AIR RESOUCE MANAGEMENT CENTER (AIRMAC)/ CLEAN AIR SRI LANKA IN PARTNERSHIP WITH UNIVERSITY OF MORATUWA

# Study of Sri Lanka Vehicle Emissions Testing (VET) Program

## Summary Report

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**5/16/2012**

This report is a part of "Clean Air And Blue skies" Exchange Project Phase 4 Activity funded by Fredkorpset (Fk) Norway. The purpose of this study is to observe and summarize "Sri Lankan Vehicle Emission Testing Program" framework, provide necessary recommendations and also use it as a case study to strengthen the Vehicle Emission Testing Program in Nepal

# ACKNOWLEDGEMENT

This report is a case study of the Sri Lankan Vehicle Emission Testing Program and is a part of "Clean Air and Blue Skies "Exchange Project Phase 4. The Exchange program and the activities have been funded by Fredkorpset (Fk) Norway.

I owe a very special thanks to Fredkorpset Norway for funding the project and Clean Air Initiatives for Asian Cities (CAI-Asia), the lead partners of this "Clean Air and Blue Skies" Exchange Project.

Dr. A.G. T. Sugathapala, Director General of Sri Lanka Sustainable Energy Authority (SLSEA) and Focal Point of this Project in Sri Lanka, who is also my supervisor, has been guiding me throughout the study. I am indebted to him for providing me with correct directions, crucial insights and invaluable comments which have enriched many aspects of this report.

I wish to convey my special thanks to Mr. Anura Jayathilake, Director of AirMAC for helping me access various crucial documents for the report and hosting me during the study period. Similarly, thanks also go to Dr. V.P.C. Dassanayake, Head of Department of Mechanical Engineering, Dr. H.K.G. Punchihewa and Dr. MMID Manthilake, University of Moratuwa for hosting me during the literature Review for this project.

I also gratefully acknowledge the contributions made by Mr. R.M.R.D. Weerasooriya and Mr. S.A. Ranasinghe, Environmental Management officer of Ministry of Environment; Mrs. T.K. Amarasinghe, Ms. T.N.V.Amilakumari, Mr. E.M.K.S. Ekanayake, Mr. H.M.B.M.B. Herath and Mr. E.S.S. Soyza and all staffs of Air Resource Management Center (AirMAC) for providing me big and crucial information details, helping me with various observations, center visits, equipments demonstration and database.

I extend my special thanks to Mr. R.N.R. Jayaratne from Central Environmental Authority , Ministry of Environment, Mr. A.W. Dissanayake, Project Director of VET Program and Mr. R.P. Samarakoddy, Waste management Authority for their valuable time and insights. Thanks are also due to Ms. Anjila Manandhar, Mr. Pankaj KC, Mr. Manjit Dhakal, Ms. Amita Thapa Magar and Clean Energy Nepal/ Clean Air Network Nepal family for their support and invaluable suggestions.

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## PRETEXT

Transport and rapid motorization are some common issues in many developing countries and Sri Lanka is no exception. The rapid increase in the vehicle fleet is mainly due to importation of used vehicles to satisfy the high demand for personal vehicles. The growing vehicle population, especially motor cycles and three wheelers together, with the high emission rates from many of these vehicles has been associated with serious air pollution problems in many urban areas of developing countries. In particular, vehicular emissions are linked to a number of health effects, including respiratory and cardiovascular diseases such as asthma and lung cancer. Emissions from vehicles consist of a large number of pollutants resulting from a number of different processes. The most critical source of pollution is vehicular exhaust that is generated during the fossil fuel combustion process and subsequently emitted from the tailpipes. Primary pollutants in the vehicular exhaust that can produce health effects include carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide and other toxic substances such as particulate matter and lead. Additionally, other gases (such as ozone) and particles (sulphate and nitrates) can form in the atmosphere as secondary pollutants from reactions involving some of those primary emissions.

Emission from on-road motor vehicles is one of the main air pollutant sources in Sri Lanka, particularly in urban sector. Ever increasing use of vehicles in transport sector without proper monitoring, controlling and regulation of emissions together with lack of standards and the national interest has resulted in deterioration in air quality in main cities, especially in Colombo. This has caused adverse health conditions and poor quality of life. The estimation of these emissions is important from a number of viewpoints. Firstly, development of local emission inventories is essential to draw up a national action plan and also to carryout research and development activities in mitigating vehicle emission.

Secondly, these inventories are very useful in comparing the present status with the ambient air quality standards or even developing new standards. Further, on-road motor vehicle emission estimates could be used to determine if area-based transportation plans and projects are consistent with the national implementation plan.

Due to the dynamic nature of the phenomenon arising from the changes in fuels & combustion technologies, mix and the quantity of the vehicle fleet, etc., such inventories should be continuously upgraded.

Therefore, reduction and control of vehicular emissions require comprehensive strategy, which requires emissions standards for new vehicles, cleaner fuels, emissions standards and inspection & maintenance program for in-use vehicles, vehicle importation policies, traffic & demand management measures; and also institutional development, awareness, education and training. In this regard, the government of Sri Lanka obtained an IDF Grant from the World Bank to strengthen the institutional and policy framework for urban air quality management in Colombo. The overall objective of the project was to help develop institutions and policies needed to reverse the deterioration in Colombo's air quality and its accompanying adverse health effects from exposure to fine particles, lead and other vehicle emissions. (AirMAC, 2004)

On the basis of Recommendations provided by the document and as a result of fundamental rights case filed by a citizen in 1999 (Bulankulama and six others v. Secretary, Ministry of Industrial development and seven others, , 1999), the "Vehicle Emission Testing Program" was implemented. This document provides the summary of all the frameworks prior and related to VET Program and also attempts to analyze the current scenario and its challenges and provide basic recommendations to the program.

# 1. LEGAL BACKGROUND

## 1.1 SUMMARY

The vehicle Emission Testing Program is the outcome of a fundamental rights case filed by a citizen in 1999. During, the progress of this FR case (No. SC/569/98 dated November 2, 1999), the Supreme Court ordered the Ministry of Environment to prepare and regulate vehicle emissions, fuel and importation standards of vehicles. Subsequently, the regulations were gazetted in 2000 under the national Environmental Act No. 47 of 1980. Those regulations were amended in 2003 (AirMAC, 2004).

A number of steps were taken by the Government to create a suitable mechanism to enforce the regulations namely; the establishment of Air Resource Management Centre (AirMac) as a multi-stakeholder organization to work out all policies related to air quality in Sri Lanka (AirMAC, 2004).

Sri Lanka initiated action for controlling air Pollution, in 1992 under Clean Air 2000 Action Plan, which was developed by Metropolitan Environment Improvement program (MEIP) of the World Bank. (World Bank and UNDP, 1989)National Policy on Air Quality Management was approved by the government in 2000. Ambient Air Quality standards were gazetted in 1994 and two stations were set up in Colombo area, to monitor the ambient air quality. Analysis of data received from the two stations indicated an increasing trend of air pollution level in Colombo area. It has been found that the major source of air pollution in Colombo and other urban areas is the Vehicle Emissions. The Ministry of Environment and natural Resources has gazetted regulations specifying mobile air emission standards, fuel standards and vehicle specification standards for importation, under section standards for importation, under section 32 of the National environment Act No. 47 of 1980, which were effective from 1$^{st}$ July 2003. These regulations stipulate that the Commissioner of Motor Traffic (CMT) is responsible for the enforcement of mobile air emission standards through authorization of accredited garages for the purpose of testing and certifying air emission levels of any motor vehicle. In order to give appropriate authority to the CMT, to implement this activity, regulations are to be gazette under Section 19, 202 and 237 of the Motor Traffic Act no. 21 of 1981. The MEIP

document has listed the Annual Vehicle Emission Testing Program under the Vehicle Emission Reduction component in this strategic document to address the growing concerns of degrading Air Quality in Sri Lanka (AirMAC, 2004).

## 1.2 FRAMEWORK PRIOR TO THE IMPLEMENTATION OF VET

### 1.2.1 National Environment Act

The National Environment Act formed on 1980 (as Act 47) has established Central Environment Authority with the powers, functions and duties of an authoritative body of the Ministry of Environment to set standards, formulate policies, coordinate regulatory activities and implement and monitor all the environment related activities in the island. Upon amendment in 1988, it further included Part IV B on Environmental Quality which has mentioned important policies such as Section 23J and Section 23K which deals with the pollution of atmosphere. (AirMAC, 2004)The Subsection 2 of Section 23K further elaborates onto the pollution because of combustion. Similarly, Section 23L mandates the fitting and maintenance of pollution-control devices in the polluting devices including vehicles.

The document, in totality, has made following provisions regarding vehicle emission reduction:

- Specify the type of fuel used in motor vehicles
- Prohibit higher polluting fuels
- Mandate the use of attitudes or treatment methods that will contribute to the reduction of pollution
- Prohibit the use of additives or treatment methods that will contribute to the pollution
- Emission standards for the vehicles
- The requirement to install/ add pollution reducing devices to the vehicles- in use
- The requirement to install/ add pollution reducing devices to the vehicles to be imported
- Preventing the use of certain type of devices in the vehicles

Further amendment of the document in 2000 also made provisions to make standards more stringent, when needed. The standards have been gazetted under Gazette extraordinary no 850/04 in 1994 to be adopted throughout the country. (National Environmental Act, 1980)

Similarly in 2003, the Ministry of Environment and Natural Resources has again gazette the regulations for the air, fuel and vehicular importation standards. (National Environmental (Amendment) Act, 2000)It has also authorized CMT to regulate the vehicular emission testing procedures for the vehicles (imported).

This act has also clearly set the emission standards for the petrol and diesel vehicles under various schedules. Along with present standards to be effective immediately, targets have been set to restrict the standards by 2005 and further by 2007.

### 1.2.2 Statutes Of Provincial Council

Provincial councils have been established under the thirteenth Amendment to the constitution of the Democratic Socialist Republic of Sri Lanka. Establishment of Provincial councils is provided for under Chapter XVII A. As per Articles 154 G, "Provincial councils have the power to make statutes applicable to a province, with respect to any matter set out in List I of the Ninth Schedule." In addition to the provincial council, the parliament can also make any matter set out in Concurrent List after consultation with all Provincial councils. (Homagama Pradeshiya Sabha(1998)2)

Since, environment is a subject that is found in the concurrent list, every Provincial council has the authority to pass a statute on environment; along with emission standards; in consultation with the parliament. Hence, this provision allows any province to set up a separate set of standards for the particular province. However, amongst the 9 provinces in the nation, only one has provincial environmental statutes. The North- western Province has Environmental Statute, which can be implemented locally. It is similar to the framework of NEA's 23 J, K and l sections. (The Constitution of the DRSL and The Thirteenth Amendment)

In terms of efficiency of Provincial statutes in Mobile Air Emissions, Mr. R.N. R. Jayaratne of CEA commented that since Air Pollution is a regional issue, enforcing different set of standards at different provinces is not necessary. (R.N.R.Jayaratne, 2012)

Mr. R. P. Samarakoddy, Director of waste management authority of Western Province on the other hand believes that since air pollution is a problem which begins at local level, it must be attacked at the local level itself. Hence, proper inventory should be

made at these provincial council and with the help of good research, the provincial level Air Quality management must be done (Samarakoddy, 2012).

However, the need to enforce particular standards for a particular province is still debatable. Sometimes, when two neighboring provinces have different standards, it might create another set of problems. For instance, if two provinces have different set of mobile air emission standards, then vehicles going from one province to other will face problems. Hence, these kind of provincial statutes might be a lot fruitful if it focuses on controlling stationery point emission sources and should focus on proper grass- root level implementation of the nationally set Air Quality and vehicle Emission Standards.

### 1.2.3 Motor Traffic Act

The Motor Traffic Act issued by Ministry of Transport and Highways under section 194 authorizes the CMT to inspect and examine any vehicle:

- To ascertain whether a motor vehicle has been in compliance with the requirements laid down under this act
- That information should be furnished in respect of a motor vehicle is correct, incorrect, true or false
- Whether it is in serviceable condition or not

It also empowers the CMT to issue a notice on the owner prohibiting the use of the vehicle until the standards have been met. It can even order that the revenue license be surrendered to him in order to impound it until the measure given in notice has been complied with. (Department of Motor Traffic)

### 1.2.4 The Metropolitan Environment Improvement Program

The Metropolitan Environmental Improvement Program (MEIP) is a pilot program aimed at finding innovative solutions to the environmental problems in Asian cities. In 1989, the World Bank and the United Nations Development Program (UNDP) established MEIP to help selected metropolitan regions design and implement practical solutions to rapidly growing environmental problems. The program promotes participation of concerned sectors of society to improve governance and to

leave in place a process that is locally-anchored and sustainable. With the theme "People Cities environment", this program specifically aims at building cities and interconnected environmental networks and catalyzes strong relationship between the government, local stakeholders, researchers, industries and communities.

The MEIP program in Colombo basically focused on following issues (World Bank and UNDP, 1989):

- Loss of natural resources - degradation of rivers, lakes, coastal lagoons, drainage canals, wetlands and in-shore marine waters
- Deteriorating quality of surface waters & groundwater
- Flooding & stagnation of water courses
- Pollution from solid waste
- Deteriorating ambient air quality
- Environmental problems in low-income areas
- Traffic congestion

To address these issues, following priority projects were identified:

- Pollution Control and Abatement Fund
- Air Quality Monitoring Network
- Beira Lake Restoration
- Central Effluent Treatment plants at Ekala and Rathmalana- Moratuwa
- Municipal Solid waste Collection and Disposal
- Community Environment Management and Infrastructure Development

Among these components, the first two components are the parts of World Bank funded Colombo Urban Air Quality Management project. The monitoring and maintenance of vehicle emissions comes under the vehicle emission reduction strategy as mentioned in the Urban Air Quality management profile Sri Lanka. (World Bank and UNDP, 1989)

### 1.2.5 Urban Air Quality Management in Sri Lanka

Targeting specifically to reduce the vehicle emission, the final report of the project on Urban Air Quality Management in Sri Lanka consists of detailed analysis study of the Vehicle emission Testing Program feasibility and also provides detailed

recommendations for the VET framework and follow up programs. The project consisted of four components:

- Institutional Development
- Vehicle Emission Reduction
- Fuel Quality improvement
- Fiscal policies on Fuels and vehicles

The Vehicle Emission Testing program comes as a part of the "Vehicle Inspection and Maintenance Program" under the Vehicle Emission Reduction Component. The Vehicle Inspection and Maintenance Program section in the document has provided recommendations for the design and implementation of the vehicle I/M program including the "system architecture", emission standards, test procedures, VET facility requirements, program supervision and oversight and implementation of on-road inspection. (AirMAC, 2004)

The recommendations made in the document are concluded as follows:

- The program should comprise periodic inspection, including measurement of emissions, supplemented by on-road enforcement of emission standards with the aid of traffic police.
- Periodic Inspections should be carried out only in a limited number of high volume, centralized, test-only inspection stations linked to a central vehicle inspection database. These inspection stations should be established and operated by a small number of private firms (preferably two or three) under government supervision and oversight. They should be e quipped with chassis dynamometers (at least for diesel vehicles) and computerized emission analyzer systems to minimize the potential for inspection personnel to affect the test results.
- Compliance with the I/M program requirements should be enforced both through the vehicle registration process (a vehicle that has not passed inspection will not be allowed to re-register) and through the use of counterfeit resistant window stickers indicating the date by which the inspection should be passed. It should be illegal to operate or park a motor vehicle without sticker on a public road in designated "critical air quality area" such as Galle-Colombo-Negombo corridor. For reasons of cost-effectiveness, as well as practicality of implementation, the sticker system should not

be applied in rural areas far away from urban centers. To avoid the problem of re-registering in such areas, however the requirement should be applied to rural vehicles and long distance transport vehicles while operating in critical air quality areas. To accommodate infrequent visitors, four-stroke petrol vehicle could be allowed to purchase a "visitor pass" with limited validity- *en lieu* of obtaining an inspection sticker.

- Government should contract with a suitably qualified company or organization to provide technical support and assist in supervising the I/M program, This organization would maintain master calibration standards, monitor and analyze the inspection results submitted by the inspection stations, organize overt and covert audits of I/M station performance, and provide the analyzers and personnel for on-road emissions enforcement in cooperation with the traffic police. It should also review the I/M emission standards and failure rates at an annual basis, and recommend appropriate tightening of standards as the average level of vehicle emission goes down. In this way, it should be possible to achieve substantially lower average emission levels over a five to seven year period.
- The capital and operating costs of the I/M program should be recovered through a fee paid by the vehicle owner to the inspection station. The costs of government supervision and oversight, including the cost of the technical support contractor, should be recovered as a part of this fee. Inspection fees were estimated at Rs 1000 for heavy duty vehicles and Rs. 6000 for light-duty vehicles, plus a further Rs. 300 to Rs. 500 was charged for the emission compliance sticker to pay for enforcement, technical supervision and oversight.
- The recommendations also suggest a phase wise implementation approach on the basis of vehicle type.
- The time frame for the first VET program has also been allocated in the document with the appropriate number of facilities and approximate estimated cost. The pilot test done in Colombo had provided ample guidance in forming the document. The document refers a certain set of emission standards with a definite acceptable failure rate; as well as the methodology of testing for diesel and two stroke vehicles.

# 2. VEHICLE EMISSION TESTING (VET) PROGRAM

## 2.1 RATIONALE

The rationale and concept for an I/M program is simple: modern vehicles are dependent on properly functioning components to keep pollution levels low. Minor malfunctions in the air/fuel or spark management systems can increase emissions significantly. Major malfunctions can cause emissions to skyrocket. Government can require that vehicles be tested or "inspected" (the "I" in "I/M") to determine whether their emissions exceed levels appropriate for that vehicle type. Vehicles that fail the test must undergo repairs or maintenance (the "M" in "I/M") to bring their emission performance up to par, or they must cease operating, at least within the geographic jurisdiction of the I/M program. Some studies suggest that a small fraction of the vehicle fleet can be responsibility for a large share of total vehicle emissions, so an I/M program that reduces the emissions of these "gross emitters" can bring substantial air quality benefits. (USAID, 2004)

## 2.2 BACKGROUND

Based on the recommendations by the final report of "Urban Air Quality management in Sri Lanka"; a "Request for proposal (RFP)" document was worked out and issued as a "bid-invitation" notice to private investors on 15$^{th}$ September 2003. The document contains the final framework of VET program, all the design details, modalities, testing procedure, Database management and Inspection provisions.

The RFP is a legal document of dept of motor traffic for the establishment of Vehicle Emission Testing (VET) Centers for Vehicle Emission Testing program in the country. It has been drafted by Vehicle emission control cell, AirMac. CMT is responsible to enforce mobile air emission standards and to accredit and authorize garages and testing centers to carry out these purposes while AirMAC is responsible for inspections and monitoring the implementation of VET Program on behalf of MOENR, CEA and DMT. The document contains different criteria that the bidders must have while soliciting the permission to bid to open a vehicle emission testing center in and around the country.

The major components in various sections of the RFP document, is listed below (Department of Motor Traffic, 2003):

## 2.3 REQUIREMENTS

- Centralized test only
- DMT will decide all the terms and conditions in a contract for the contractor which can be a private company( E.g.: Laugfs, Clean Co)
- Arrangements for the establishment of mobile center
- Lane-time analysis
- Procurements of all equipments, logistics and labor will be done by the contractor; DMT and related bodies will monitor and approve it.
- Basic property types and facility designs have been spelled out
- Specific guidelines have been mentioned to ensure the comfort and safety of the vehicle owners.
- The technical details have been specified strictly and the quality and process will be closely monitored. Similarly, proper maintenance of the overall testing center has also been stressed.

## 2.4 VET PROGRAM OPERATION

- The service hours will be 11 hours and 6 days a week mandatorily.
- Special emphasis has been given to the performance audit and overt audits.
- Wait Time Monitoring system
- Training of technicians and employees
- There is also a good provision to collect, record and improve on areas based on motorist complains.
- Annual VET
- The various test procedures are also mentioned viz idle test for motor cycles, gas cap tests for all vehicles and smoke opacity test for diesel vehicles**.**
- DMT guidelines should be followed for Chassis Dynamometer load test.
- The testing center will provide certificates to both the vehicles who have passed or failed the test. All information is to be maintained and recorded. This is an important step to assure transparency within the system.

- Different kinds of inspections will also be carried on in a periodic or impromptu basis.

## 2.5 DATA MANAGEMENT AND OTHER REQUIREMENTS

- The contractor is mandated to provide a data handling system that will provide all software to be used by DMT ; telecommunications capabilities between the contractor and center; transmission connections for all test systems (via central database). The data connection shall allow all centers to access the database through the entry of a vehicle license plate number or vehicle identification number (VIN) to obtain all the vehicle specific information needed to verify the identity of the vehicle and determine the appropriate test procedures and standards. The transmitted data should include all the information required for the VET certificate.
- Specifications for Task Assignment Process
- Specifications for data availability and cross checking
- Following parameters have to be reported to the DMT: loading, utilization, vehicle queue and throughout reports of VET.
- Reporting to be made monthly and annually
- Network testing activity should include: Parameters to be included in weekly/ monthly reports: Test count, Test fees, Pass/ fail test results (gasoline/ diesel) , emission levels, diesel exhaust capacity, government vehicles.
- Automated Software
- Test records
- Operations and Maintenance: Daily equipment log listing, equipment status, lane status, corrective repairs actions taken (if any), downtime (if any) total test performed in each lane monthly record of all required schedule maintenance, monthly record of corrective (non-scheduled maintenance performed.
- Final system documentation
- Equipment requirement: The system shall measure HC, CO and smoke opacity automatically
- And there should be automatic, hassle-free VIN decoding software. The system should meet all applicable provisions of National Environmental Regulations No. 1 2003 and any other imposed under NEA and motor traffic act.
- Public Information Requirements:
- Program Information website

- PR plans

## 2.6 SPECIAL TERMS AND CONDITIONS

- Financial auditing required for each contractor- To auditor General of Sri Lanka
- Compensations- pre payment of motorist test fees
- Report submission dates and periods have been clearly specified.
- Liquidated damages
- Late report fees
- Acceptance test procedure
- Centre not operating for more than 4 consecutive days, contractor has to pay liquidated damages again
- Contractor's liquidated damages- contractor is also responsible for the compensation if the state supplants the contractor or in the event the state terminates the contract but the contractor should provide their schedule of values and termination claims.
- Insurance policies
- Performance Bond- Rs. 5 million mandatory
- Contract: Firm, fixed type, usage- need basis,

## 2.7 ADVANTAGES

### Government Control

All the framework, policy and monitoring regarding the VET program are carried out by different government authorities and the under-lying departments. AirMAC, Central Environment authority and DMT are the designated authoritative body to conduct, inspect and monitor the entire VET framework along with Department of Traffic Police and Department of Units, Measurements and Standards.

### Implementation by Private Enterprises

It has been found that many services of a public nature are best delivered by a private firm accountable to the government rather than by a state-owned entity that essentially holds a perpetual monopoly in providing the service. (USAID, 2004) The latter organizational form often suffers from low technical competence and a general

inability to punish poor performance or fraud at the individual employee level and the organizational level as a whole. A capital-starved public monopoly can be subject to budgetary pressures from external forces that threaten service quality and its ability to generate revenue, even if it is otherwise capable of providing that service in a financially viable manner.

**Competition between Private Enterprises**

Originally, the RFP was supposed to provide VET center contracts to three private enterprises, but only two enterprises qualified in the bid i.e. Cleanco and Laugfs. Since, two public enterprises are carrying out VET program, monopoly is reduced as it maintains competition over quality alive and assures better quality of VET services and facilities to the drivers and public.

If there were 3 or more public enterprises as planned earlier, there would definitely be more competition. But one has to take into account the demand or the vehicle population as well. Having too many companies on the market than needed might create other problems and issues of unhealthy competition. For instance, in Sri Lanka, a vehicle owner had complained that his vehicle had been failed in one VET center but was given a pass certificate in another test center belonging to different Company. If such malpractice can happen when two companies are carrying out testing facilities, the presence of 3 or more companies might worsen it. One should also take into consideration that it might be difficult for the government to oversee and monitor multiple firms.

**Strong RFP Mandate**

The RFP document has been prepared by Department of motor Traffic after detailed research on different scenarios, policies, best practices and after many pilot testing programs. The RFP document is very strong, strategic and binding and has considered every aspect of the VET program thoroughly starting from the legal framework to the contract details. The centralized testing, high volume, test-only facilities; linked by electronic communications to a central database are very effective. This arrangement reduces to a larger extent the potential for corruption in a testing process. Close links have been established between the vehicle registration and emission testing procedures which helps to avoid malpractices such as counterfeiting of vehicle

inspection certificates or stickers. The RFP also gives upper- hand to government ensuring authority to impose fines for corrupt practices. The RFP also motivates the contractors to establish pay, management and supervision practices that minimize corrupt practices. Upon close observation it can be seen that; from the top level Commissioner of Motor Traffic to the grass root level VET center managers, all strictly follow RFP code at all sectors and areas. Hence, the document is very effective.

**Provision of "Test Only Centers":**

The centralized testing as mentioned in the RFP has limited itself to test only facilities that are the test centers cannot provide repairing and maintenance services to the customers. As an advantage such "test centers" have ability to spread costs over a high volume of inspections, and achieve a low cost per inspection. Additionally, test-only facilities can afford more costly, sophisticated test equipment by the ability to spread costs. Oversight of the facilities by government is also relatively easy due to their small number.

Also, in case of "Test and Repair" facilities, a certain "conflict of Interest" might be observed as repairing will bring in more income to the center than mere monitoring. Hence, this might lead the "test and repair" centers helps to involve in malpractices of failing vehicles deliberately by the test centers themselves so as to do the repairs themselves. With the establishment of "Test only "facilities, this possibility is eliminated.

**Annual calibration For Every Inspection Center:**

When each of the VET centers has to calibrate their equipments annually, with the Department of Units, Measurements and Standards, it ensures that the equipments remain updates and there remains a minimal error in emission testing due to calibration.

**Inspection by DMT-AirMAC-CEA team before opening of a new center:**

RFP document itself has mandated specific provisions regarding establishment of new VET centers on the basis of distance between two neighboring centers. This ensures the proper distribution of vehicles over a center and doesn't allow one center to be

overcrowded while the other center has sparse customers. Also, before establishing a new center, the Commissioner of Motor Traffic appoints a committee to oversee the proposal details and provide team has to do a site visit, evaluate and provide permission to the proposing firm.

**Proper check over the issuance of certificate:**

The presence of Central database system in the VET program ensures proper check over the issuance of certificate to the vehicles. It also plays a crucial role in cross-checking during inspection (roadside and spotter). It also helps to provide up-to date data regarding vehicle population, fleet, usage and maintenance for research purposes.

The Vehicle emission testing certificate itself possesses 6 security features which ensure the originality of the test certificate. They are listed as below:

- Center
- Center location
- Serial Number of the issued certificate
- Certificate Bar Code
- Vehicle Identification Number
- Vehicle Photos

**Automated Recording:**

Since, the data handling system is automated; it lessens the chances of errors and tampering as in the case of manually handled data. Also, it makes it easily accessible for monitoring and research purposes.

**Emission Testing By Software:**

The software also covers the testing of vehicles itself which helps lessen the frauds by technicians and also reduces the case of fraud and corruption.

**Proper Inspection Strategy:**

No matter how effective a program might be, when it is not properly monitored and inspected, the effectiveness of the program declines over time. To avoid this, the RFP document mandates Roadside Emission Testing. This inspection is done randomly

and without pre- notice as such. With the Traffic police enforcing the testing and CEA-DMT and AirMAC officials carrying out testing, it catches the polluters red-handed. This kind of inspection activity compliments the proper enforcement of VET Program

# 3. IMPLEMENTATION FRAMEWORK

## 3.1 BACKGROUND

After the solicitation of bids, as per the RFP document, Clean Co Lanka Ltd. (Cleanco)and Laugfs Eco-Sri Pvt Ltd., (Laugfs)two private enterprises were awarded the VET program contracts. The program is designed as a public-private partnership and is a centralized system with two private sector companies - Laughfs Eco Sri (Pvt) Ltd. And Clean co Lanka Pvt) Ltd - authorized to issue the Vehicle Emission Testing certificates.

Preliminary activities for the vehicle Emission Testing (VET) program started in 2003. However it was officially commenced only in mid-2008 due to various constraints. Two private companies selected to implement the system were required to invest on VET centers, equipment and other facilities for the smooth implementation of the program. Each company was asked to establish fixed and mobile centers.

Since, the establishment of Fixed (permanent) testing center is not feasible everywhere, the VET framework also accommodates the establishment of mobile centers as well. The establishment of mobile centers is less costly and since it is mobile, it can be moved to another location periodically to serve in another area when the need in the previous area is less. This flexibility of mobile testing service is very useful in locations where there are less vehicle population. (Department of Motor Traffic, 2003)

However, the date, time and venue of each mobile service have to be reported to DMT in advance and DMT approval must be obtained before operating the service. The fixed center inspection also has to satisfy the RFP guidelines and on that basis have to be approved by DMT. The sites were selected on the basis of number and types of vehicles to be tested and other evaluation criteria as mentioned in RFP.

## 3.2 FINANCIAL MODEL

The Urban air Quality Management in Sri Lanka Report, provided a good illustration of the costs involved for test-only systems. Inspection lanes carry a capital cost of

roughly $206,000 each for heavy duty vehicles, and $120,000 for light duty vehicles. This cost includes buildings, dynamometers, emission analyzers, computer hardware and software, training and start-up costs. The number of lanes needed for a fully implemented program was 6 heavy duties and 61 light duties, implying a total upfront investment cost of $8.5 million. Operating costs include labor, land rent, utilities, etc. and were estimated at $105,000 for heavy duty and $65,000 for light duty. Amortizing capital costs and dividing by about 15,000 inspections per lane per year produced an estimated cost of about $9.89 for heavy duty vehicles and $6.04 for light duty vehicles. The Study also estimated a second cost component for oversight and management. Cost elements here included creation of a centralized I/M database, quality assurance, auditing, assessment, and the actual production of I/M stickers. This cost component was estimated at about $2.94 per vehicle inspected.

**Table 3.2.1 : Estimated costs to build and operate a vehicle inspection lane** (AirMAC, 2004)

| | **Heavy Duty** | **Light Duty** |
|---|---|---|
| **Capital Cost (USD)** | | |
| Chassis Dyno | 50,000 | 30,000 |
| Smokemeters / Analyzers | 6,000 | 10,000 |
| Informatics | 20,000 | 10,000 |
| Building | 80,000 | 30,000 |
| Installation | 20,000 | 10,000 |
| Training and Startup | 30,000 | 30,000 |
| Total Capital Costs | 206,000 | 120,000 |
| Amortized 5 years @20% | 30,900 | 18,000 |
| **Annual Operating Costs (USD)** | | |
| Labor | 55,000 | 45,000 |
| Utilities and Misc. | 20,000 | 10,000 |
| Land Rent | 30,000 | 10,000 |
| Total Operating Costs | 105,000 | 65,000 |
| **Revenue Required** | | |
| Total Revenue Required | 149,490 | 91,300 |
| Vehicles Inspected/Year | 15,120 | 15,120 |
| Inspection Fee Required | 9.89 | 6.04 |
| Inspection Fee (LKR) | Rs 989 (1USD=100LKR considered) | 604 |

**Table 3.2.2: Estimated oversight and supervision costs for the vehicle I/M program**

| Oversight Component | Capital Cost | Operating Cost/Year |
|---|---|---|
| Central I/M database & comm. | 2,000,000 | 600,000 |
| Overt QA | 25,000 | 200,000 |
| Covert audits | 350,000 | 400,000 |
| On-road testing support (10 teams) | 300,000 | 400,000 |
| Evaluation and assessment | 500,000 | 200,000 |
| Sticker Production/Security | 25,000 | 300,000 |
| Total Cost | 3,200,000 | 2,100,000 |
| Total Revenue Required | | 2,944,152 |
| Vehicles Covered | | 1,000,000 |
| Sticker Cost / Vehicle USD | | 2.94 |
| Sticker Cost / Vehicle | | Rs 294 |

Each company has invested more than Rs.400-500 million which is USD 4 million (as of 27 November 2011 (WIJEYEKOON, 2011))to build VET centers throughout the island, except in the Northern and Eastern Provinces.

## 3.3 IMPLEMENTATION

The VET program is implemented by the CMT through Revenue License procedures. The annual revenue license is issued by the Provincial Commissioner of Motor Traffic through the Divisional Secretariat office. As such, prior to the implementation of the program, all officials linked to this process had to undergo training in addition to the technical personnel of the Motor Traffic Department, the Police and other related training institutions.

During preliminary phase, AirMAC also carried out awareness programs to cover all stakeholders. The training program was carried out prior to the commencement of the VET program. VET program in the country has been developed as a nationwide program with the main objective of controlling air pollution in Colombo and other Urban cities caused by vehicular emissions. This program adopts a comprehensive strategy comprising the development of effective monitoring regulatory and enforcement mechanisms and policies establishment and strengthening of institutional structure, development of sustainable program for capacity building, training and skills development and mass awareness and education. (WIJEYEKOON, 2011)

It is mandatory to have the VET certificate to obtain the annual revenue license in the Western Province from November 17, 2008. Other Provinces such as the Central, North Central and Southern Provinces started the process on June 22, 2009 while the North Western, Sabaragamuwa and Uva provinces followed suit on December 15, 2009.

As per the records provided by AirMAC, following progress can be observed:

### 3.3.1 On The Basis Of Fuel Type

**Table 3.3.1.1: No. Of Vehicles Tested Annually and Their Results** (AirMAC, 2012)

| S.No. | Fuel type | Year | Pass-Initial | Pass-Retest | Total Pass | Pass % | Failed - Initial | Failed Retest | Total Fail | Fail % | Total no. of vehicles tested |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Diesel | 2008-2009 | 176714 | 25678 | 202392 | 84.30% | 33780 | 3923 | 37703 | 15.70% | 240095 |
| | | 2009-2010 | 301813 | 37504 | 338867 | 87.65% | 44464 | 3288 | 47752 | 12.35% | 386619 |
| | | 2010-2011 | 319893 | 38907 | 358800 | 88.09% | 43910 | 4623 | 48523 | 11.91% | |
| 2. | Petrol | 2008-2009 | 583416 | 79066 | 662482 | 83.02% | 112817 | 22704 | 135521 | 16.98% | 798003 |
| | | 2009- | 986066 | 183886 | 1169952 | 81.85% | 228227 | 31237 | 259464 | 18.15% | 1429416 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2010 | | | | | | | | | |
| | | 2010-2011 | 1331565 | 226503 | 1558068 | 83.75% | 252739 | 49673 | 302412 | 16.26% | 1860480 |
| 3. | CNG | 2008-2009 | 38 | 8 | 46 | 82.14% | 7 | 3 | 10 | 17.86% | 56 |
| | | 2009-2010 | 21 | 3 | 24 | 70.59% | 8 | 2 | 10 | 29.41% | 34 |
| | | 2010-2011 | 1 | 0 | 1 | 100% | 0 | 0 | 0 | 0% | 1 |
| 4. | LPG | 2008-2009 | 144 | 43 | 183 | 74.80% | 41 | 22 | 63 | 25.20% | 187 |
| | | 2009-2010 | 66 | 25 | 91 | 75.21% | 26 | 4 | 30 | 24.79% | 121 |
| | | 2010-2011 | 1 | 1 | 2 | 66.67% | 1 | 0 | 1 | 33.33% | 3 |

### 3.3.2 On The Basis Of Vehicle Type

**Table 3.3.2.2: On the Basis of Vehicle Type**

| S.No. | Vehicle Type | Year | Pass-Initial | Pass-Retest | Total pass | Pass % | Fail-Initial | Fail-Retest | Total fail | Fail % | Total No. Of vehicle tested |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Bus | 2008-2009 | 370 | 62 | 432 | 14.35 % | 102 | 14 | 116 | 12.07 % | 548 |
| | | 2009-2010 | 392 | 43 | 435 | 9.89 % | 78 | 11 | 89 | 12.36 % | 524 |
| | | 2010-2011 | 139 | 24 | 163 | 14.72 % | 28 | 4 | 32 | 12.50 % | 195 |
| 3 | Dual purpose | 2008-2009 | 90,474 | 12749 | 103233 | 12.35 % | 16845 | 2147 | 18992 | 11.30 % | 103223 |
| | | 2009-2010 | 138734 | 17621 | 156355 | 11.27 % | 21078 | 1843 | 22921 | 8.04 % | 179276 |
| | | 2010-2011 | 142402 | 17997 | 160399 | 11.22 % | 20329 | 2534 | 22863 | 11.08 % | 183262 |
| 4 | Land | 200 | 70 | 7 | 77 | 9.09 | 13 | 2 | 15 | 13.33 | 92 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vehicle | 8-2009 | | | | % | | | | % | |
| | | 2009-2010 | 138734 | 17621 | 156355 | 11.27% | 21078 | 1843 | 22921 | 8.04% | 179276 |
| | | 2010-2011 | 465 | 31 | 496 | 6.25% | 38 | 2 | 40 | 5.00% | 536 |
| 5 | Light land vehicle | 2008-2009 | 95 | 10 | 105 | 9.52% | 50 | 6 | 56 | 10.71% | 105 |
| | | 2009-2010 | 502 | 38 | 540 | 7.04% | 65 | 5 | 70 | 7.14% | 610 |
| | | 2010-2011 | 6 | 3 | 9 | 33.33% | 3 | 1 | 4 | 25.62% | 13 |
| 6 | M/lorry (Prime Mover) | 2008-2009 | 584 | 50 | 634 | 7.89% | 73 | 4 | 77 | 5.197 | 711 |
| | | 2009-2010 | 533 | 88 | 621 | 14.17% | 116 | 3 | 119 | 2.52% | 740 |
| | | 2010- | 509 | 75 | 584 | 12.84% | 79 | 1 | 80 | 1.25% | 664 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011 | | | | | | | | | |
| 7 | Motor car | 2008-2009 | 145966 | 15304 | 161270 | 9.49% | 25044 | 6264 | 31308 | 20.01 | 192578 |
| | | 2009-2010 | 183518 | 2 | 208070 | 11.80% | 34511 | 7185 | 41,696 | 17.23% | 249766 |
| | | 2010-2011 | 210204 | 23871 | 234075 | 10.20% | 29429 | 9522 | 38951 | 24.45% | 234075 |
| 8 | Motor coach | 2008-2009 | 15,175 | 2148 | 17323 | 12.40% | 2890 | 350 | 3240 | 10.80% | 20563 |
| | | 2009-2010 | 239895 | 23433 | 263328 | 8.90% | 4274 | 357 | 4631 | 7.71% | 37177 |
| | | 2010-2011 | 28972 | 3262 | 32234 | 10.12% | 3806 | 456 | 4262 | 10.70% | 36496 |
| 9 | Motor cycle | 2008-2009 | 302225 | 55870 | 358095 | 15.60% | 77595 | 14,532 | 92,127 | 15.77% | 450222 |
| | | 2009-201 | 564897 | 136636 | 701533 | 19.48% | 166882 | 20783 | 187665 | 11.07% | 889198 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | | | | | | | | | |
| | | 2010-2011 | 820193 | 155947 | 976140 | 15.98% | 172511 | 28827 | 201338 | 14.32% | 1177478 |
| 10 | Motor Lorry | 2008-2009 | 65916 | 9087 | 75003 | 8.54% | 12,083 | 1596 | 13679 | 11.67% | 88,682 |
| | | 2009-2010 | 128628 | 15067 | 143695 | 10.49% | 18402 | 1718 | 20120 | 8.54% | 163815 |
| | | 2010-2011 | 139088 | 15839 | 154927 | 10.22% | 18112 | 2434 | 20546 | 11.85% | 154927 |
| 11 | Motor tricycle | 2008-2009 | 138,892 | 9435 | 148327 | 6.36% | 11839 | 1723 | 13562 | 12.70% | 161889 |
| | | 2009-2010 | 27,076 | 2615 | 29261 | 8.81% | 239895 | 23433 | 263328 | 8.90% | 293019 |
| | | 2010-2011 | 311129 | 48635 | 359764 | 13.52% | 527533 | 10,609 | 63,362 | 16.74% | 423126 |
| 12 | Omnibus | 2008-2009 | 247 | 24 | 271 | 8.86% | 33 | 2 | 35 | 5.71% | 306 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2009-2010 | 1475 | 98 | 1573 | 6.23 % | 204 | 9 | 213 | 4.23 % | 1786 |
| | | 2010-2011 | 565 | 51 | 616 | 8.28 % | 60 | 6 | 66 | 9.09 % | 682 |
| 13 | Prime movers | 2008-2009 | 86 | 15 | 101 | 14.85 % | 23 | 3 | 26 | 11.54 % | 127 |
| | | 2009-2010 | 76 | 6 | 82 | 7.32 % | 8 | 1 | 9 | 11.11 % | 91 |
| | | 2010-2011 | 142 | 18 | 160 | 11.25 % | 19 | 2 | 21 | 9.52 % | 181 |

Implementing agency of the program is the Department of Motor Traffic; monitoring and evaluation is carried out by the AirMAC and the auditing of the overall VET program is carried on by CEA of the Ministry of Environment. So, in order to start a new VET center, the interested enterprise amongst the two public enterprises, has to seek Permission with DMT, CEA and AirMAC, with the details plans as per the RFP. The DMT-CEA-AirMAC team then carries out the proposed site inspection and will issue permission to the proje ct. The enterprise will then bear all the costs and establish the VET centers. The DMT and AirMAC are authorized to inspect the center anytime and even suspend the license if aught is observed against RFP document.

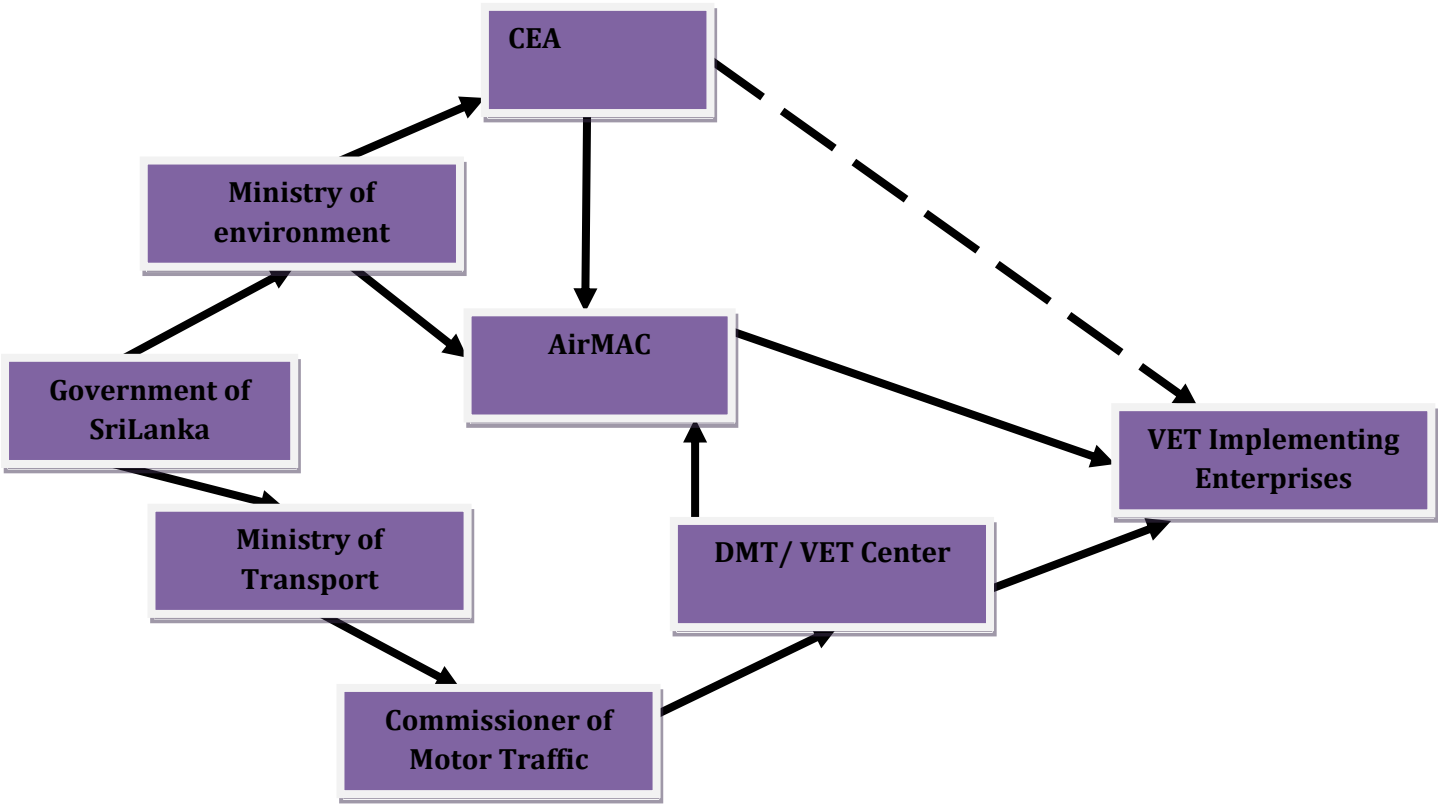



**Figure 3.3: A Flowchart Diagram of VET Implementing Framework**

## 3.4 VEHICLE EMISSION STANDARDS

### 3.4.1 Petrol Vehicles

**Table 3.4.1: Vehicle Emission Standards for Petrol Vehicles as effective from 01 April 2008** ((CEA) Central Environmental Auuthority, 2003)

| S.No | Type of vehicles | Carbon Monoxide CO (%v/ | Hydrocarbon HC (ppm v/v) | Other matters |
|---|---|---|---|---|

| | | v) | | |
|---|---|---|---|---|
| 1 | Petrol Vehicles other than motor bi-cycles and motor tri-cycles | 4.5 | 1200 | Both Idling and 2500 RPM with no load |
| 2 | Petrol motor vehicles and petrol motor tri-cycles | 6 | 9000 | |

**Abbreviations**

% v/v - percentage as per volume

ppm v/v - parts per million as per volume

RPM - Rounds per minutes.

### 3.4.2 Diesel Vehicles

**Table 3.4.2: Vehicle Emission Standards for Diesel Vehicles as effective from 01 April 2008** ((CEA) Central Environmental Auuthority, 2003)

| **Type of vehicle** | **Smoke Opacity at Instant acceleration K factor ($m^{-1}$)** |
|---|---|
| Diesel vehicles | 8.0 |

**Abbreviations -**

K – factor - absorbent Co-efficient

Instant acceleration - Carries the same meaning in the interpretation of the term 'SAE RECOMMENDED PRACTICE J 1667

## 3.5 ROLE OF VEHICLE REPAIR CENTERS

Vehicle Repair Centers are crucial part of the VET program. After all, the main objective of any VET Program is to maintain the vehicle properly so as to reduce the vehicular emissions and maintain the air quality. Hence, these repair centers have a direct role of maintaining the vehicles and maintaining the air quality. The RFP document has also acknowledged the importance of these repair centers. Though the Sri Lankan VET Program focuses on centralized test only facilities, the RFP document has focused on the proper accreditation/ certification of these garages.

Though SVSP and Roadside Emission Testing help to identify and check these malpractices; proper monitoring should also be done at the repair centers themselves. The technicians at the repair centers should be properly trained and made aware of the various environmental impacts and legally punished in case of malpractices detection.

# 4. INSPECTION AND MONITORING

## 4.1 CENTER INSPECTION:

It can also be known as "inspect the inspectors" process. Effective oversight and quality assurance (QA) is essential to deliver the actual emission reductions sought and help maintain public support for the program. Oversight and QA involve a set of highly technical tasks that can be performed by government (if the capacity exists) or contracting out in part. For this AirMAC along with DMT conducts regular inspections of various centers: fixed and mobile both. There's no fixed schedule for the center inspection though. It is usually done when DMT or AirMAC receives complains or on doubtful grounds. The center inspection team follows a specific guideline where they check the equipments and status of the testing center on the basis of the RFP guidelines. The form used during center inspection is attached in Annex 1.

During the center inspection, the inspection team mainly refers to the RFP guidelines and check whether the center is functioning as per the guidelines or not. As per the type of center, the team monitors the Staffing arrangement details, equipment calibration reports of the center, queue handling, customer handling, VET Procedure Inspection, maintenance of the VET center and other details as per the RFP mandate.

## 4.2 SMOKY VEHICLE SPOTTER PROGRAM

Considerable Air Pollution problems at roadside are caused by vehicular emissions. One of the major pollutions is the dark smoke emission from poorly maintained diesel vehicles. Even limited number of such vehicles could contribute to the major portion of the emissions from the sector (i.e. gross polluters). To deal with these smoky vehicle problems AirMAC has been jointly operating Smoky Vehicle Spotter program (SVSP) jointly with Department of Motor Traffic from May 2011. The program started with the training of selected spotters to help finding out the smoky vehicle from the fleet; and then calling up the owners of smoky vehicles to present the problematic vehicles for a smoke emission test in designated VET centers within a specified period of time; and following up action such as to recommend the cancellation of vehicle's license for non-attendance or failure on the smoke test.

It has been found that generally if the smoke is visible against Bitumen road surface; it exceeds the limit of 75 HSU. (AirMAC, 2010)

**Table 4.1: Permissible Smoke Opacity from Diesel Motor Vehicles** ((CEA) Central Environmental Auuthority, 2003)

| **Diesel vehicles** | | **Hartridge Smoke Unit** | |
|---|---|---|---|
| Type of Vehicle | Smoke Opacity on Snap acceleration ($lm^{-1}$) | Idle | Free acceleration |
| Diesel | 8.0 | 65 | 75 |

The Hartridge Smoke Unit Value mentioned is not stipulated in the emission standards and only used for smoky vehicle spotting. But it doesn't include the smoke emitted (mostly in puffs or ringlets) during hard acceleration from rest or during change in gear. Hence, any vehicle emitting visible smoke during normal driving is spotted and noted down.

Typically, a Smoky Vehicle Spotter Program includes the spotting of polluting vehicles on road for about two hours at a selected area. 3-5 spotters are assigned to spot the vehicles and fill in the details in the provided SVP form. The polluting vehicles after spotting are listed and checked in the data bases of DMT. The DMT database has access to all the related data such as the first registered date, details of vehicle owner, previous renewal of licenses, earlier records of emission testing etc. Then, a letter on behalf of DMT is sent to the vehicle owner and they are invited to come for emission testing at a specified date. The letters are sent twice at the maximum. If still the vehicle owners don't respond, then their license is suspended.

AirMAC in collaboration with DMT, tests the invited vehicles. The owners have to bring their recent VET passed certificate. Then, the DMT and AirMAC officials will carry out the Snap Idle Test and smoke opacity is measured. They use Smokemeter (with its probe), Pocket PC and Mobile Gas Analyzer for Petrol Vehicles. If the vehicle passes the test, a temporary certificate is given to the owner authenticated by

the DMT examiner and AirMAC officer. This certificate however is not valid for license renewal. Upon failing the tests, the results are compared with the previous pass emission certificates. This cross-checking helps to find the discrepancies, modifications or malpractices done by vehicle owners or VET centers.

## 4.3 ROADSIDE EMISSION PROGRAM:

Roadside emission testing program is conducted by the Department of Motor Traffic and AirMAC with collaboration with Traffic Police Division. It is also done on the spontaneous basis. The traffic police use the portable testing equipments and select a road stretch randomly. Then, the vehicles are asked to pull over and are tested by the traffic personnel. All the vehicles tested are issued with a certificate and the failed vehicles are asked to repair the faults.

Though there is provision that Traffic Personnel can note down the number of polluting vehicle and also fine the polluting driver, it is not implemented yet.

## 4.4 INSTITUTIONAL EMISSION PROGRAM

Apart from these checks, AirMAC and DMT along with Central environmental Authority also conduct regular Emission Testing Program of Government and Institutional Vehicles. The institutions having vehicles more than 100, are sought by AirMAC team and in coordination with DMT, a date is selected for the testing. Usually, the institution is selected as venue and all the institutional vehicles are ordered to show up during the testing by the institution authority themselves. In one day, on average more than 100 vehicles are tested. Sometimes, in case of more vehicles, a two day Vehicle Emission Testing Program is organized.

# 5. CURRENT SCENARIO

The two private companies which are authorized to issue the certificates operated 234 centers across seven provinces in the island at the commencement of the program. Both companies have subsequently increased the number of centers, to cater to the ever increasing demand for VET certificates.

**Table 5: No. of VET centers in Sri Lanka***

| Company | Fixed | Semi-Fixed | Mobile | Total |
|---|---|---|---|---|
| **Company 1** | 19 | 38 | 87 | 144 |
| **Company 2** | 15 | 28 | 47 | 90 |
| **Total** | 34 | 66 | 134 | **234** |

*as found in the AirMAC database on 28th February 2012

## 5.1 A TYPICAL VEHICLE EMISSION TESTING CENTER OBSERVATION

**Observation Site:** Company 1 VET Center 1,

### 5.1.1 Center Design

According to the Manager of the VET Center 1 of Company 1 is a fixed VET center and has been designed as per the RFP document. It has been designed with 3 lanes ; 2 lanes for petrol vehicles and 1 for diesel vehicles. The center looks spacious enough with good infrastructure, appropriate services and adequate greenery. There was adequate queuing space for the vehicles and no conflict with center parking areas could be seen as the center had adequate space and separate boundary. The vehicles did not directly enter to the queuing lanes from the adjacent roads.

There were proper sign boars inside and outside the testing center with proper indication of petrol/diesel testing lanes. Sign boards indicating the voltage and other safety concerns have also been duly maintained.

### 5.1.2 Equipments Used

The center possessed following equipments to carry out the emission testing:

**Table 5.1.2 : Equipments used in a typical VET center**

| S. No. | Equipment | Model | Purpose |
|---|---|---|---|
| 1 | Gas analyzer | Infragas 196 | For Petrol Vehicles |
| 2 | RPM meter | RPM sensor | For both |
| 3 | Opacity (Smoke) Meter | PUMA OPA 105 | For diesel vehicles |

Apart from these, basic emission testing equipments; the center has also an integrated software, which is designed by the company; as per the RFP document. This software has been mentioned in the RFP document as Contractor provided data Handling System (CPDHS) and provides telecommunication capacities between center and contractor database as well as within the center.

The center also has software for automatically printing of the VET certificates; which has been pre- printed and color coded by DMT. The center also has Vehicle Identification Number (VIN) Decoding Software and cameras at specific points. Similarly, the center also has software to measure the wait time of each vehicle. All these have been mandated by the RFP document.

The center also has a temperature sensor equipments and proper backups of all the above mentioned equipments and a backup generator for power supply. The equipments have to be calibrated at least once a year as per the Measurement, units, Standards and services acts. Apart from the mandatory calibrations, the company also calibrates its equipments internally from time to time.

The system and equipments meet all applicable provisions of National Environment Regulations no 1 of 2001 and other related to NEA and Motor Traffic Act.

### 5.1.3 Staffing

The center has 6 staffs at the center; 3 technicians and 3 data loggers; 2 at each lane. Apart from them, there are additional 4 staffs for managing, administrative and security purposes. The technical staffs and security personnel were wearing uniforms and badges indicating their identification and level. The center opened from 7 in the morning till 6 in the evening, 6 days a week; except on corporate holidays.

The staff members seemed friendly to the customers and efficient.

### 5.1.4 VET Procedure

As soon as the vehicle enters the testing center, they are directed to the specific lanes on the basis of their fuel types. At each lane, the vehicles are visually tested first. During visual testing, Following criteria are noted:

- Chassis number
- Engine number
- Silencer leak
- Oil Leak
- Water Leakages
- Air Filter (if Possible)
- Fuel tank cap
- Engine oil dip stick
- Plug Top
- Fan belt
- Abnormal vibration and noises
- Operation of governor (accelerator)

If any of these observations, then the vehicle won't be subjected to emission testing. The owner will be advised to repair and maintain the failure and come for testing again. A specific "Visual Inspection" form is used for this purpose. The VIN of the pass vehicles is then entered into the Contractor provided data Handling System (CPDHS) and then allowed for emission testing.

After the visual inspection, the diesel vehicles in their respective lane are tested. The oil temperature is set around 55 °C. The diesel vehicles undergo smoke opacity test

(Snap Acceleration), with 3 pre snap acceleration test cycles and 3 measurement snap acceleration test cycles.

In case of petrol vehicles, they undergo gas analyzer test in the set temperature and RPM (2500+/-300) and CO and HC are monitored under Idle and 2500 RPM speed. During testing, the automated software is used and the technicians only have to insert the testing probe. There is an inbuilt camera which automatically takes picture of vehicle number plate during the testing. The passed and failed vehicles both are then issued their results with their emission values on the approved and color-coded pre-printed VET Certificates. The half slip of the certificate is submitted to the local authorities.

All the vehicles have to pay designated charge for the testing. Upon failure, the testing center will specific handouts for retests explaining the reason behind test failure. The service center provides free retest for the failed vehicles and is asked to visit after proper maintenance within a period of 60 days.

All the data regarding the vehicle information, previous test dates and the failure (in case of failed vehicles) are recorded in the automated software, which can by cross-checked by DMT and AirMAC officials.

It was found that the testing center was functioning as per the RFP mandates.

## 5.2 RELEVANT CHARGES FOR VEHILCE EMISSION TESTING

The necessary testing fee should be paid to the institution that conducts vehicle omission testing (All charges and taxes relevant to the test have been included).

**Table 5.2: List of Different Charges As per the Vehicle type** (Department of Motor Traffic, 2011)

| S. No | Class of Vehicle | Charges (with VAT) |
|---|---|---|
| 1 | Motor bicycle (Petrol) | 355 |
| 2 | Motor Bicycle (Diesel) | 355 |
| 3 | Three wheeler (Petrol) | 435 |

| | | |
|---|---|---|
| 4 | Three wheeler (Diesel) | 435 |
| 5 | Motor Car (Petrol) | 950 |
| 6 | Motor Car (Diesel) | 950 |
| 7 | Dual purpose vehicles / van (Petrol) | 1030 |
| 8 | Dual purpose vehicles / van (Diesel) | 1030 |
| 9 | Motor lorry (Petrol) | 1350 |
| 10 | Motor lorry (Diesel) | 1350 |
| 11 | Motor coach (Petrol) | 870 |
| 12 | Motor coach (Diesel) | 870 |
| 13 | Bus (Petrol) | 870 |
| 14 | Bus (Diesel) | 870 |
| 15 | Prime Mover (Diesel) | 1430 |

## 5.3 GENERAL GUIDELINES TO PUBLIC ON VEHILCE EMISSION TESTING PROCEDURE

Certain guidelines have been disseminated to the general public on the VET procedure in various forms. Certain modification on the VET procedure has also been declared to the public as mentioned by Department of Motor Traffic in their website. (Department of Motor Traffic, 2011) The guidelines are listed below:

- With effect from 01.02.2011, all Brand New vehicles for one year only and in issuing the revenue licence for the second year checking vehicle emission certificate is compulsory.
- Vehicles manufactured prior to 31.12.1975 have been exempted from obtaining vehicle emission certificates.
- Obtaining vehicle emission certificate to get the revenue licence is required from the first year with respect to reconditioned vehicles.
- In issuing revenue licences all agricultural land vehicles have been exempted from obtaining vehicle emission certificate.

- In issuing revenue licences for all agricultural land vehicles they have been exempted from the requirement of obtaining vehicle emission certificates. Only four wheeled agricultural tractors and hand tractors are considered as agricultural land vehicles.

- As vehicles that are run by using liquid petroleum gas have been defined as motor vehicles, they have been exempted from the requirement of obtaining vehicle emission certificate in issuing licences for such vehicles. However for vehicles that are operated using liquid petroleum gas and petrol (bi-fuel vehicles) revenue licence should be obtained. In the issue of that, vehicle emission certificate on the use of petrol should be checked.

- As vehicles run using liquid petroleum gas have been defined as motor vehicles, in issuing licences for such vehicles, it is informed that revenue licences should be issued by charging the same fee charged on petrol vehicles.

- If the owner of the vehicle confirms that the engine of a vehicle has been repaired, a receipt is issued by charging the annual revenue licence fee so that the vehicle could be run on the condition of completing 2000 kilometres forward from the number of kilometers depicted on the milometer of the vehicle or 02 months forward from the date of repair of the engine, whichever comes first. Once that condition has been met the owner of the vehicle should obtain the revenue licence by producing the vehicle emission certificate.

- In issuing the revenue licence for electrical vehicles and hybrid vehicles, they have been exempted from the requirement of obtaining the vehicle emission certificate.

- Only one revenue licence can be obtained on one vehicle emission certificate.

## 5.4 **Database Software**

Though the private companies themselves are mandated to develop the software for fixed and mobile test stations, it has been observed that ESP India has designed and developed the software for the nationwide Sri Lanka VET Program. In addition to deploying test equipment for fixed and mobile test stations, the software for fee collection, test equipment, test stations and networking for test stations was developed by ESP. (Environmental systems Production India Limited)

# 6. CHALLENGES

## 6.1 MALPRACTICES / COMPLAINTS

The introduction of the VET system is to reduce air pollution caused by vehicular emissions is no doubt commendable. However, after two years of the system being in operation, a number of public complaints from all corners of the country have been received with regard to the issuance of the VET certificates.

The main complaint is that there are touts or agents outside the Divisional Secretary offices who are prepared to get the VET certificates for the vehicle owners on the payment of a few hundred rupees more than the certificate value without even seeing the vehicle. Some vehicle owners who had claimed that their vehicles are quite new and their emission negligible, have still found their vehicles failing the test and being asked to tune up their vehicle engines and reproduce them for inspection. Another common complaint is that some vehicles which had failed the test at one centre passing the test at another centre without any work done on the vehicle. Yet another common complaint is that even after passing the test, some vehicles belch clouds of smoke, inconveniencing other motorists and pedestrians in addition to polluting the air. Some vehicle owners have complained that they do not have confidence about the accuracy of the testing equipment of some centers where their vehicles had failed the test.

Some vehicle owners also believe that the technicians who carry out the vehicle testing are not qualified or trained to get the correct readings and that as a result, vehicle owners are unnecessarily victimized.

Vehicle owners have also complained that some testing centers are not up to the required standards; that they are filthy and dusty and that it is doubtful if they would issue a valid certificate to the customers. Likewise, there have been a large number of

different complaints made by vehicle owners with regard to the process of obtaining VET certificates.

These were some of the challenges the VET framework has regarding the customer and service centers.

## 6.2 TECHNICAL ASPECTS

But if we look at the Technical side of the VET program, the testing procedure "Snap Idle test" itself has many limitations. The rapid acceleration under no load; which is the operating condition doesn't resemble the actual operating condition involved in normal driving condition. The test consists of 3 pre-snap acceleration test cycles which are average to get the final result. The maximum deviation between these three measurements should not be significant to accept the measurements as correct. In practical situation, with excising instrumentation it is found that the measurements are significantly affected by the slow- snapping of accelerating paddle and not reaching the maximum rpm of the engine during the test cycle by the instrument operator which is not complying with the standard.

The emission standards are too wide. They need to be tightened. Even during testing, there were many instances when many polluting vehicles had to be given a pass certificates because, though they were polluting, the emissions were within the standards.

Also, there seems to be high bureaucracy prevalent in the VET framework. For instance, AirMAC had carried out the spotter test on the month of November and submitted the reports to DMT but DMT initiated correspondence (or writing legal letters to the polluting vehicle owner) only in the month of February. A whole 3 months time period was lost idle in between. Further, the DMT organized Emission testing only in the month of March. This might indicate the loss of time because of bureaucratic process and definitely will affect the effectiveness of the program.

Similarly, AirMAC had earlier done research on revising the K-Factor values as per the strategy, immediately after 3 years of VET Program implementation. But the revision of the emission standards has not yet been done. (Weerasooriya, 2012)The

gazette itself has set target years and values for revision of standards and still with the proper research and proposal of new standards, the inability to revise standards highlight certain bureaucratic friction between related departments.

It has been observed that these repair centers are also widely involved in malpractices. Time and again, they have offered the drivers with low-cost adjustments to the engine, instead of proper maintenance of the vehicles so as to pass the emission testing and get the certificates. Such practices result in more vehicular emissions despite high pass percentage of vehicles in VET centers.

Similarly, the Air quality monitoring Stations are also not in function. Without the proper and consistent monitoring of Air quality, it is difficult to assess the actual effectiveness of the VET in Air quality management.

# 7. RECOMMENDATIONS

## 7.1 TECHNICAL IMPROVEMENTS

### 7.1.1 Revision of Emission Standards

- Priority: High
- Stakeholders Involved: Central environmental authority, AirMAC, DMT and Research Institutions

  The standards need to be revised and made more stringent. But while revising the standards, it should also be noted that the percent failure rate should be acceptable; not more than 20%.

  If we take a look at the study conducted by the AirMAC with a formation of stakeholder committee, to revise the standards it has been found that in case of petrol vehicles, with following parameters constant, following failure rates were observed (Weerasooriya, 2012):

  **Table 7.1.1.1 : Observed Failure Rates In Vehicles** (Weerasooriya, 2012)

| Vehicle Class | 9000 HC CO6 | 6000 HC CO4 |
|---|---|---|
| Petrol motor Tricycles | 8.58 | 31.19 |
| Tricycle | 6.8 | 26.56 |
| Motor tricycles | 17.26 | 39.62 |

  Similarly, in terms of other vehicles, following failure rates were observed at following emission values:

  **Table 7.1.1.2 : Observed Failure rates In Different Vehicles** (Weerasooriya, 2012)

| Vehicle Class | 1200HC CO4.5 | 1000 HC CO 3 |
|---|---|---|
| Dual purpose Vehicle | 23.84 | 41.0 |
| Bus | 28.92 | 39.76 |
| Van | 10.19 | 97.39 |
| Motor car | 13.6 | 19.62 |

| | | |
|---|---|---|
| Motor lorry | 16.76 | 86.35 |
| Motor Coach | 30.89 | 26.95 |

In case of diesel vehicles, following failure rates were observed at following k-factors:

**Table 7.1.1.3 : Observed Failure rates at different K values** (Weerasooriya, 2012)

| Vehicle Class | K factor 8 difference 1 | K factor 4 difference 1 |
|---|---|---|
| Dual purpose vehicle | 10.42 | 11.28 |
| Tri cycle | 23.56 | 24.52 |
| Land Vehicle | 14.45 | 14.94 |
| Motor Lorry (Prime Mover) | 10.28 | 10.94 |
| Motor lorry | 10.02 | 10.62 |
| Bus | 10.3 | 10.91 |
| Motor car | 11.18 | 12.13 |
| Motor cycle | 7.69 | 7.69 |
| Total | 10.45 | 11.20 |

It can be observed from the above studies that when the k factor is strengthened to 4, the failure rate in slightly increased but is still below the permissible 20%. Hence, it would be appropriate to revise the diesel emission standard and make the standards more stringent.

However in case of petrol vehicle, when standards were restricted, majority of vehicle types showed failure rates higher than 20%. This needs to be properly considered as it is not wise to enforce strict emission standards when vehicles are highly failing to meet them. Hence, in case of petrol vehicle, strategic steps should be taken before revising the standards.

### 7.1.2 Snap Acceleration Test Methodology Revision

- Priority: High
- Stakeholders Involved: Central environmental authority, AirMAC, DMT and Research Institutions

As mentioned in the challenges section before, the snap- idle testing condition does not resemble the actual driving condition. The Snap-Idle test methodology needs to be revised or re considered. By identifying the correct snap acceleration, the snap acceleration test can be improved. (Perera, 2012)

### 7.1.3 Consistent Air Quality Monitoring

- Priority: High
- Stakeholders Involved: Central environmental authority and Research Institutions

It can be observed that the Air quality monitoring activities which was initially functioning in Colombo area hasn't been properly functioning. To assess the improvement in Air quality scenario, proper and consistent monitoring has to be done in Colombo area and throughout the country as well. This will also help set the targets to reduce vehicle emissions and consequently revise vehicle policies and emission standards.

## 7.2 POLICY CHANGES

### 7.2.1 Introduction of Stronger Anti- Corruption Policies

- Priority: Medium
- Stakeholders Involved: AirMAC, DMT , Transparency Organizations

The anti corruption policies and strategies need to be strengthened and malpractices should be discouraged and punished.

### 7.2.2 More inspection power to the Traffic police Division

- Priority: High
- Stakeholders Involved: DMT , Traffic police Division

The traffic police division is a major stakeholder and implementer when it comes to road enforcement and monitoring. Since, they are present in almost every road stretch; the traffic police should also have an authority to enforce punishment over a polluting vehicle upon spotting it randomly on the road. This would also dramatically help in

reducing emissions and keeping malpractices in check. For instance: a motorist might acquire emission certificate by maladjustments to the engine but if traffic police can issue warning or a definite punishment to the motorist, then he will have to maintain the vehicle and the emissions get controlled. This wouldn't require any independent program as traffic police are already mandated to inspect motorist behavior and manage traffic on the road.

### 7.2.3 Inspection and capacity building of the Vehicle Service Centers (Garage):

The repair centers are found to have almost been neglected in the VET program. Since, they handle the maintenance aspect of the Vehicle Testing Program, they should be properly trained in this aspect. Similarly, they are also one of the major group where malpractices are dominant, there should be a proper legal framework to inspect and monitor these repair centers as well.

## 7.3 REGULATORY NEEDS

### 7.3.1 Control of Bureaucracy In The VET Procedure

- Priority: High
- Stakeholders Involved: Consortium bodies like AirMAC, DMT and all other institutions

The bureaucracy within the institutions has to be addressed in order to make the program more effective.

### 7.3.2 Proper Awareness At Grass Root Level

- Priority: Medium
- Stakeholders Involved: National media, television and news papers; Ministry of Communication , AirMAC, DMT, CEA

The Vehicle Emission Testing, from a motorist's perspective, seems to be focused only on the issuance of annual renewal certificate. Though it does give a sense of compulsion, it doesn't give the sense of responsibility to the general public. The major objective of any VET program is ultimately to maintain Air quality and

maintain public health. This idea should be properly percolated to the general public. More Mass Awareness campaigns is needed so that the public can understand the importance of clean air, get concerned to maintain vehicles themselves so that the test failure percentage is reduced. If the public are encouraged to maintain their vehicles and are made aware of the benefits of a healthy vehicle from their economical perspective, the VET program will take effective direction.

### 7.3.3 More Frequent Inspection Program

- Priority: High
- Stakeholders Involved: Central environmental authority, AirMAC, DMT

  It has been observed that spotter program is done at the maximum of twice a year and the roadside emission testing is also not done as frequently as needed. For effective regulation of the VET program, the SVSP inspection and Roadside Emission testing should have a wider outreach i.e. should be carried out in many places frequently. For this, adequate manpower and resources have to be allocated.

### 7.3.4 Induction of Competitive Enterprising

- Priority: Medium
- Stakeholders Involved: Central environmental authority, AirMAC, DMT, media and Implementing Enterprises

  Competition helps to improve the performance and assures better quality of services. Since, there are two firms involved here; competition can be encouraged by making awards based on the performance of these two VET implementing enterprises.

### 7.3.5 Publication of Vehicle Maintenance Tips

There should be proper dissemination of the knowledge on vehicle maintenance. For this, the VET program could fund the publication of small leaflets of booklets for general vehicle maintenance tips. These tips could be distributed to the drivers during their annual tests or disseminated through petrol pumps or repair centers.

## 7.4 FINANCIAL REMODELLING

### 7.4.1 VET Fund

- Priority: High
- Stakeholders Involved: Central environmental authority, AirMAC, DMT and Ministry of Finance

  Within the total revenue collected by the Vehicle Emission Testing Program, government is entitled to 10% of the revenue. It is known as VET trust Fund. It is used to maintain the VET Project office in Department of Motor Traffic and also on the monitoring and evaluation activities as well as for various technical reformations in the framework. It is mandated that the VET fund should also be used in air quality management activities. Hence, it is highly recommended that this fund be used strategically to implement overall vehicle emission reduction activity along with I/M program.

### 7.4.2 Restructuring of Inspection fees

- Priority: medium
- Stakeholders Involved: Central environmental authority, AirMAC, DMT, ministry of Finance

  Provide for appropriate inflation-indexing or wage-indexing of inspection fees. These are costs not under the control of the firm.

### 7.4.3 Introduction of Monetary Punishment System

- Priority: High
- Stakeholders Involved: Traffic police division

  As mentioned earlier, there is an urgent need to involve the monetary fining system in the VET framework. If enforced, it will concern the polluting drivers to maintain their vehicles and in case of non-compliance it will add more to the VET fund, which can be used to strategically create massive awareness and research activities. The penalty amount should be more than the inspection fees, at least double the fees.

# REFERENCES


(CEA) Central Environmental Auuthority, M. o. (2003, 6 30). The Gazette of Democratic Socialist Republic of Sri Lanka. Sri Lanka.

AirMAC. (2012, 5 1). AirMAC VET Database. Sri Lanka.

AirMAC. (2010). *Smoky Vehicle Spotter Program- Keynotes for Spotting.* AirMAC.

AirMAC. (2004). *Urban Air Quality management in Sri Lanka.* World Bank.

Bulankulama and six others v. Secretary, Ministry of Industrial development and seven others, , 884/99 (SC 1999).

Cleanco. (n.d.). *Drivegreen*. Retrieved 4 2012, from http://www.drivegreen.lk

Department of Motor Traffic. (n.d.). Motor Traffic Act . Sri Lanka: Comissioner of Motor Traffic.

Department of Motor Traffic. (2003). *Request for Proposals For the Establishment of Vehicle Testing Centers for issue of Vehicle Emission Certificates.* Vehicle Emission Control Cell, AirMAC.

Department of Motor Traffic. (2011, August 3). *Vehicle Emission Testing*. Retrieved April 2012, from Department Of Motor Traffic: http://www.motortraffic.gov.lk/web/index.php?option=com_content&view=article&id=123&Itemid=149&lang=en

*Environmental systems Production India Limited*. (n.d.). Retrieved 4 15, 2012, from ESP india: http://www.esp-global.com/en_US/ETP/India

Homagama Pradeshiya Sabha(1998)2, G. v. (n.d.). *Sri Lankan law Report.* Retrieved 4 2012, from Lawnet: http://www.lawnet.lk/docs/case_law/slr/HTML/1998SLR2V11.htm

Laugfs. (n.d.). Retrieved 4 2012, from http://laugfs.lk//page/ecosri.html

National Environmental (Amendment) Act. (2000, 08 18). Sri Lanka: Parliament of CDemocratic Socialist Republic of Sri Lanka.

National Environmental Act. (1980). *Gazette Extraordinary* . Sri Lanka: Ministry of Environment, Government of Sri Lanka.

Perera, R. (2012). Improving the Implementation of Snap Acceleration Test Procedure by automatic Identification of Correct Snap Acceleration. *"Air That We Breathe" 5th National Symposium on Air Resource Management in Sri Lanka- research abstracts* (p. 15). Taj hotel, Colombo: AirMAC.

R.N.R.Jayaratne. (2012, 5). Sri Lanka VET Analysis. (K. Shrestha, Interviewer)

Samarakoddy, R. (2012). Stakeholder survey in AQM in Sri Lanka. (K. Shrestha, Interviewer)

The Constitution of the DRSL and The Thirteenth Amendment.

USAID. (2004). *Vehicle Inspection and Maintenance Programs: International Experience and Best Practices.* USAID.

Weerasooriya, R. (2012, April). Sri Lanka VET Analysis. (K. Shrestha, Interviewer)

WIJEYEKOON, J. (2011, November 27). *Features*. Retrieved April 3, 2011, from Sunday Observer: http://www.sundayobserver.lk/2011/11/27/fea11.asp

World Bank and UNDP. (1989). *Metropolitan environment Improvement Program.*

# ANNEXES:

1. NEW VET CENTER ACCREDITION FORM

**Report of Inspection and Monitoring of Vehicle Emission Testing Centers – By VET Monitoring Unit**

**Date:** …… **Time:** …….. **District:**……..……..

**Company:** CleanCo / Laugfs **Location:** ……... **Province:**……..……...

**Type of Center:** Fixed / Semi Fixed / Mobile

- **Details of staff:**

| Name | NIC No. | Designation | Educational Qualification | Professional Qualification |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

- **Calibration Reports :**

| Type of Instruments | Serial No | MUSSD Last Calibration date | Company Last Calibration date | Leak Test |
|---|---|---|---|---|
| Gas Analyzers | | | | Pass/ Fail |
| GA Backup | | | | Pass/ Fail |
| Opacity(Smoke) Meter | | | | Pass/ Fail |
| SM Backup | | | | Pass/ Fail |
| RPM Meter | | | | |
| RPM Backup | | | | |

**RPM sensor** **- in good order / at time defective / out of order**

**Temperature probe /sensor** **- in good order / at time defective / out of order**

**Backups**

| | | |
|---|---|---|
| **RPM sensors** | Yes/No | |
| **Temperature probes /sensors** | Yes/No | |
| **Sufficient spare parts** | Yes/No | |

- **Number of test conducted previous working day: ……..**
- **Number of test Conducted on the Inspection day up to this time: ……**

1

| REP ref under Scope of work & No | RFP Guidelines/Recommendations | | Remarks |
|---|---|---|---|
| 2.1.2 - 2.1.2.1 Page 3 | **1. Adjacent Land use** | | |
| | i. Religious place | Yes/No | |
| | ii. School | Yes/No | |
| | iii. Hospital | Yes/No | |
| | iv. Park | Yes/No | |
| | v. Residential | Yes/No | |
| ( 2.2.5- 2.2.5.2) Page 6 | **2. Queue handling** | | |
| | i. Having adequate queuing space for vehicle | Yes/No | |
| | ii. Testing lanes overflow on to an adjacent street | Yes/No | |
| | iii. Testing lanes conflict with center parking areas | Yes/No | |
| | iv. Queuing space : Long - Width - | | |
| | v. Vehicle directly enter to the queuing lanes from adjacent roads | Yes/No | |
| | vi. Number of vehicle in the queue | Yes/No | |
| (3.1.21.1) Page 23 | **3. Customer relations** | | |
| | i. Average waiting time | Yes/No | |
| | ii. Customer relations | | V. Good / Good / Fair / Bad / V. Bad |
| (2.2.8) Page 6 | **4. Landscape** | | |
| | i. Suitable ground cover in the testing bay | Yes/No | Tar / Cement / Concrete / Soil |
| | ii. Landscaping with turf, trees/shrubs & other plantings | Yes/No | |
| (2.2.9) Page 6 | **5. Permanent illuminated testing center sign boards** | | |
| | i. Availability of the center sign boards | Yes/No | |
| | ii. Visibility of sign boards | Yes/No | |
| | iii. visibility of the sign and direction boards for identification from both sides and petrol /diesel testing lanes | Yes/No | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **(2.4.13 - 2.4.13.3) Page 14** | **6. Identification of staff & their level** | | | | | |
| | i. Identification for different staff levels - uniforms | | Yes/No | | | |
| | ii. Wearing Identity Cards/Name tags | | Yes/No | | | |
| **5.2.2 - 5.2.3 Page 31** | **7. Providing information to each motorist by inspector** | | | | | |
| | i. Provide first test failure handout | | Yes/No | | | |
| | ii. Provide retest failure handout | | Yes/No | | | |
| | iii. Presence of first failure handout | | Yes/No | | | |
| **2.2.13.2 Page 7** | **8. Availability of CO monitor** | | Yes/No | | | |
| **2.2.15 Page 8** | **9. Protection of workers** | **Mask** | Yes/No | **Use** | **Not use** | |
| | | **Gloves** | Yes/No | **Use** | **Not use** | |
| | **10. Protection of customers property** | | Yes/No | | | |
| **2.2.17 Page 8** | **11. Availability of customer waiting areas** | | | | | |
| | i. Sitting area | | Yes/No | | | |
| | ii. Wash room/ Toilets | | Yes/No | | | |
| **2.3.3 Page 10** | **12. Equipment maintenance** | | | | | |
| | i. Availability of inventory of spare parts / equipment check list | | Yes/No | | | |
| | ii. Availability of calibration gasses for testing centers | | Yes/No | | | |
| **2.4.2.3 Page 10** | **13. Equipment failures, repairs or replacement activities during business hours** | | Yes/No | | | |
| **2.4.4.2 Page 11** | **14. Smoking by employee & motorists** | | Yes/No | | | |
| **2.4.15.2 Page 14** | **15.** i. Presence of forms / Book for the motorists to register complains | | Yes/No | | | |
| **1.1.8 Page 1** | ii. Quality of customer service-damage claims/assistance /information & all others | | Yes/No | | | |
| **1.1.7 Page 1 2.2.2.7 Page 6** | **16. Having waste disposal mechanism** | | Yes/No | | | |

| | | | |
|---|---|---|---|
| 2.5.5 Page 17 | **17. Visual inspection** - Checking for | | |
| | Chassis number | Yes/No | |
| | Engine number | Yes/No | |
| | Silencer leak | Yes/No | |
| | Oil leak | Yes/No | |
| | Water leakages | Yes/No | |
| | Air filter (If possible) | Yes/No | |
| | Fuel tank cap | Yes/No | |
| | Engine oil dip stick | Yes/No | |
| | Plug top | Yes/No | |
| | Fan belt | Yes/No | |
| | Abnormal vibration and noises | Yes/No | |
| | Operation of governor | Yes/No | |
| | **18. Testing procedure**<br>**For Diesel vehicle** | | |
| | Set RPM sensor | Yes/No | |
| | Set Oil temperature sensor (55ºC) | Yes/No | |
| | Maximum RPM - 3 flush | Yes/No | |
| | Proper insertion of the testing probe | Yes/No | |
| | Maximum RPM - 3 Snap | Yes/No | |
| | **For petrol vehicle**<br>Set Oil temperature sensor | Yes/No | |
| | Set RPM sensor | Yes/No | |
| | Proper insertion of the testing probe | Yes/No | |
| | Test For RPM 2500 ± 300 | Yes/No | |
| | Idle test | Yes/No | |
| | i. Involvement of outside people for testing | Yes/No | |
| | ii. Attending repairs at the testing center | Yes/No | |
| | | | |

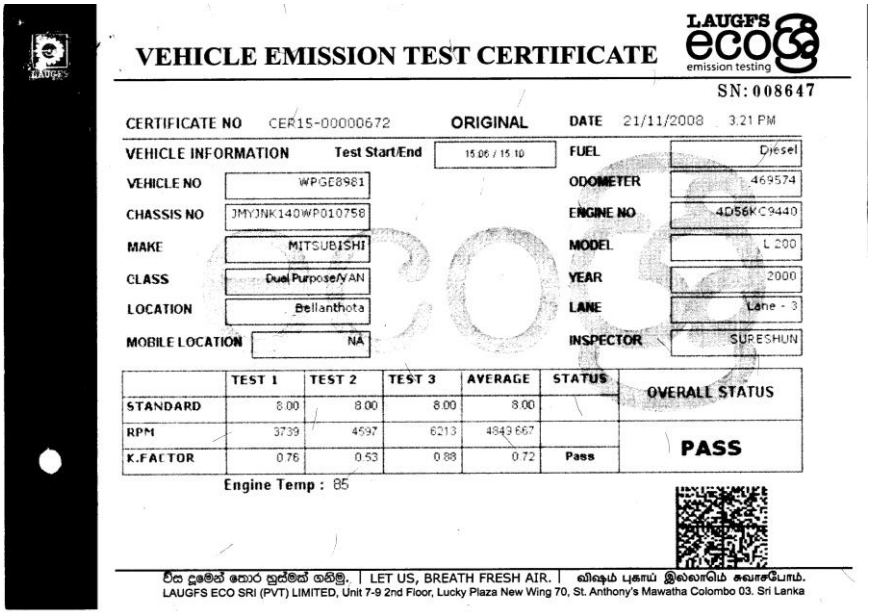
4

| | | | |
|---|---|---|---|
| **2.6.1. Page 18** | **19. VET Certificate** | | |
| | i. Serial No | Yes/No | |
| | ii Accuracy | | Good / Bad |
| **2.6.1.2. Page 18** | a. errors | Yes/No | |
| | b. Adjustment photos | Yes/No | |
| | c. Clarity | Yes/No | |
| | **20. Availability of generator** | Yes/No | |
| | **21. Details of tests conducted during the inspection time period** | | |
| | **22. Customer observations** | | |
| | **23. Other observations** | | |
| | **24. Recommendations/Remarks** | | |

Center Inspection Format ver-4

5

2. LAUGFS VEHILE EMISSION TESTING CERTIFICATE SAMPLE



**VEHICLE EMISSION TEST CERTIFICATE**

LAUGFS eco emission testing

SN: 008647

CERTIFICATE NO CER15-00000672 ORIGINAL DATE 21/11/2008 3.21 PM

VEHICLE INFORMATION Test Start/End 15:06 / 15:10

| | | | |
|---|---|---|---|
| VEHICLE NO | WPGE8981 | FUEL | Diesel |
| CHASSIS NO | JMYJNK140WP010758 | ODOMETER | 469574 |
| MAKE | MITSUBISHI | ENGINE NO | 4D56KC9440 |
| CLASS | Dual Purpose/VAN | MODEL | L 200 |
| LOCATION | Bellanthota | YEAR | 2000 |
| MOBILE LOCATION | NA | LANE | Lane - 3 |
| | | INSPECTOR | SURESHUN |

| | TEST 1 | TEST 2 | TEST 3 | AVERAGE | STATUS | OVERALL STATUS |
|---|---|---|---|---|---|---|
| STANDARD | 8.00 | 8.00 | 8.00 | 8.00 | | |
| RPM | 3739 | 4697 | 6213 | 4849.667 | | PASS |
| K.FACTOR | 0.76 | 0.53 | 0.88 | 0.72 | Pass | |

Engine Temp : 85

වීස දූමෙන් තොර සුස්මක් ගනිමු. | LET US, BREATH FRESH AIR. | விஷம் புகாய் இலவாமெ சுவாசபோம்.

LAUGFS ECO SRI (PVT) LIMITED, Unit 7-9 2nd Floor, Lucky Plaza New Wing 70, St. Anthony's Mawatha Colombo 03. Sri Lanka

3. CLEANCO VEHICLE EMISSION TESTING CERTIFICATE SAMPLE

drive

Serial No: 009591

So we can all breathe easier

CleanCo Lanka (Pvt) Ltd.

334, T. B. Jayah Mawatha, Colombo 10.

(011) 744 44 44

**VEHICLE EMISSIONS INSPECTION CERTIFICATE**

| Make | Model | Month | Year | Vehicle Type | Eng.Comp. |
|---|---|---|---|---|---|
| MITSUBISHI | 2CAB | Jan | 2000 | Motor Car (Diesel) | WEF 01-07-03 |
| **TestType** | **TestFee** | **Receipt Num.** | **Odometer** | **VIN** | **Reg. Num.** |
| Initial | 759.00 | ST001221110800822 | 469564 | JMYJNK140WP010758 | GE8981 |

INSPECTOR INFORMATION

| Station | Lane | Technician | Date | Start Time | End Time |
|---|---|---|---|---|---|
| 12 | 3 | EI0089 | 21/11/2008 | 13:57 | 14:10 |

Signature

**Diesel Snap Test Report**

| | |
|---|---|
| Pass Limit -K (1/m) | 8.00 |
| Measured Oil Temperature (°C) | 71.00 |
| Vehicle Power (BHP) | n/a |
| Standard EOPL (mm) | 45 |

**Snap Data**

| Snap Number | Measured Opacity (%) | Standard Opacity (%) | Smoke Density (K) | Measured RPM |
|---|---|---|---|---|
| 1 | 27.7 | 3.94 | 0.89 | 3739 |
| 2 | 32.1 | 4.67 | 1.06 | 3684 |
| 3 | 22.4 | 3.09 | 0.7 | 3720 |

**Average**

| Standard Opacity (%) | Smoke Density (K) | Result |
|---|---|---|
| 3.9 | 0.883 | PASS |

**Visual Inspection Report**

| | |
|---|---|
| Gas Cap | Satisfactory |

| Vehicle Plate Image | Vehicle Information |
|---|---|
| No Vehicle Image | |

**Inspection Certificate**

Inspector No.: EI0089
Receipt No.: ST001221110800822
Registration No.: GE8981
Year: 2000
Make: MITSUBISHI Odometer:469564
Date: 21/11/2008 Exp. Date:21/11/2009

Please remove this portion and include it with your renewal card and registration payment.

PASS

: Result is Fail,Reasons for failuers.

.Average opacity (K) exceeded the limits. 2.The difference between highest and lowest snap reading exceeded limits (10(%) or 1(K)).

4. SAMPLE OF THE FORMS USED IN EMISSION TESTING OF SPOTTED VEHICLES

| # | VIN | Checking of participation ✓ / × | Last Tested Date | Company Name | Location of Center | Test Data - Diesel | | | Result | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Opacity | K Factor | RPM | | |
| 1 | GK-5030 | | | | | | | | | |

5. SAMPLE OF FORM USED IN INSPECTION AND MONITORING OF VEHICLE EMISSION TESTING CENTER

**Report of Inspection and Monitoring of Vehicle Emission Testing Centers – By VET Monitoring Unit**

**Date:** …… **Time:** …….. **District:**……..……..

**Company:** CleanCo / Laugfs **Location:** ……... **Province:**……..……...

**Type of Center:** Fixed / Semi Fixed / Mobile

- **Details of staff:**

| Name | NIC No. | Designation | Educational Qualification | Professional Qualification |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

- **Calibration Reports :**

| Type of Instruments | Serial No | MUSSD Last Calibration date | Company Last Calibration date | Leak Test |
|---|---|---|---|---|
| Gas Analyzers | | | | Pass/ Fail |
| GA Backup | | | | Pass/ Fail |
| Opacity(Smoke) Meter | | | | Pass/ Fail |
| SM Backup | | | | Pass/ Fail |
| RPM Meter | | | | |
| RPM Backup | | | | |

**RPM sensor** **- in good order / at time defective / out of order**

**Temperature probe /sensor** **- in good order / at time defective / out of order**

**Backups**

| | | |
|---|---|---|
| **RPM sensors** | Yes/No | |
| **Temperature probes /sensors** | Yes/No | |
| **Sufficient spare parts** | Yes/No | |

- **Number of test conducted previous working day: ……..**
- **Number of test Conducted on the Inspection day up to this time: ……**

1

| REP ref under Scope of work & No | RFP Guidelines/Recommendations | | Remarks |
|---|---|---|---|
| 2.1.2 - 2.1.2.1 Page 3 | **1. Adjacent Land use** | | |
| | i. Religious place | Yes/No | |
| | ii. School | Yes/No | |
| | iii. Hospital | Yes/No | |
| | iv. Park | Yes/No | |
| | v. Residential | Yes/No | |
| ( 2.2.5- 2.2.5.2) Page 6 | **2. Queue handling** | | |
| | i. Having adequate queuing space for vehicle | Yes/No | |
| | ii. Testing lanes overflow on to an adjacent street | Yes/No | |
| | iii. Testing lanes conflict with center parking areas | Yes/No | |
| | iv. Queuing space : Long - Width - | | |
| | v. Vehicle directly enter to the queuing lanes from adjacent roads | Yes/No | |
| | vi. Number of vehicle in the queue | Yes/No | |
| (3.1.21.1) Page 23 | **3. Customer relations** | | |
| | i. Average waiting time | Yes/No | |
| | ii. Customer relations | | V. Good / Good / Fair / Bad / V. Bad |
| (2.2.8) Page 6 | **4. Landscape** | | |
| | i. Suitable ground cover in the testing bay | Yes/No | Tar / Cement / Concrete / Soil |
| | ii. Landscaping with turf, trees/shrubs & other plantings | Yes/No | |
| (2.2.9) Page 6 | **5. Permanent illuminated testing center sign boards** | | |
| | i. Availability of the center sign boards | Yes/No | |
| | ii. Visibility of sign boards | Yes/No | |
| | iii. visibility of the sign and direction boards for identification from both sides and petrol /diesel testing lanes | Yes/No | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **(2.4.13 - 2.4.13.3) Page 14** | **6. Identification of staff & their level** | | | | | |
| | i. Identification for different staff levels - uniforms | | Yes/No | | | |
| | ii. Wearing Identity Cards/Name tags | | Yes/No | | | |
| **5.2.2 - 5.2.3 Page 31** | **7. Providing information to each motorist by inspector** | | | | | |
| | i. Provide first test failure handout | | Yes/No | | | |
| | ii. Provide retest failure handout | | Yes/No | | | |
| | iii. Presence of first failure handout | | Yes/No | | | |
| **2.2.13.2 Page 7** | **8. Availability of CO monitor** | | Yes/No | | | |
| **2.2.15 Page 8** | **9. Protection of workers** | **Mask** | Yes/No | **Use** | **Not use** | |
| | | **Gloves** | Yes/No | **Use** | **Not use** | |
| | **10. Protection of customers property** | | Yes/No | | | |
| **2.2.17 Page 8** | **11. Availability of customer waiting areas** | | | | | |
| | i. Sitting area | | Yes/No | | | |
| | ii. Wash room/ Toilets | | Yes/No | | | |
| **2.3.3 Page 10** | **12. Equipment maintenance** | | | | | |
| | i. Availability of inventory of spare parts / equipment check list | | Yes/No | | | |
| | ii. Availability of calibration gasses for testing centers | | Yes/No | | | |
| **2.4.2.3 Page 10** | **13. Equipment failures, repairs or replacement activities during business hours** | | Yes/No | | | |
| **2.4.4.2 Page 11** | **14. Smoking by employee & motorists** | | Yes/No | | | |
| **2.4.15.2 Page 14** | **15.** i. Presence of forms / Book for the motorists to register complains | | Yes/No | | | |
| **1.1.8 Page 1** | ii. Quality of customer service-damage claims/assistance /information & all others | | Yes/No | | | |
| **1.1.7 Page 1 2.2.2.7 Page 6** | **16. Having waste disposal mechanism** | | Yes/No | | | |

| | | | |
|---|---|---|---|
| 2.5.5 Page 17 | **17. Visual inspection - Checking for** | | |
| | Chassis number | Yes/No | |
| | Engine number | Yes/No | |
| | Silencer leak | Yes/No | |
| | Oil leak | Yes/No | |
| | Water leakages | Yes/No | |
| | Air filter (If possible) | Yes/No | |
| | Fuel tank cap | Yes/No | |
| | Engine oil dip stick | Yes/No | |
| | Plug top | Yes/No | |
| | Fan belt | Yes/No | |
| | Abnormal vibration and noises | Yes/No | |
| | Operation of governor | Yes/No | |
| | **18. Testing procedure For Diesel vehicle** | | |
| | Set RPM sensor | Yes/No | |
| | Set Oil temperature sensor (55°C) | Yes/No | |
| | Maximum RPM - 3 flush | Yes/No | |
| | Proper insertion of the testing probe | Yes/No | |
| | Maximum RPM - 3 Snap | Yes/No | |
| | **For petrol vehicle** Set Oil temperature sensor | Yes/No | |
| | Set RPM sensor | Yes/No | |
| | Proper insertion of the testing probe | Yes/No | |
| | Test For RPM 2500 ± 300 | Yes/No | |
| | Idle test | Yes/No | |
| | i. Involvement of outside people for testing | Yes/No | |
| | ii. Attending repairs at the testing center | Yes/No | |
| | | | |

| | | | |
|---|---|---|---|
| **2.6.1. Page 18** | **19. VET Certificate** | | |
| | i. Serial No | Yes/No | |
| | ii Accuracy | | Good / Bad |
| **2.6.1.2. Page 18** | a. errors | Yes/No | |
| | b. Adjustment photos | Yes/No | |
| | c. Clarity | Yes/No | |
| | **20. Availability of generator** | Yes/No | |
| | **21. Details of tests conducted during the inspection time period** | | |
| | **22. Customer observations** | | |
| | **23. Other observations** | | |
| | **24. Recommendations/Remarks** | | |

Center Inspection Format ver-4

6. SAMPLE FORM OF SPOTTER PROGRAM

# SPOTTER PROGRAMME

**Department of Motor Traffic** **Air Resource Management Centre**

## Vehicle Emission Test Certificate

**VIN**
**Location:** Department of Motor Traffic, Werahera

**Date:**
**ODO Meter:**

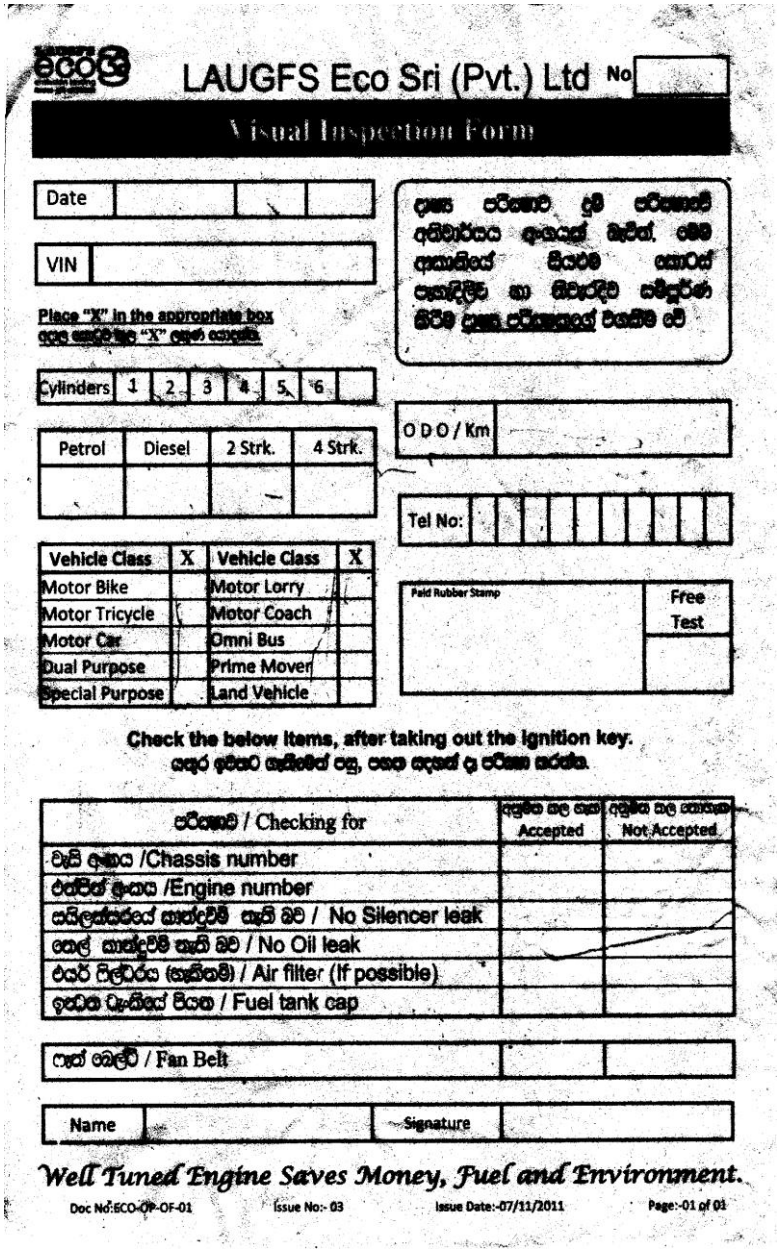
| | Test - 1 | Test - 2 | Test - 3 | Avg. | Status | Overall Status |
|---|---|---|---|---|---|---|
| **Standard** | 8.00 | 8.00 | 8.00 | 8.00 | | |
| **RPM** | Max. | Max. | Max. | | | |
| **Opacity %** | | | | | | |
| **K Factor** | | | | | | |

* This Certificate cannot use for obtain the Revenue License

*Certified by:*
Examiner
Sri Lanka VET Programme
Department of Motor Traffic

*Certified by:*
Air Resource Management Center
Ministry of Environment

7. VEHICLE VISUAL INSPECTION SAMPLE (LAUGFS)



LAUGFS Eco Sri (Pvt.) Ltd No

Visual Inspection Form

Date

VIN

Place "X" in the appropriate box

Cylinders 1 2 3 4 5 6

| Petrol | Diesel | 2 Strk. | 4 Strk. |
|---|---|---|---|
| | | | |

| Vehicle Class | X | Vehicle Class | X |
|---|---|---|---|
| Motor Bike | | Motor Lorry | |
| Motor Tricycle | | Motor Coach | |
| Motor Car | | Omni Bus | |
| Dual Purpose | | Prime Mover | |
| Special Purpose | | Land Vehicle | |

ODO / Km

Tel No:

Paid Rubber Stamp

Free Test

Check the below items, after taking out the ignition key.

| පරීක්ෂාව / Checking for | Accepted | Not Accepted |
|---|---|---|
| චැසි අංකය /Chassis number | | |
| එන්ජින් අංකය /Engine number | | |
| සයිලන්සරයේ කාන්දුවීම් නැති බව / No Silencer leak | | |
| තෙල් කාන්දුවීම් නැති බව / No Oil leak | | |
| එයර් පිලිටරය (හැකිනම්) / Air filter (If possible) | | |
| ඉන්ධන පැනීයේ පියන / Fuel tank cap | | |
| ෆෑන් පෙළිය / Fan Belt | | |

Name Signature

*Well Tuned Engine Saves Money, Fuel and Environment.*

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8. SAMPLE OF SMOKY VEHICLE REPORT FROM BY EMISSION SPOTTER

Air Resource Management Center
Ministry of Environment

## SMOKY VEHICLE REPORT FORM BY EMISSION SPOTTER

**REGISTRATION MARK**

**CLASS OF VEHICLE**

1. ☐ BUS
2. ☐ DUAL PURPOSE VEHICLE
3. ☐ LIGHT LAND VEHICLE
4. ☐ MOTOR CAR
5. ☐ MOTOR COACH
6. ☐ MOTOR LORRY
7. ☐ MOTOR TRYCYCLE
8. ☐ PRIME MOVERS
9. ☐ MOTOR CYCLE
10. ☐ ----------

**COLOUR**

1. ☐ RED
2. ☐ YELLOW
3. ☐ ORANGE
4. ☐ GREY
5. ☐ GREEN
6. ☐ BLUE
7. ☐ WHITE
8. ☐ BROWN
9. ☐ BLACK
10. ☐ GLOD
11. ☐ SILVER
12. ☐ _____

**BODY TYPE/ VEHICLE TYPE**

1. ☐ 2- AXLES GOODS VEHICLE
2. ☐ 3- AXLES GOODS VEHICLE
3. ☐ 4- AXLES GOODS VEHICLE
4. ☐ TRACTOR
5. ☐ ENCLOSED GOODS COMPARTMENT
6. ☐ OPEN GOODS COMPARTMENT (Include canvas curtained)
7. ☐ CONSTRUCTION SITE TIPPER
8. ☐ CTB/ PRIVATE BUS
9. ☐ WITH REAR GOODS UNLOADER
10. ☐ CONCRETE MIXER
11. ☐ BOWSER
12. ☐ 4STK/2STK/DIESEL 3 WHEELER

(supplementary information, please provide if possible) ----------

DATE OF SPOTTING (dd/mm/yyyy) _____ TIME (24 hrs) _____

LOCATION _____

SPOTTER NO: _____ NAME _____ SIGNATURE _____

_____ NAME _____ SIGNATURE _____

CERTIFIED BY:

..... (Spotter Programme Coordinator) Date:.....

..... (Director/AirMAC)

9. PHOTOS

PHOTO 1: Visit to a typical VET Center

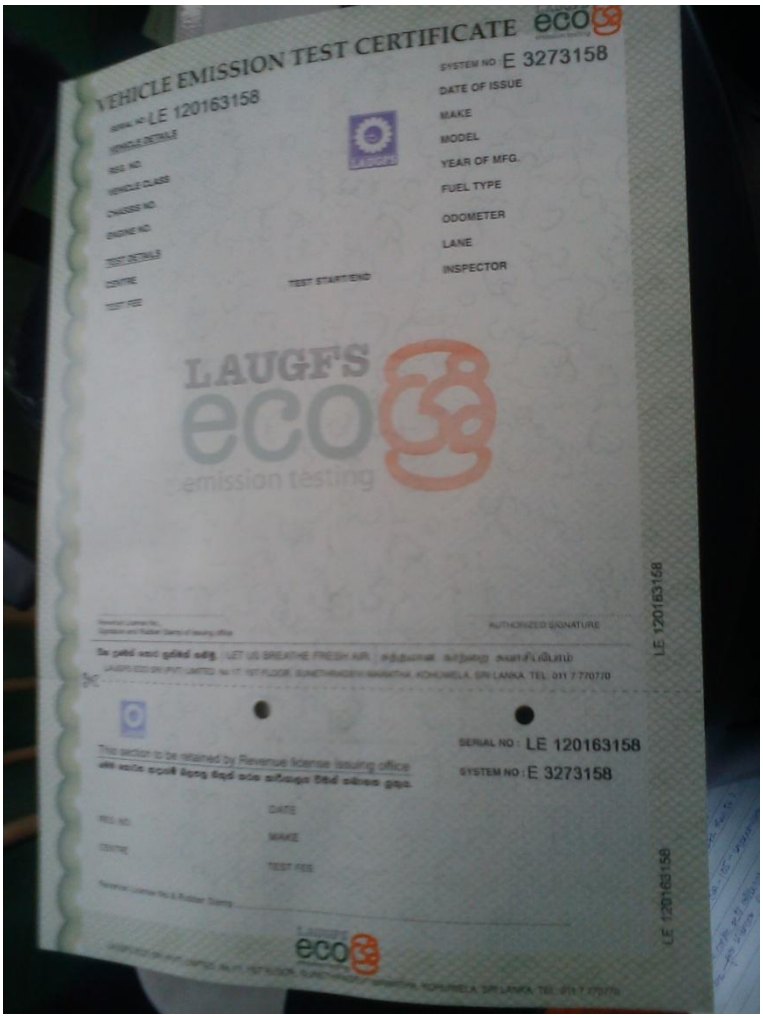



PHOTO 2: a sample of Laugfs Vehicle Emission Certificate

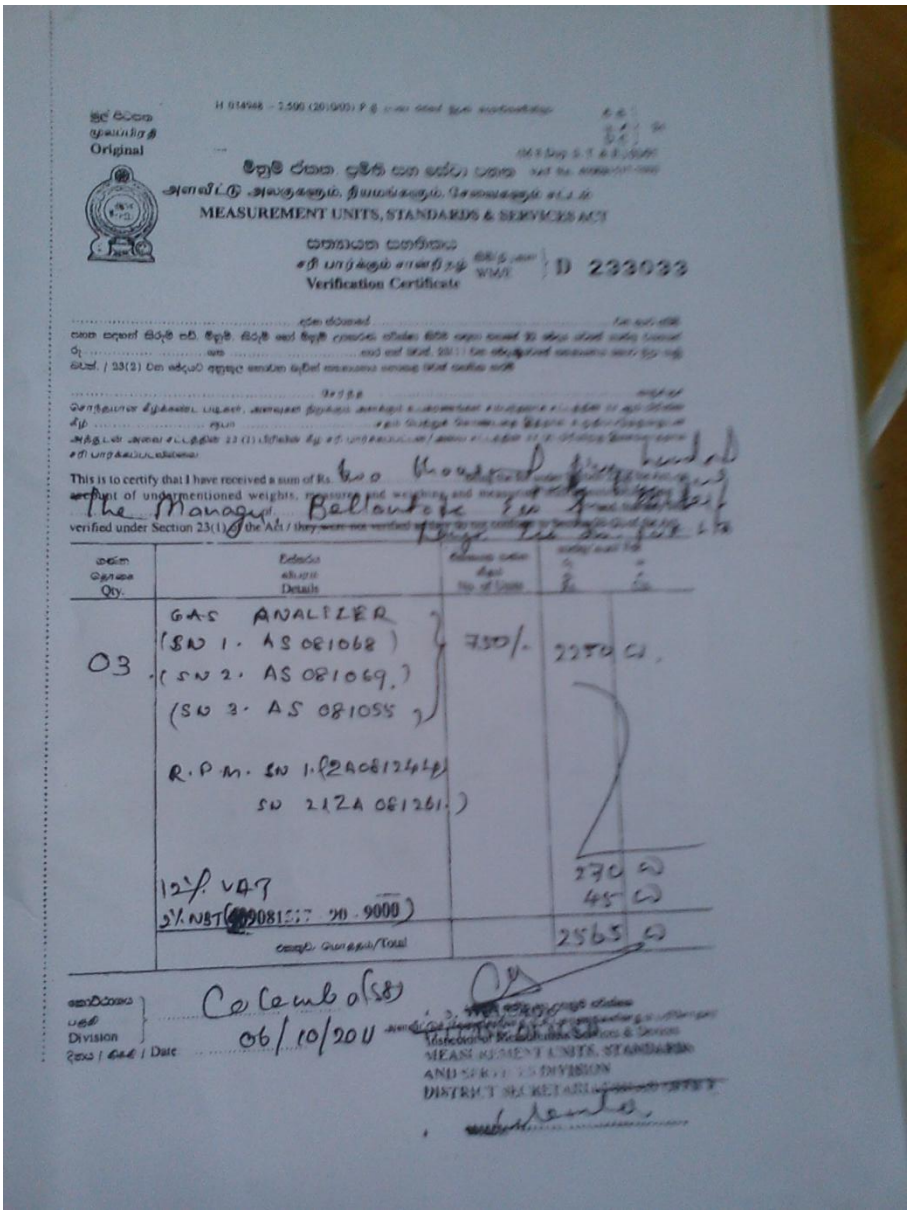



PHOTO 3 : A sample of report of Calibration of the VET Center Equipments by Measurements, Units Standards and Services Department

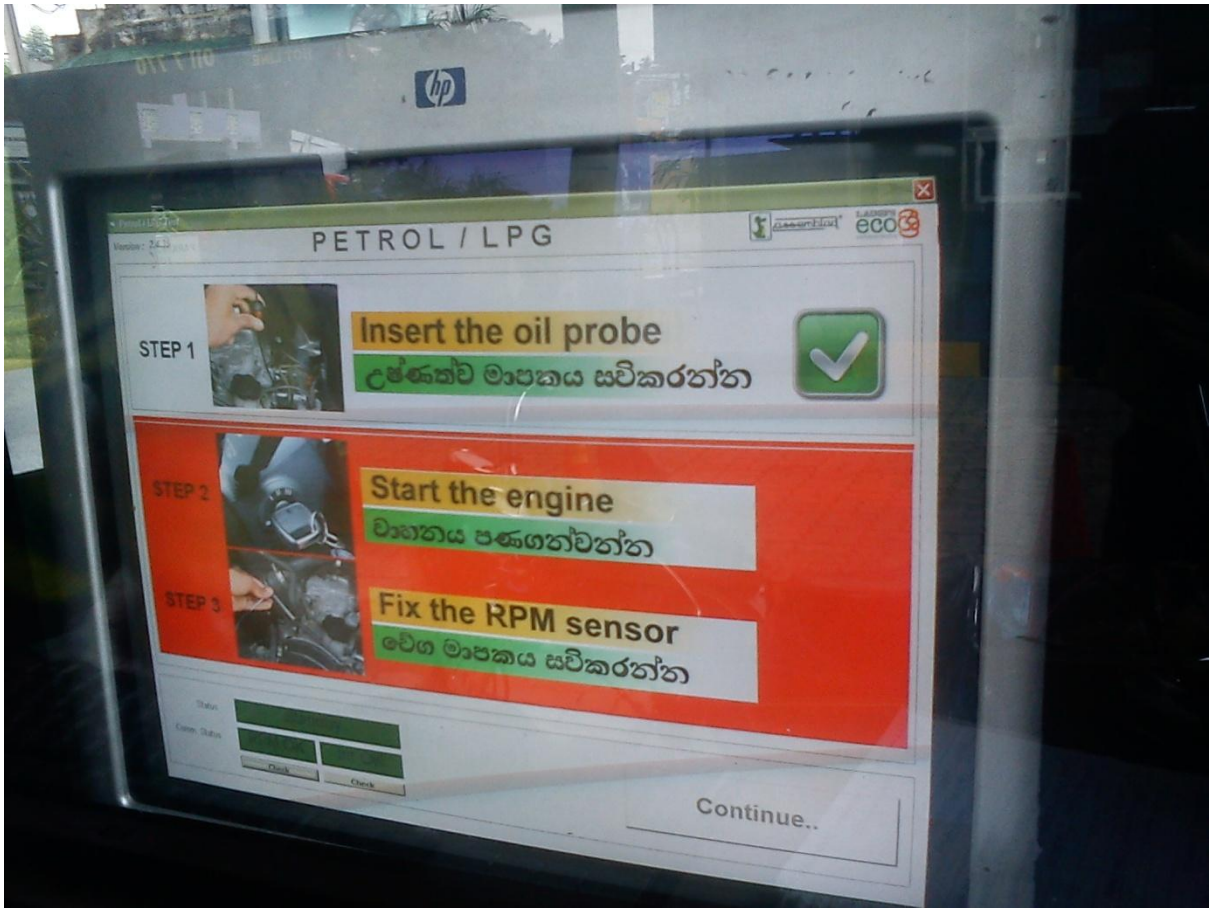
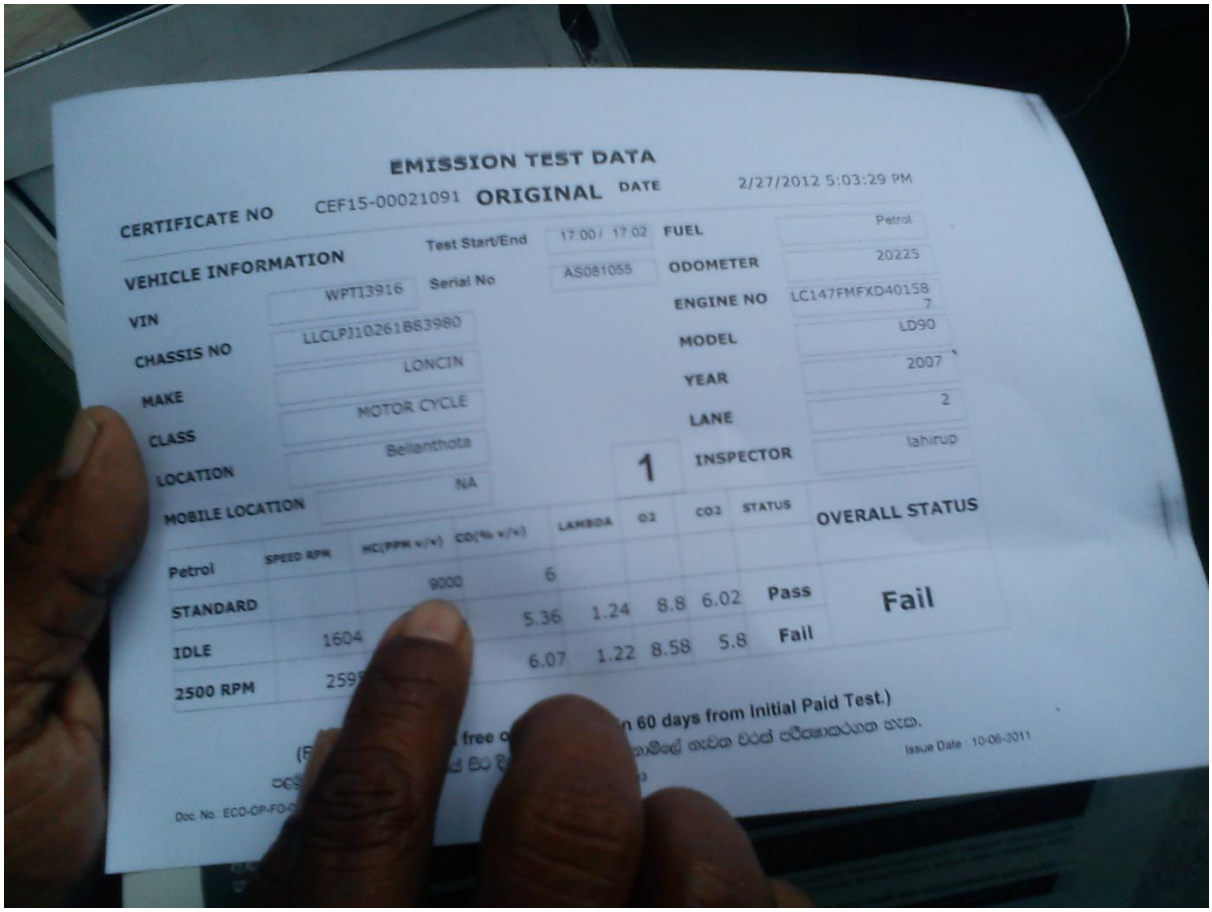



PHOTO 4 : The automated Software providing guidance to the technicians


PHOTO 5 : Emission testing of a two-wheeler vehicle

PHOTOS 6 : Automatic Issuance of Vehicle Emission Certificate




PHOTOS 7 : A failed Emission Certificate


PHOTOS 8: During the Smoky Vehicle Spotter program

PHOTOS 9 Calibrating the Smoke meter during Smoky Vehicle Emission Testing Program