program

The study established that increases in duties and CO_2 Levy 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 per gCO_2/km would not significantly differ from countries that have feebate programs initiated. Regular reviewing of the 170 gCO_2/km should be embraced.

7. RECOMMENDATIONS

Labeling Program

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

b) We propose 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.

c) Energy Regulatory Commission 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 CO_2 Levy 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, there be a CO_2 Levy of Kshs 1,500 per gCO_2/km for vehicles with emissions above 170 gCO_2/km. Additionally, we recommend that the implementation of program should begin with the administration of the CO_2 levy for at least 6 months before the payment of the rebates commences. During this period, accurate data capture on the key parameters for determination of the threshold CO_2 emission and feebate rate should be carried out covering the whole motor

vehicle population. This will enable the government to establish the actual administrative costs of the feebate program and carry out the necessary adjustment on the threshold CO_2 emission and/or feebate rate to ensure revenue neutrality in the program. One of the alternatives after establishment of the actual administrative costs is to have a lower rate for rebates but a higher rate for the CO_2 levy with a view of ensuring that the program is self-financing. Going forward, there is need to improve on the motor vehicle characteristics data capture at the ports for more accurate monitoring and evaluation of the implementation of the program.

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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 anew 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. Kshs……..
   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?** Kshs……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

……
……
……
……

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. Kshs ……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		

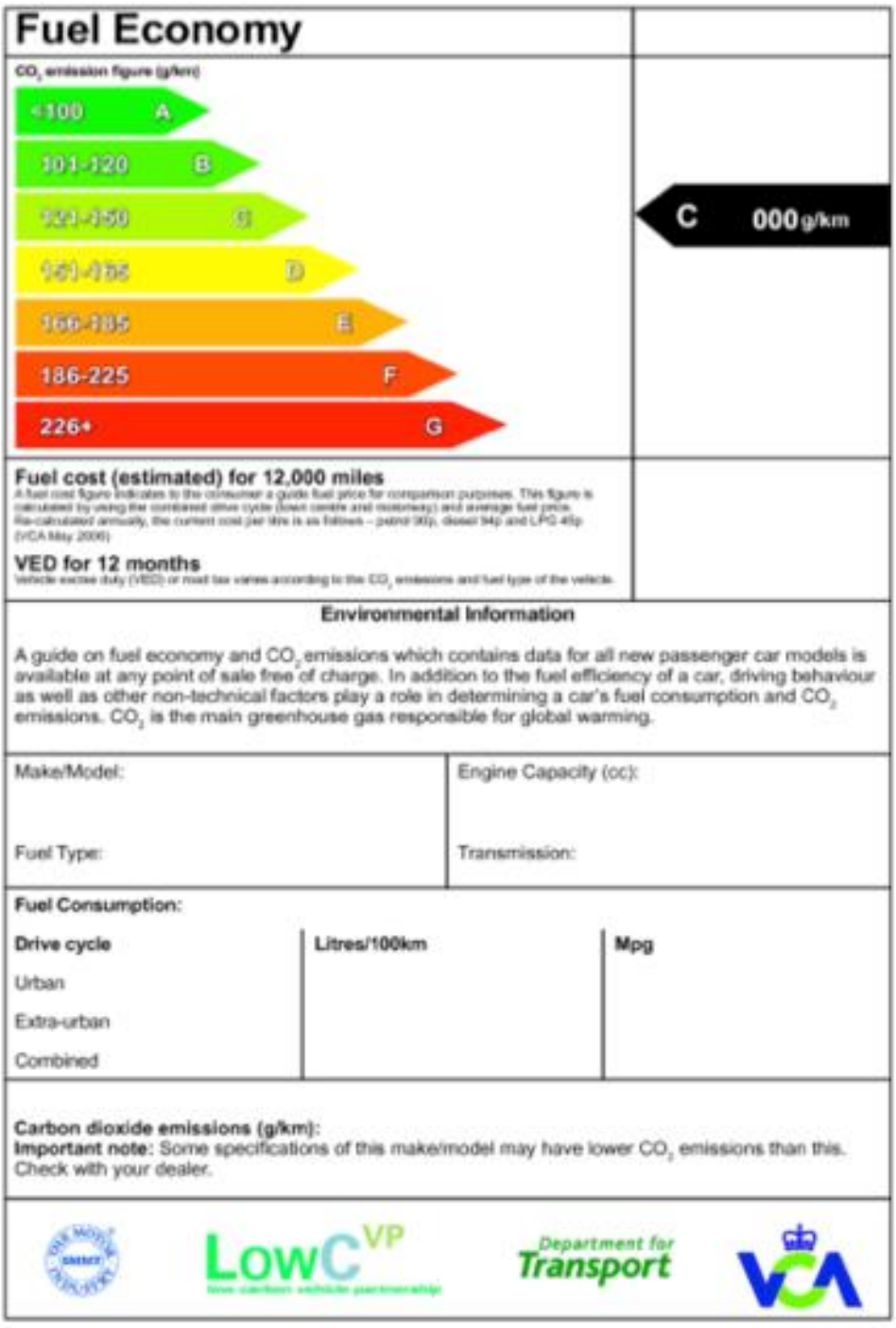
Thank you for participating in this survey

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		

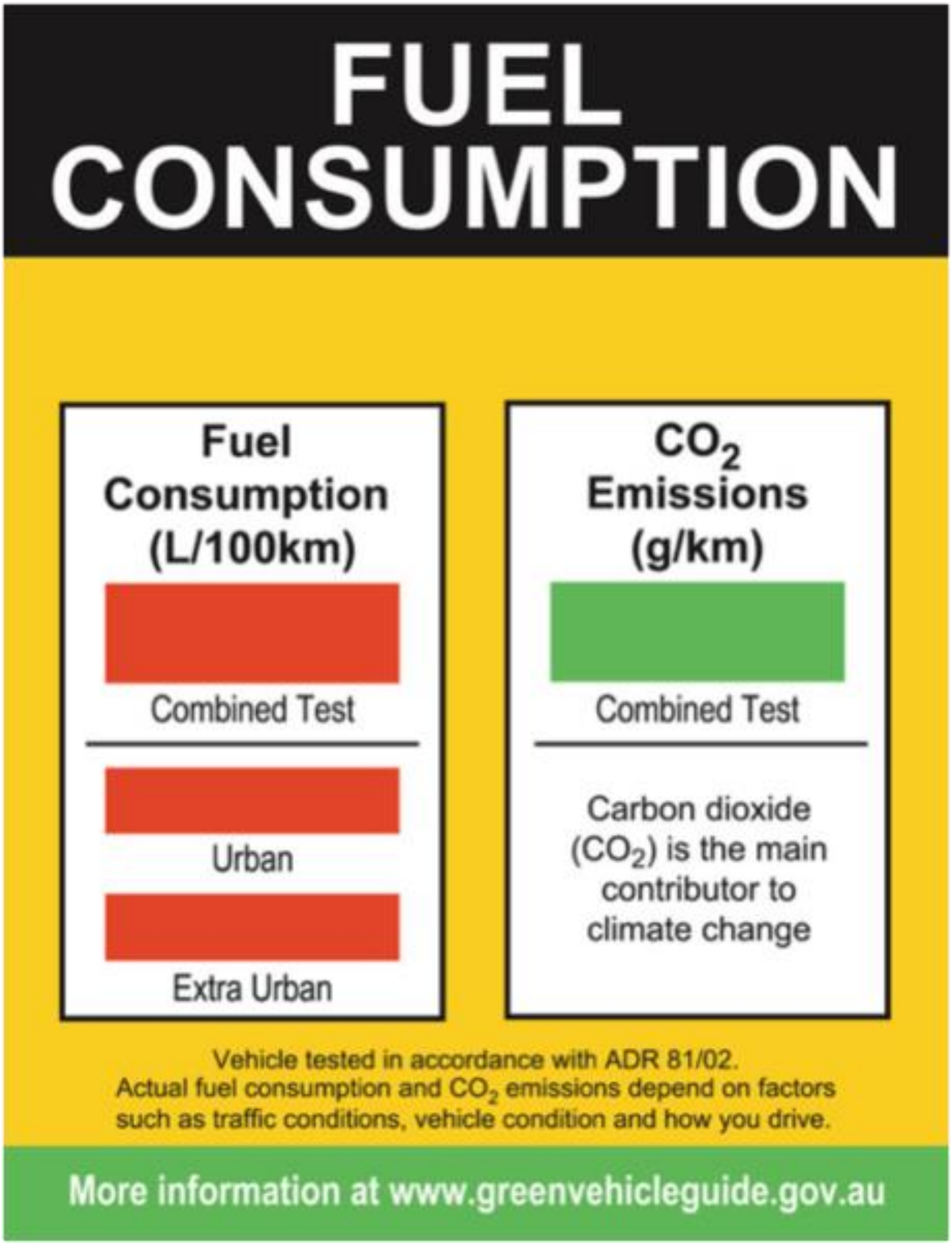
Carbon dioxide emissions (g/km):
Important note: Some specifications of this make/model may have lower CO_2 emissions than this. Check with your dealer.

LowCVP

Department for Transport

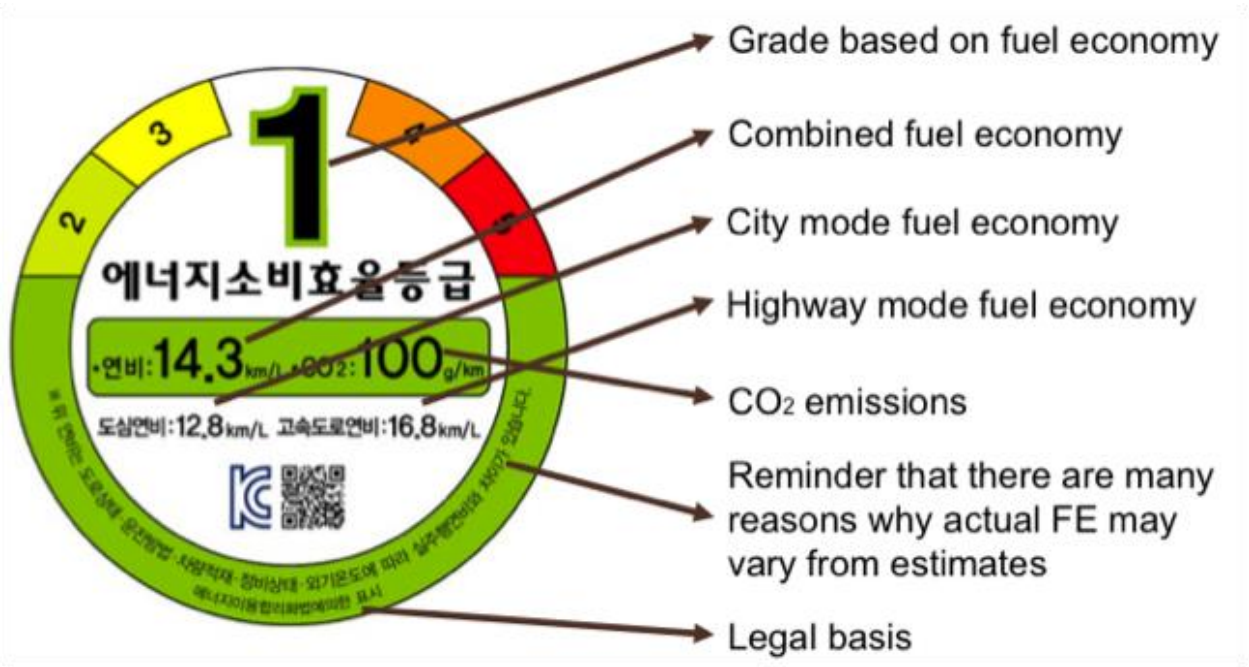
VCA

b) Australia Fuel Efficiency Label

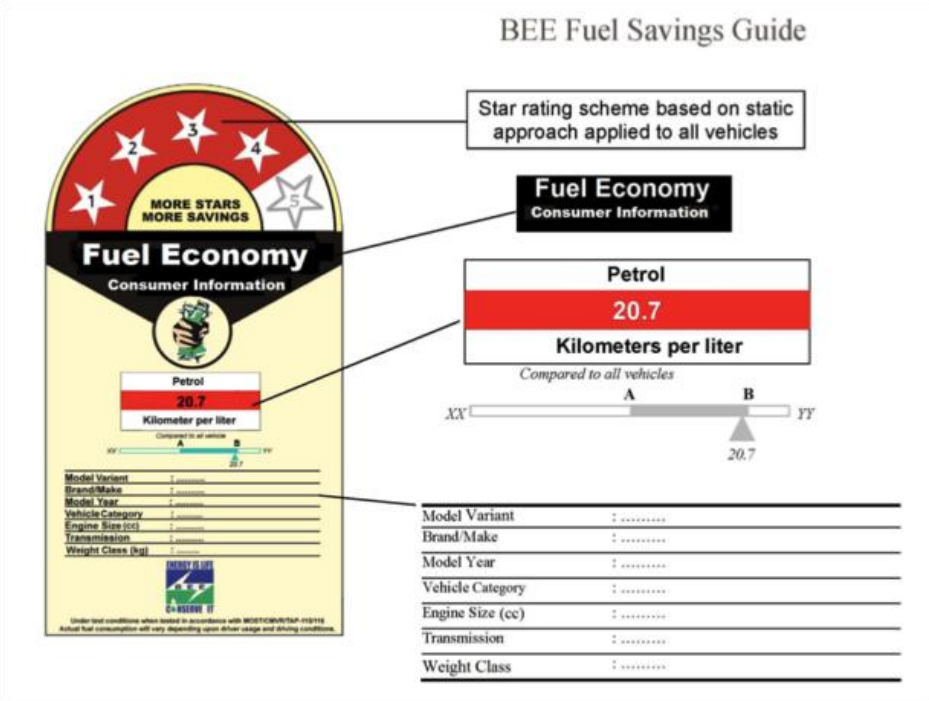


c) South Korea Fuel Efficiency Label

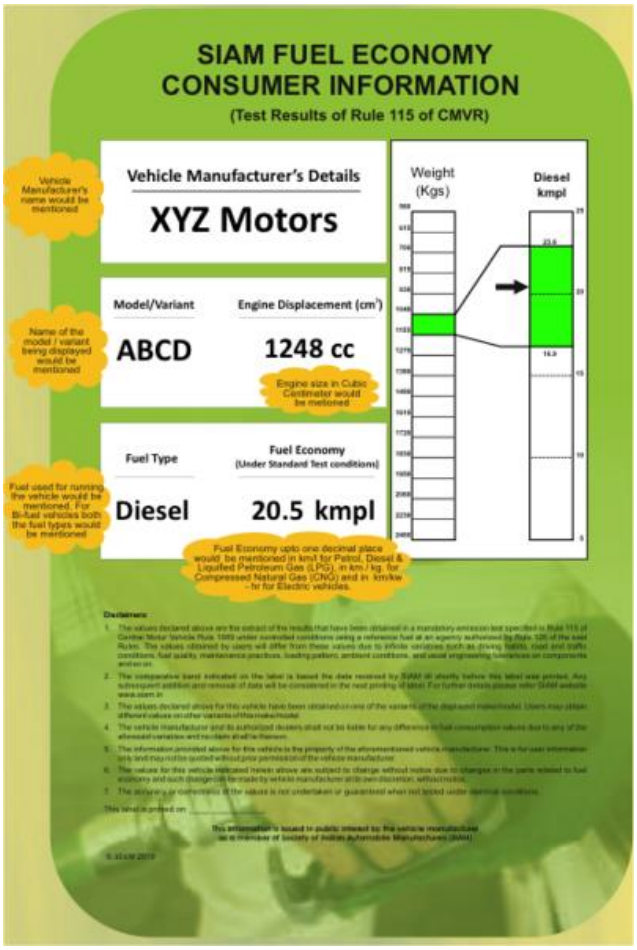
GRADE	1	2	3	4	5
~2011 (FTP-75)	≥ 15	14.9~12.8	12.7~10.6	10.5~8.4	≤ 8.3
2012~ (US Combined Mode adjusted)	≥ 16	15.9~13.8	13.7~11.6	11.5~9.4	≤ 9.3
Label					



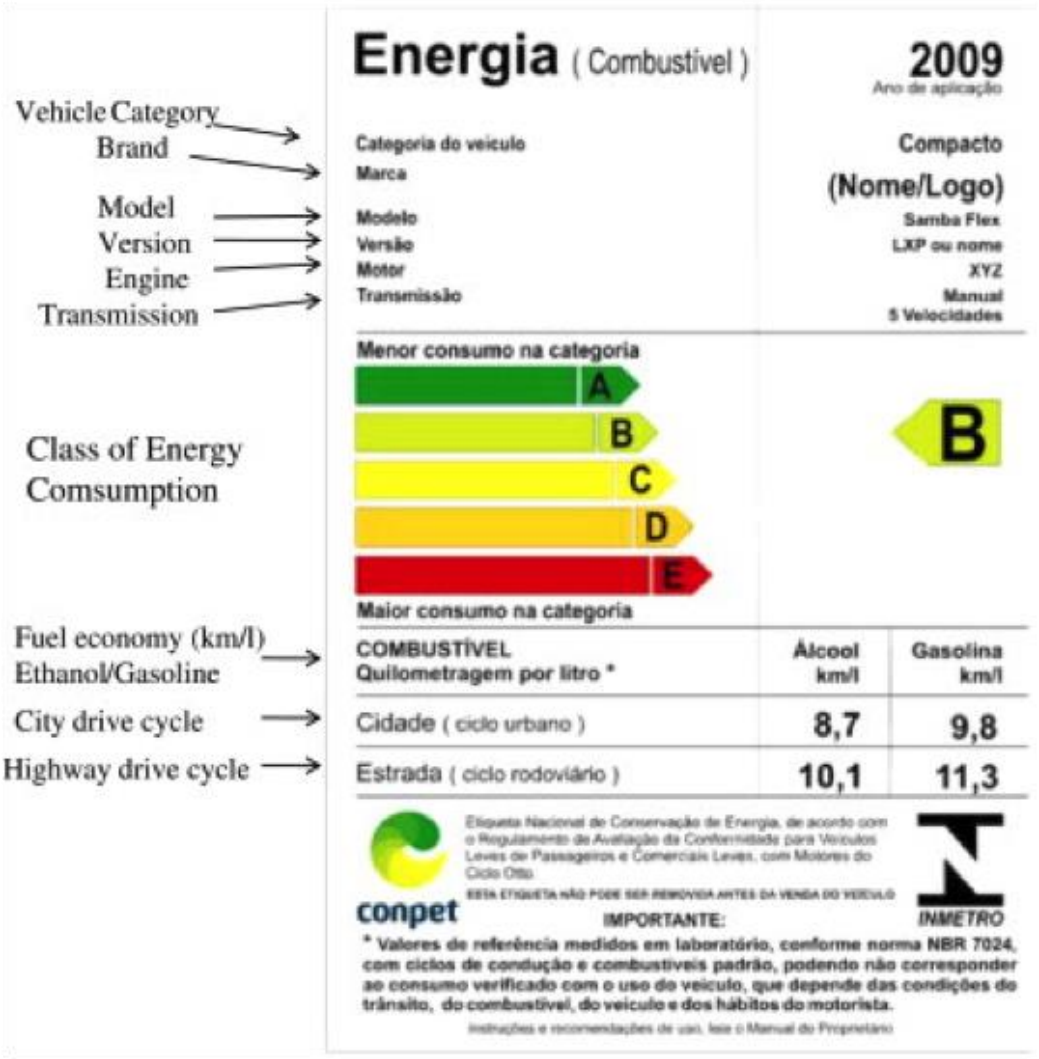
d) India Fuel Efficiency Label 1



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

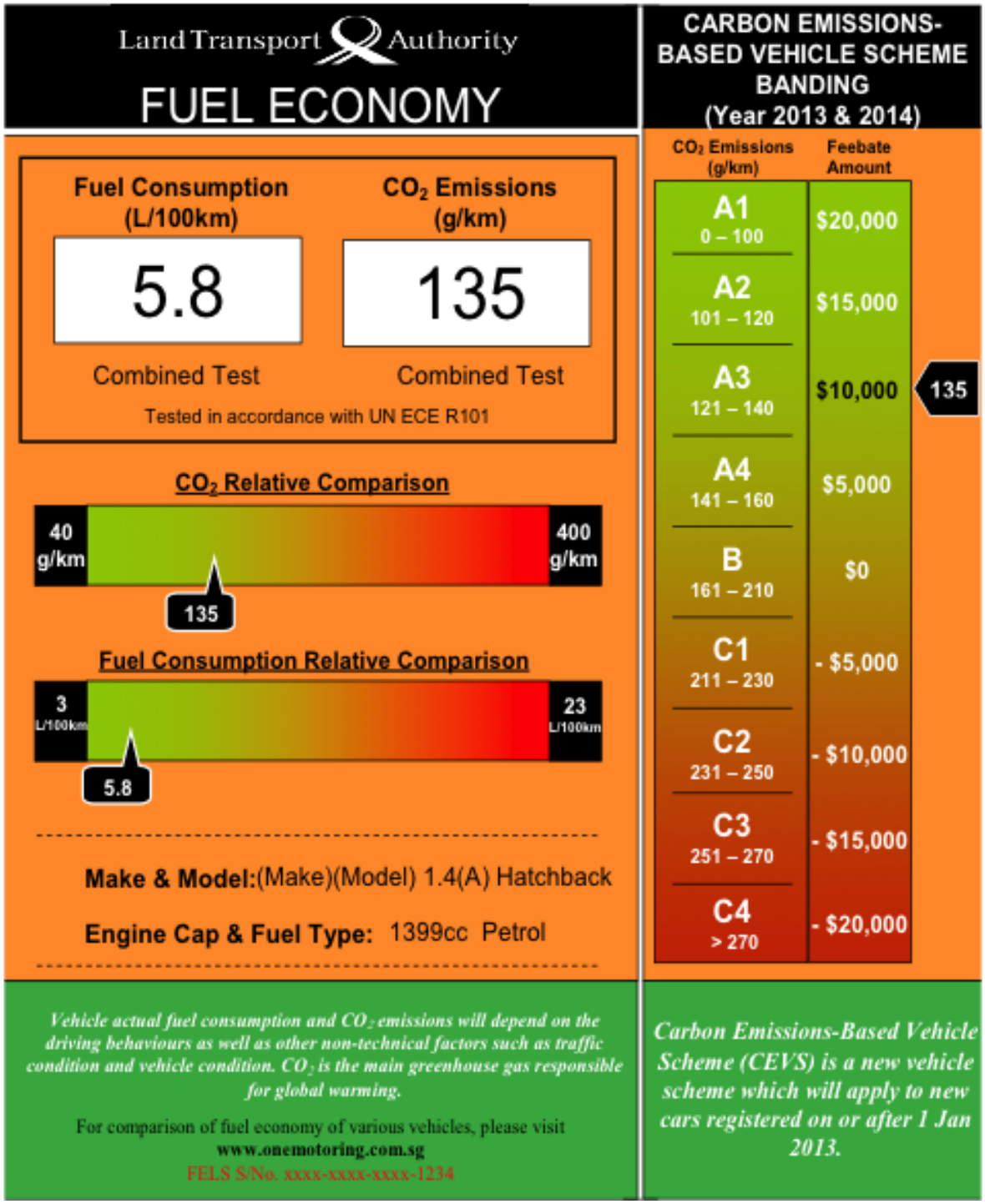
Applicable national standard number limit requirements and implementation date (click to enter)

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

k) Japan Fuel Efficiency Label

	Fuel Efficiency	Emissions Performance	Incentives		
			Automobile Tax	Acquisition Tax	Tonnage Tax
Alternative-Energy/ Next-Generation Vehicles	Electric (including fuel cell), plug-in hybrid, clean diesel, hybrid and natural gas vehicles that meet certain performance requirements		50% reduction	Exempt	Exempt
Passenger Cars and Mini-Vehicles	Compliant +25% compared to 2010 fuel efficiency standards 	Emissions down by 75% from 2005 standards 	50% reduction	75% reduction	75% reduction
	Compliant +15% compared to 2010 fuel efficiency standards 		—	50% reduction	50% reduction

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 Gnt. Ser.	722606228	jkorir@industrialization.go.ke	
2.	Charles Nyaangaya	UI	UNES	0723891004	janyangaya	
3.	Robert Mr. 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 Kipdagat	Director Ind. Policy & Plan	MoIED	0722357818	jkkiplagat@yahoo.co.uk.	
3.	R. 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	Consultant	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	jyaka@knbs.or.ke	0729482364	
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 Nyaangaya	"	"	janyangaya.@uonbi.ac.ke	0723891004	
3.	Paschal Musa	KEBS	Manager Petroleum	musa@kebs.org	0722822539	
4.						
5.						
6.						
7.						