

Policy Options and Analysis

For Sustainable Low Emission in Liberia



EPA
LIBERIA

Environmental Protection Agency

Ensuring environmental protection & conserving biodiversity

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LIST OF ABBREVIATIONS

GFEI	Global Fuel Economy Initiative
UNEP	United Nations Environmental Program
IEA	International Energy Agency
FIA	Internationale de L' Automobile
ITF	International Transport Forum
LRA	Liberia Revenue Agency
MOT	Ministry of Transport
LDV	Light Duty Vehicle
NEDC	New European Driving Cycle
CAFÉ	Corporate Average Fuel Economy
JCO8	Vehicle Fuel Consumption measurement based on approval in Japan

Executive Summary

In February, 2017, the Environmental Protection Agency entered into an agreement with a local consultant to analyze and interpret vehicle registration data with the aim of establishing the country's average fuel economy (setting baseline). The study established that the average fuel consumption to be 7.93L/Km while the average CO₂ was 179.03g/Km.

In June, 2017, the EPA agreed further with another consultant to conduct an analysis and interpretation of the vehicle data and propose best policy options for reducing the fuel economy of the country. The intent is to put measure in place that will encourage the purchase of low fuel consumption/emission vehicles and cleaner fuel technology by enacting key regulations and enhancing targeted support to enforcement agencies.

The policy options considered in this study prioritizes Feebate and vehicle registration tax as the best options for Liberia. Feebate is a combination of fees and rebates in which fee is levied on inefficient vehicles and a rebate is rewarded to efficient vehicles. This system comprises of benchmark emission for gCO₂/Km above which a fee on the inefficient vehicle is levied and a rebate system through which less polluting vehicles are rewarded.

In order to establish a benchmark for feebate a study of various policies worldwide was done to identify its successes. Based on the dataset for the period of study 2005, 2008, 2011, 2013, and 2015 was used in simulations to yield 178 gCO₂/Km and was used to establish a benchmark CO₂ of 178 gCO₂/km and 179 gCO₂/Km.

Increasing taxation/duties levied on light duty vehicles on the basis of engine size will have marginal effect on the purchase on vehicles. The study is proposing a rate which will correspond to that of other countries that have implemented similar programs. The study is proposing a rate of \$154.64 for both feebate and rebate programs.

1. Introduction

In February, 2017 the EPA entered into an agreement with consultant with interpreting the aim of reducing localized air pollution and Global national Fuel bills through the promotion of cleaner fuel efficient vehicles. The main focus of the study was LDVs with gross weight of less than 3,500g. Two governmental agency (Ministry of Transport and Liberia Revenue Authority) records were used to develop the fuel economy of Liberia.

The following were the conclusion of the study:

- a. The average fuel consumption was established to be 7.93L/Km, while the average CO₂ was 179.03g/Km.
- b. The total number of registered LDVs increased from 7440 in 2005 to 32,522 in 2015.
- c. The total of LDVs is predicted to increase to 913,853 2050 on the basis of trend of the study period.
- d.

The study made the following assumptions.

1. a. Extrapolation was considered by the consultant to develop trends of fuel economy and CO₂ for three wheelers, passenger cars, trucks, buses and min-buses, vans, pickups.
2. Where data on vehicle make and models were not available, especially in the case of old vehicles, data on the closest model was used on the assumption that there would be marginal variance between one generation model and subsequent one.
3. Vehicles of over eight (8) years that appeared in the data were considered to be registered after use by other groups which may include Non-Governmental Organizations, (NGO), United Nations (UN) and other governmental agencies.
4. Even though the fuel economy and CO₂ of motor cycles are of different magnitude, they were included in the data as LDVs.

Currently only a few countries outside of the OECD have developed fuel economy policies. Such policies will be needed to ensure that developing countries attract the import of more fuel efficient vehicles into their countries. To support these policy developments, the GFEI facilitates vehicle inventory analysis to establish annual average fuel economy levels of newly imported vehicle fleets (baseline and trends). The benefits to Liberia accruing from the adoption of a national policy on cleaner and fuel-efficient vehicles are threefold: improved air quality, reduced CO₂ emissions and fuel savings.

From the conclusions of the study on analysis of fuel economy and the corresponding recommendations, the EPA commenced work on the policy options to be adopted for improvement in fuel economy of the country. This report contains a description of the different policy recommendations that could improve fuel economy.

There are different kinds of policy programs being used globally for reduction in fuel economy and global carbon emission from LDVs. For the purpose of this study and report, a high-level description is made of three (3) options that could be applicable to Liberia as discussed below.

1.2 Feebate Program

A feebate is a market based policy for encouraging reduction of greenhouse gas emissions from the passenger vehicle by levying fees on relatively high emitting vehicles and provides 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 consists of a set of benchmark emission for gCO₂/km above which a fee is levied on inefficient vehicles and a rebate system through which

less polluting vehicle vehicles are rewarded. A feebate system is basically a “transfer” system, not a “tax”, since the fee paid by inefficient vehicle is transferred to efficient vehicles.

1.3 Vehicle Labeling

Vehicle labeling provides information on vehicle fuel economy using labels by which consumers consider additional performance characteristics as they make choices in addition to government duties and taxation.

Information provided on fuel economy and emissions enlightens consumers as these social and fiscal running costs. Stickers on the windshield inform prospective buyers of the fuel consumption and carbon dioxide emissions and hence the extent to which the vehicles they are buying contribute to global climate change.

There are three basic types of labeling to consider under this policy. These differ in terms of metrics, amount and type of information provided and graphical presentation.

- A. Graphical rating as is used in the UK and New Zealand
- B. Direct in by providing the value of CO₂emission or fuel economy. This is the most common system and used in the US, South Africa, Australia, Singapore, Chile, and India, or
- C. Relative vehicle performance compared to the fuel economy standard, as used in Japan.

1.4 New Vehicle Purchase Scheme

This scheme targets major cities where high vehicle and human population tend to result in deterioration of the air quality. This has been the experience in London, Dehli, and Cairo where high levels of Particulate Matter (PM) and Oxides of Nitrogen (NO₂) have prompted the implementation of scrappage of vehicles. Such programs offer incentives on surrender of old vehicles in exchange for more efficient one. The age at which a vehicle qualifies for scrappage is predetermined by Local Authorities, e.g. it is 13 years in Australia and 20 years in Cairo.

Buy-back programs have also widely used to accelerate the retirement of older vehicles technology.it provides monetary or other incentives to vehicle owners to voluntarily retire their older, often more polluting vehicle. Incentives may be provided directly to the owner and may take the form of tax or may be paid directly to the newer vendor. The state may not be involved. An arrangement is made between the sellers who guarantee to buy-back after an agreed duration of use.

2. Methodology

The methodology utilize the term of reference as set forth in the structure which outlines the following:

2.1 Feebate Policy

In designing the feebate policy/program the following procedure was adopted.

1. Comparative analysis of various feebate programs in the world
2. Identification of key successes
3. Analysis of financial incentives that promote sale and use of cleaner vehicles.

2.2 New Vehicle purchase Schemes

In designing the New Vehicle Purchase Scheme the following procedure was adopted.

1. Review various model of New Vehicle Purchase Schemes. (Trade-in and Scrappage)
2. Identify best practice
3. Recommend type and age for scrappage.

2.3 Vehicle Labeling

In designing 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 program.
- c) Design of a well safeguarded vehicle labeling system of both new and used imported vehicles.

3. Legal Framework

The act creating the EPA among other things establishes a monitoring, coordinating and supervisory authority for the sustainable management of the environment in partnership with regulated Ministries and organizations and in a close and responsive relationship with the people of Liberia; and to provide high quality information and advice on the state of the environment and for matters connected therewith.

Specifically, section 6 of the EPA ACT among other things provides for the proposition of environmental policy and strategies to the Policy Council and ensure the integration of environmental concerns in overall national planning.

3.1 Current Policy Concept

There is no available policy concept that provides the basis for monitoring CO2 emissions. The EPA Act provides for the framework which enables the collection, analysis and preparation basic scientific data and other information pertaining to pollution, degradation and on environmental quality, resource use and other environmental protection and conservation matters and undertake research and prepare and disseminate every two years a report on the state of the environment in Liberia.

3.2 The Environmental Sector

The purpose for the examination of the regulations that have so far been adopted to address harmful pollution from vehicular emission is propose reasonable policy options appropriate to Liberia. The below paragraphs interrogate these regulations to establish gaps and inadequacies that have created short falls in the implementations of these policies at the same juxtaposing them with best practices around the world.

3.2.3 The Environmental Protection Agency Act, 2002.

The Environmental Agency Act provides for a complete regulatory, supervisory, fiscal, and penal institutional framework. Section 43 of the Act states among other things that “the agency shall, in collaboration with relevant line and/or agency establish standards, guidelines and procedures for pollution control, toxic substances, hazardous waste and licensing.” Section 44 enhances further the strength of the EPA by providing that “without prejudice to the provision of the income tax of Liberia or any other law relating to tax, the Minister of Finance shall on the recommendation of the policy council of the EPA include in the national budget economic instruments to ensure an appropriate pricing of environmental resources and cost of pollution are paid by polluters.

3.2. 4 Environmental Protection and Management Law of 2006.

Section 70 of the Environmental Protection and Management Law prohibits the emission by motor vehicles and other conveyance from operating in such a manner as to cause air pollution in contravention of established emissions standards or to import any machinery, equipment or any similar device which is likely to cause emissions into the ambient air in contravention of the established emissions standards. Under the same section, specifically section 70.3, a penalty is provided for a person who contravenes the provisions. A fine of \$5000.00 or imprisonment for a period not less than 2 years or both is there to serve as deterrence.

3.3 Tax Provision

The Revenue Code of Liberia Act of 2000 as Amended states that there shall be levied, collected and paid on all goods imported into Liberia. Section 1701 sets rates payable on importation of motor vehicles as follows:

- a. Excise Tax of 10% on automobile (Luxury vehicles value above \$20,000)
CIF multiplied by luxury tax rate of 10%
Eg. CIF = \$20,000 X 10% = \$2,000
- b. New vehicles (value above \$40,000)
CIF = \$40,000 X Luxury tax rate of 10%
Eg. CIF = \$ 40,000 X 10% = \$4,000
- c. GST
CIF plus Import Duty plus Excise tax plus CUF multiplied by GST rate.
Eg. CIF = \$10,000; Import Duty = \$ 1,000; ETL = \$50; Excise Tax \$ 3,500.
GST = (\$10,000 + \$1,000 + \$50 + \$3,500) X 7% for all other products.
GST = \$14,000 X 7% = \$1,018.50
The Transport master plan

3.4 Gaps and Challenges in Existing Legal and Regulatory Framework.

Many challenges exist in the legal framework in the transport industry. These include challenges relating to the creation of vehicle emission reduction strategies, inadequate resources to synchronize the overlapping regulatory functions of line ministries and governmental agencies and an inadequate motor vehicle inspection system.

The understanding of environmental issues associated with emissions is key to the development of good policies and laws. The question of capacity and poor coordination among line ministry is observed to be a problem. The EPA, MOT, and LRA may have worked together on vehicle inspection, but testing of vehicle is lacking because of the absence of mechanism to ensure that they work effectively with the Liberia National Police (LNP) to enable the success of implementation.

Additionally, institution tasked with the enforcement of laws relating to the environment in the transport sector lack the facilities and equipment to effectively carryout their functions; e.g there are no testing centers around the country where emission testing are performed.

Finally, the lack of policies to promote less polluting fuel is a contributing factors to vehicular emission. The tax provisions on petroleum should take into account the hazardous effects from emissions that these products have on the environment. Products that are most polluting should be heavily taxed while less hazardous ones should be subsidized to incentivize the importation of less hazardous petroleum products.

3. Comparative Analysis of Liberia's Emission regime against the global practice

Legislations on the sustenance of the environment are more or less restrictive rather than proactive. For example, Liberia's standard on used vehicles importation does not address the

need for fuel catalytic converter that will assist minimize air pollution of old vehicles already in the Liberian Market. Below are selected countries' regulations on emission. It must be stated here that Most African Countries, Latin America and Asian countries are yet to finalize their policies on emission thus Mauritius and the European Union are used for this study.

4.1 Mauritius

Mauritius has an excise duty based on CO2 emissions for vehicles. Section 5 of the country's Excise (Amendment) Act of 2011, states that a CO2 levy shall be chargeable, or a CO2 rebate shall be granted, as the case may be, on the motor vehicles. The ley/rebate compliments the existing fees for cars, and is calculated with the following formula:

$$AC=RX(C-T)$$

Where:

A is the amount of CO2 levy or CO2 rebate

R is the appropriate rate of the CO2 levy, or the appropriate CO2 rebate per gram

C is the CO2 gram per km of the motor car rounded to the nearest whole number

T is the CO2 threshold currently placed at 158grams per km.

The country also levy tax on vehicle ownership based on engine size.

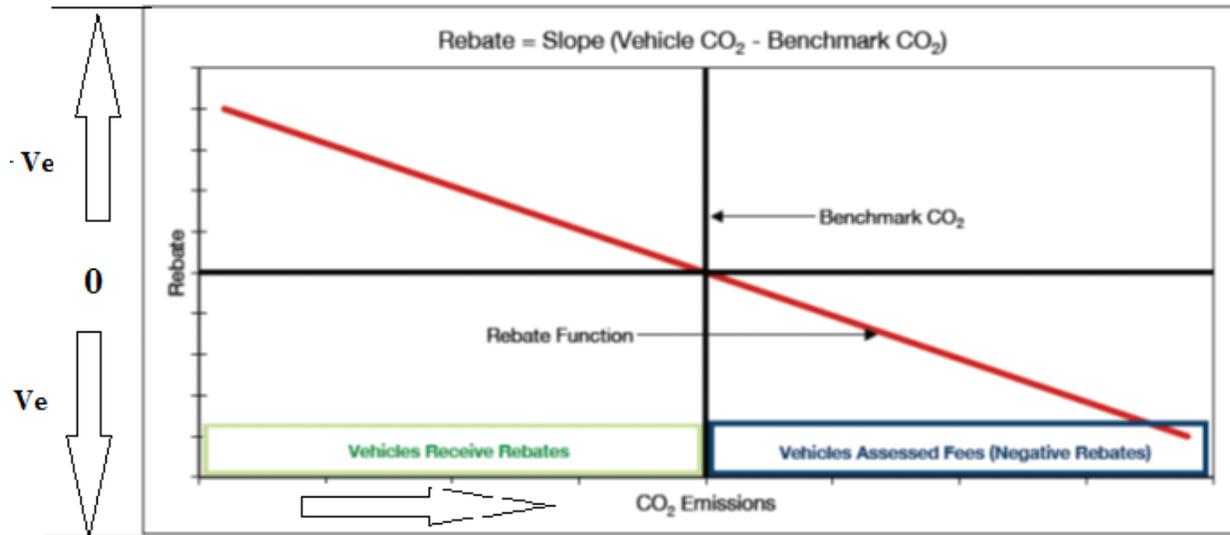
4.3 European Union

European Union has developed various policies and measures on vehicle fuel efficiency. Apart from EU policies, EU member's countries have also developed laws and measure to improve vehicle fuel in their nations. The EU now sets the target of 130 gCO2/km and 5.6l/100km for the average emission for new cars to phase out in 2015.

5. Literature Review

Fuel economy of a Vehicle refers to the fuel relationship between the distance traveled and the amount of fuel consumed. It is expressed in volume of fuel to travel specified distance. 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 gCO2/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. Figure1 presents a generalized depiction of a feebate system.

Figure 1: Feebate Slope (Vehicle CO₂-Benchmark CO₂)



Source: German and Mesler (2010)

Figure 1 represents a benchmark for CO₂ emissions which separates the efficient and inefficient vehicles. From the diagram, if the CO₂ emission of a new vehicles exceeds the benchmark (falls to the right half of the figure, it then qualifies to pay a fee on top of the purchase price). Because the rebate is linear, the fee would be directly related to the amount by which the emissions exceeds the benchmark and a direct function of the amount.

This mean that rebate decline continuously with increasing CO₂ emissions. If the CO₂ emission of a new purchased vehicle exceeds the benchmark (falls to the right half of the figure), it would be required to pay a fee on top of the purchase price. Since the rebate function is linear, the fee would be directly related to the amount by which the emissions exceed the benchmark and a direct function of this amount. On the other hand, new purchased vehicles with CO₂ emission below the benchmark (the left half of the figure), would be rewarded by a rebate depending on how far their CO₂ emissions are below the benchmark. This is a continuous feebate program where the rebates decline continuously with increase in CO₂ emissions. We also have non-continuous feebate programs (with piecewise linear function and step-wise functions).

German and Mesler (2010) also proposed a feebate program that is non-continuous. The slope range is Zero where vehicle with different CO₂ emission rates are evaluated equally within the range. Vehicle are exempted from both fees and rebate.

5.1 Example of Feebate in other Countries

There are a number of countries that have been using the feebate system. In other to establish what is best for Liberia, an examination of the feebate program of selected countries are seen

below. 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.

France

In France, the feebate program was introduced in December 5, 2007. They began the program with rebate. The benchmark system employed by France in 2009 was 130-160g/km (193-257g/mi). This requires that fees are neither charged no awarded rebates, a system known as donut hole.

Figure 2 shows range of vehicles that affected by the feebate policy.

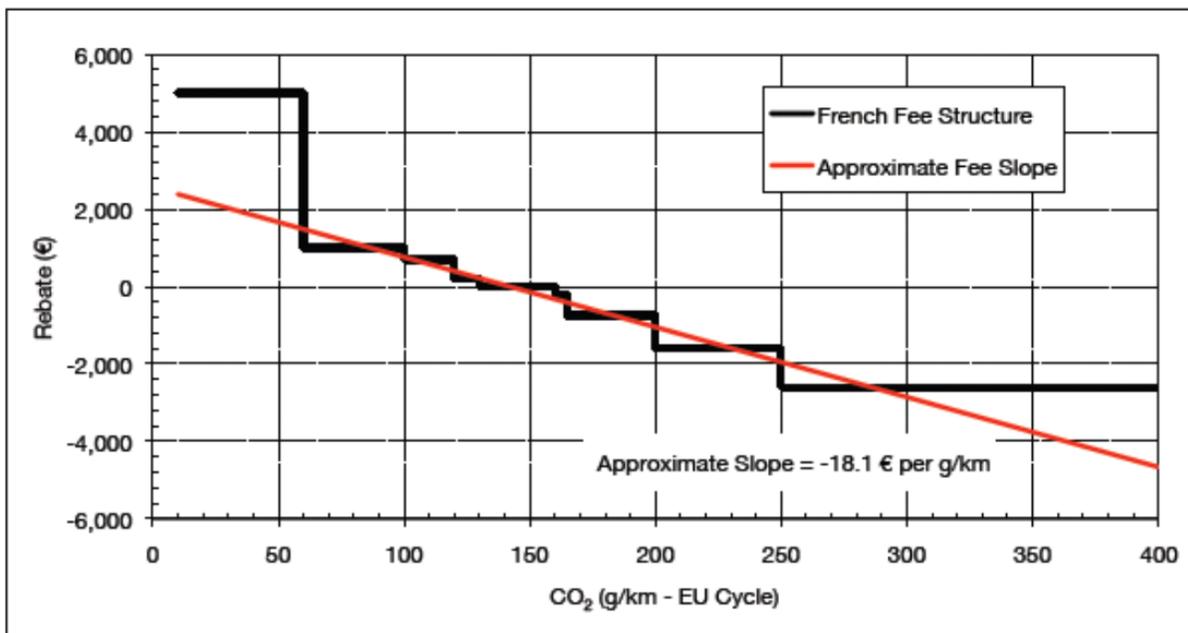


Figure 1: Range of Vehicles affected by feebate policy

This depicts a step functions. 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. All of these countries adopted a single benchmark which is considered fair since they provide an absolute standard that is the same for all vehicles.

5.2 Current taxes of motor vehicles

There are several duties levied in Liberia for motor vehicles. The LRA and the MOT regulate the registration of vehicles by engine size as follows:

Table 1: Revenue of vehicles by engine size, 2015

Category	2015 Average Revenue Per Unit (taxes and fees)
1100-1500	\$ 75.00
1600-2000	\$ 110.00
2100-2500	\$ 125.00
2600-3000	\$ 150.00
3100-3500	\$ 200.00
3500+	\$ 500.00

Source : Ministry of Transport

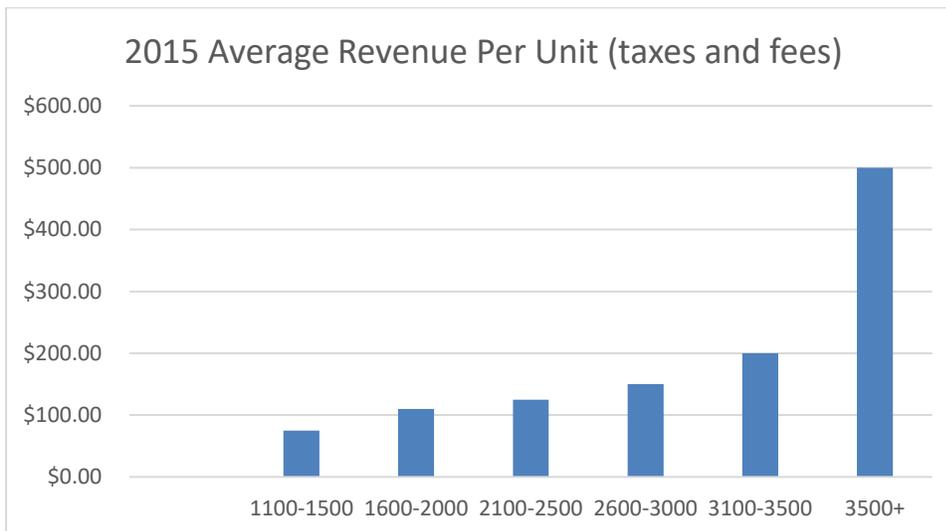


Figure 3: Average Revenue of engine size showing tax and fees

5.3 Baseline Analysis

Table 1 shows data that was obtained from the LRA and MOT from 2005 to 2015. It is from these variables indicators that are used to guide the analysis of the proposed feebate policy in Liberia. The registry of vehicles for the years 2005, 2008, 2011, 2013 and 2015.

The average fuel economy for Liberia was established to be 7.93L/Km with a corresponding average CO₂ emission of 179.03g/Km. Comparing this with the global average of 7.2L/100Km it is shown that Liberia’s average fuel economy is higher and is not improving.

The significant increase in the number of used vehicle with no record of hybrid vehicle imported in country is an issue of concern. This is unusual. However, it could be attributed to no public awareness on environmental degradation and fuel efficiency issues as is the case with Kenya.

The record of vehicles registered since 2005 and observations made are as follows:

1. During the period under study, 90% of the vehicles were manufactured in Japan and Germany and 10% in the United States of America.
2. The number of used vehicles in the fleet continue to increase. The study established that 89.7% of Vehicles were used and 11.3% were new. The average age of vehicles imported into the country is 10 years old.
3. The total number of LDVs registered in Liberia in 2005, 2008, 2011, 2013, 2015 included 7,440, 17,367, 21,609, 30,832, 32,522 respectively. On the basis of this trend, and based on extrapolation of best line of fit, the total number of Light Duty Vehicles could reach 913,853 by 2050. This also conforms to R. Gakenheimer 1997 study that “in much of the developing world, the number of motor vehicle is increasing at more than 10% per year”

Table 2: Variable Guiding the Analysis

Vehicle Condition (New or Used)	Estimate Revenue before Feebate
Fuel Economy	CO ₂ Emissions (g CO ₂ /km)
Production Year	Estimated Revenue after Feebate
Engine Size	Vehicle Make
Fuel Type	

The data show that in 2015, which is the year that is being used as the baseline year, there were 32,522 that were registered; thus 32,522 was selected to perform the analysis. Revenue were computed using the respective fees and taxes in 2015 and applied to the vehicle inventory. The total computation stood at \$4,026,223.1. Table 3 and figure 4 show estimated revenue per engine size.

Table 3: Revenue by Vehicle Engine Size Category in 2015

Category	%market share	Avg. CO ₂ emissions (g/Km)	Average Fuel Economy L/100Km	2015 Average Revenue Per Unit (taxes and fees)
1100-1500	5	116	5.81	\$ 121,957.50
1600-2000	53.66	181	7.23	\$ 1,896,032.60
2100-2500	23.3	191	7.82	\$935,007.50
2600-3000	12.04	247	8.01	\$ 585,396.00
3100-3500	6	247	13.11	\$ 292,698.00
3500+	3	285	13.11	\$ 195,132.00

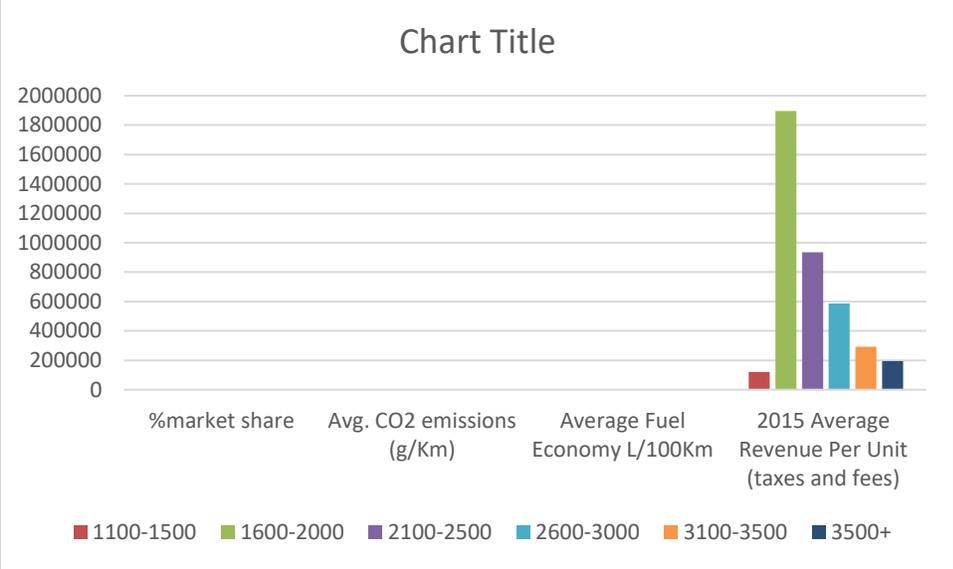


Figure 2: Chart showing Tax and fees for 2015

The data shows in figure 4 that the highest revenue of \$ 1,896,032.60 was generated by 1600-2000 cc engine category which constitute 53.66% of the vehicles. This is followed by engine category 2100-2500 cc.

Table 4: Average Revenue per Vehicle Engine Size Category.

Category	%market share	Avg. CO ₂ emissions (g/Km)	Average Fuel Economy L/100Km	2015 Average Revenue Per Unit (taxes and fees)
1100-1500	5	116	5.81	
1600-2000	53.66	181	7.23	
2100-2500	23.3	191	7.82	
2600-3000	12.04	247	8.01	

3100-3500	6	247	13.11	
3500+	3	285	13.11	

Table 5: Average Revenue by Vehicle age Category in 2015

Age of vehicle	No. of Vehicles	Avg. CO ₂ emissions (g/Km)	Avg. Fuel economy L/100Km	Revenue 2015 (taxes and fees)
1986-1990	9,367	181	7.8	\$ 18,724,633
1991-1995	14,123	220	7.4	\$28,231,877
1996-2000	32,439	215	6.5	\$64,845,561
2001-2005	21,588	187	8.3	\$43,154,412
2005-2010	33,955	181	7.4	\$67,876,045
2011-2015	6220	179	7.4	N/A

Table 6: Revenue by Vehicle Condition

Average CO ₂ emissions (g/Km)	Average Fuel economy L/100Km	No. Of Vehicles	Percentage (%)	Age	Revenue in US Dollars
New	8.2	3,577	11	3.2	\$5,165,188
Used	7.7	38945	89	6.8	\$77,851,055

5.3 Scenario for benchmark and Feebate Rates

The literature and country statics were used to develop feebates rates. There are recommended practices which is aimed at running a scenario to achieve revenue-neutrality which are designed to be self-financing. Determination of benchmark can be obtained through various factors, such as attributes of the vehicle fleet-fuel economy and market shares (Rivers and Scaufele, 2014).

Revenue neutrality can be achieved by low feebate rates and a point that is straightly lower than the baseline average CO₂ emissions (Zacchhariadi and Clerides, 2015). The study points out further that in order to maximize welfare improvement, the pivot point needs to be set at a level considerably lower than the current average gCO₂/km and marginal feebate rate not too high (less than 100 Euros per ton of CO₂).

Zacchhariadi and Clerides developed the simpler symmetrical function for feebate as:

$$A_j = t(E_j - PP)$$

Where;

A_j is the total tax in Euros per car of model;

E_j is the CO₂ emissions level of model; and

PP is the pivot point, both expressed in gCO₂/km.

T is the tax rate, Euros/g/km.

It is from the above equation that the feebate was developed.

5.4 Determining Liberia Benchmark and rate

The benchmark and rates were determined using examples from other countries; and involved several steps:

Step I: Using the vehicle inventory, establish g/CO₂ emissions for all vehicles based on the make and model, such that

$$g = \text{units per model} \times \text{gCO}_2$$

Step II: Determine the weighted average CO₂ which is the average for all the vehicle models in the inventory.

$$\text{AvgCO}_2 = \text{Total emission/number of unit}$$

Range	Units	Total Emissions
0-180	3,253.2	582,322.8
180+	28,239	5,629,793.89
178-179	1031	183,951.02

Table 7: Vehicle emission per range

Step III: Determine the difference between the weighted average CO₂ and individual emission per vehicle

$$D = \text{W AvgCO}_2 - \text{gCO}_2$$

Step IV: the key assumption is that the point of purchase, the consumer chooses between fuel efficient and fuel inefficient vehicles whereas the government selects tax and rebate policies with the objective of maximizing welfare.

$$T_{pcvc} = t_{pdvd}$$

Where;

t_{pcvc} = fees

t_{pdvd} = rebate

This is further solved through differentiating the left hand side (LHS) and the Right Hand Side (RHS) and consider only a revenue feebate such that $R=0$.

Step V could not be applied due to the absence of consumer interviews and response. The study used the dataset of the five years 2005, 2008, 2011, 2013 and 2015 to conduct the simulation to determine the rates to be charged as fee and an incentive in the implementation of the feebate program.

It was established that the average CO₂ emission for the vehicles in the dataset was 179gCO₂/km. This figure was used in establishing the benchmark CO₂ emissions which we recommend to be 178gCO₂ with a range of 179gCO₂/km based on the vehicle population for the five years period. Therefore, we considered the vehicles with CO₂ emission of below 179gCO₂/km to be fuel efficient and those 180gCO₂/km and above to be fuel inefficient. This benchmark is relatively higher than Kenya that is 169.99gCO₂/km and Mauritius 158 gCO₂/km.

5.5 Best Practice for feebate program

In order to set the basis for the proposal of feebate policy for Liberia, consider a list of the best practices. This list is not exhaustive as Liberia does not manufacture vehicles.

- a) Use a single benchmark for all vehicles, combined with a single rate parameter.
- b) There will be range of vehicle that is unaffected by the feebate policy.
- c) Revenue neutrality: The basic function of feebate program is to influence consumer's choice for 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.

5.6 Success and failure of feebate policy

There are drivers that could contribute to the success and failure of feebate policy. One key driver is that the way feebate policy is introduced (abrupt, delayed, in phases and gradually).

Delaying the implementation would enable the concern parties to prepare for the feebate policy, however, it could also lead to 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 rebate.

6. Policy Options

The following taxes and fees have been observed to be implementable to vehicle imports.

The excise duty applicable to vehicle imports is proposed as follows:

- a) Vehicle less than 3 years old from the date of first registration on the tariff will be on the flat rate of \$1440.00
- b) Vehicle over 3 years old from the date of first registration the rate of \$1,920.

- c) For motor cycles the tariff the rate of \$100.00

7. New Vehicle Purchase Scheme

Whenever new and more vehicles are purchased, the environment is protected and this on the other hand will stimulate the automobile industry and reduce vehicle abandonment (ERC Report 2016).

The vehicle purchase scheme that are used typically are:

I. Scrappage Schemes

In other to accelerate the retirement of older more polluting vehicle so that newer cleaner vehicles are put to use sooner than would occur naturally, a scheme usually funded by the Government and industry is used. This requires that car owners could trade their existing vehicle and be rewarded on their purchase of a new vehicle.

This scheme is basically strong in Europe. For example, in the UK, individual trading in their vehicle gets a discount of £2,000 off the price of new vehicle. The manufacturer and the government each provide half of the £2,000 outlay. 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 payment. For Liberia, the new purchase scheme will stimulate the local vehicle industry, preserve employment, promote socio economic development and as a promoter of green economy.

II. Credit Schemes

This scheme as is done in Nigeria, where the National Automobile Council floated a fund to support the purchase of vehicles made in the country, could be adopted in Liberia government could create credit schemes to sustain the industry. This will reduce the use of older vehicles as consumers would now have the option to obtain a newer vehicle through the scheme.

Other new car buying schemes that could be applicable are:

- III. **Personal Loans** from banks are considered as one of the cheapest way to finance a car depending on the rate of interest.
- IV. **Logbook Loans** where a lender will temporarily own your vehicle until loan is settle.

8. Conclusion

8.1 Feebate Program

When there is an increase in duties and fees it will likely lead to some minimum effects in vehicle purchase and therefore influence the choice based on engine size. Using the dataset for the years 2005, 2008, 2011, 2013, and 2015, it was established that the average CO₂ emission was 179.03

gCO₂/km and the average fuel economy is 7.93 L/100km. It can be safely stated that implementation of feebate program is likely to increase the purchase of fuel efficient vehicles. Therefore, the proposed benchmark of between 178 gCO₂/km to 179 gCO₂/km and a rate of \$15.00 per g/Km is similar to countries that have feebate programs in place. The benchmark should regularly be reviewed.

8.2 Vehicle Labeling

In order to apply the vehicle labeling system in Liberia, a design of a vehicle sticker should be proposed. As this aspect is not covered under the term of reference, including it in this study will be prejudicial because the stakeholders in the transport sector must be consulted before arriving at the best option. The case of Kenya is relevant to this. A separate study was done to define the best option of vehicle labeling for the country.

8.3 New Vehicle Purchase Scheme

A study must be done to establish the best option for new vehicle purchase scheme. The EPA and other line ministries must encourage this. It must however be pointed out that this option is only implementable by private vehicle dealers and consumers.

9. Recommendation

In order to ensure that the feebate and new vehicle purchase work, the following suggestions will suffice:

- a) A standard on vehicle labeling should be considered. The vehicle labeling program should be modeled in a way as to create a regulatory framework. The EPA, MOT and LRA should collaborate on this; bringing together key stakeholders in the transport sector.
- b) The EPA should lobby for support of an Energy Bill that will create an energy efficient section within the EPA that will implement the proposed policies in collaboration with other governmental entities.
- c) A feebate system should be created in Liberia with a range of between 178gCO₂/km to 179gCO₂/km. Vehicle purchases with emissions of below 178gCO₂/Km be considered efficient and an incentive of \$15.00 per g/km be established as the rebate. Vehicle purchases with 179gCO₂/Km with a fee of \$15.00 per g/km be charged.

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