Draft Project Outline

Vehicular Emissions Testing Equipment for Trinidad and Tobago

Background

Motor vehicle exhaust is a complex mixture of gases, the composition of which depends on: quality and type of fuel, design and engineering of the vehicle, age and population of vehicles, operating conditions of the engine, maintenance programmes, and use of emission control devices. Currently, ground transportation in Trinidad and Tobago consists of motorized road vehicles, as there are no rail systems.

There has been a significant increase in the vehicle fleet over the past few years with a concomitant increase in exhaust emissions, including greenhouse gases, and the consequent impact on human health and the environment. This has been demonstrated by ambient air monitoring data, which shows the generation of ground level ozone during peak traffic hours. The Table below compares emissions from the transport sector in 1990 and 1994. The values in brackets indicate the contribution of the particular greenhouse gas from the transport sector as a percentage of total emissions of that gas from all emitting sectors. The large percentage increases are likely due to a drastic increase in vehicle population, and the concomitant increase in the consumption of fuel combined with ill-maintained and improperly tuned vehicles.

GREENHOUSE GAS (Gg)	**1990**	**1994**
Carbon dioxide (CO_2)	14988 (8.9)	25229 (32.97)
Methane (CH_4)	33.87 (0.94)	73 (38.19)
Nitrous Oxide (N_2O)	1.07 (0.93)	4 (83)
Nitrogen oxides (NOx)	36.86 (31.87)	4450 (99.44)
Non-methane volatile organic carbons (NMVOCs)	93.13 (27.54)	1199 (93.82)
Carbon Monoxide (CO)	405.67 (33.68)	5909 (95.31)

The current rate of increase of vehicle population in Trinidad and Tobago is estimated at 20,000 per year (all vehicle types, but a greater proportion attributed to privately owned vehicles). At this rate, and with increasing traffic congestion and time spent on the roads, emissions are expected to increase.

A rough estimate of this increase for the period 1992-2002 is provided in the Table below.

YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002 (MAY)
CO_2 (Gg)	25846	24704	25229	26061	28086	30195	33001	35357	38165	40027	40868

The values arrived at are calculated by dividing the total emissions in the road transport sector for data obtained in that year by the total number of vehicles to obtain a rough factor (1994 data used), then multiplying by the total number of vehicles in the particular year for which the emissions are calculated. While the values are quoted for carbon dioxide, a similar trend is also expected for all the other greenhouse gases, particularly nitrogen oxide, which tends to show the largest increases. Given the greenhouse warming potential of nitrogen oxides, the overall carbon dioxide equivalent for total emissions from the transport sector is likely to be very significant.

There already exists an inspection programme requiring vehicles to be certified for road-worthiness, and which is conducted by competent private garages that are designated by the Ministry of Works and Transport of Trinidad and Tobago, and for which a fee is paid for the service (see below). There is a recommendation that an emissions testing regime be incorporated into the inspection programme, via the necessary legislative amendments, with the objective of ensuring that emissions are within applicable standards and thereby minimizing environmental and human health impacts. Emissions would be eventually regulated for carbon monoxide, oxides of nitrogen, hydrocarbons, etc. with the objective of further regulating emission control devices used in vehicles, such as catalytic converters, specifications for fuels used on the market as well as making recommendations for the use of alternative fuels for vehicles and revising existing fuel specifications and standards.

Current Inspection Regime

The current regime mainly involves inspection for safety features of the car such as brakes, suspension, lights etc. but does not include an emissions test. Existing legislation provides for penalties related to emissions but limited to the presence of "visible vapours" and is not included in the inspection programme, and which also needs to be revised. Private garages certified by the Ministry of Works and Transport carry out the inspections, for which each a fee of approximately USD 26.00 is paid once every two years depending on the age of the vehicle. A percentage of this fee in the amount of USD 8.00 goes to Government. There are about 75 garages actively conducting inspections, which are expected to increase. There is also a provision in the proposed emissions testing regime to allow for remote on-the-spot road tests by authorized personnel including the environmental police and traffic management officers. Failure of these tests would also attract a fine.

Global and Local Benefits Expected From Implementing Exhaust Emissions Testing

The implementation of a vehicle exhaust testing regime is expected to result in the following benefits:

- More efficient vehicles that would be properly tuned as motorists seek to meet standards and avoid fines. This is likely to result in an overall reduction in greenhouse gas emissions as less fuel would be consumed as a consequence;
- The reduction in emissions of oxides of nitrogen, which as seen from the Table above, constitutes the major greenhouse gas emission and the one with the largest growth, is expected to be significant since the emissions are largely due to ill-tuned and improperly maintained vehicles. This would further result in a decrease in the overall carbon dioxide equivalent of greenhouse gas emissions as well as a decrease in the generation of ground level ozone;
- Improvement of local ambient air quality.

Barriers to the Implementation of the Proposed Emissions Testing Regime

The personnel training and human resource factors are identified barriers to fully and efficiently implementing the testing programme. However, a recommendation of a train-the-trainer programme as well as lessons learned from a pilot-testing programme a few years ago indicate that such barriers can be minimized, if not eliminated. The train-the-trainer programme would involve the Ministry of Public Utilities and the Environment, the Environmental Unit and Transport Division of the Ministry of Works and Transport, the Bureau of Standards, the Ministry of National Security and the Environmental Management Authority, whose personnel would have hands-on training in addition to being the authorized officers to implement the programme. It is expected that the suppliers of the equipment would provide training to the private garages; otherwise this would be done as a follow-up to the train-the-trainer programme where the trained personnel would do the training of the private garages. The major barrier to implementing the emissions testing programme is one of cost. The private garages would be expected to acquire the necessary testing equipment at their own cost as per the following estimates per testing facility:

Item	**Estimated Cost (USD)**
Dynamometer for testing NOx emissions under load (including computer hard- and software and training)	$18,000.00
5-gas analyzer (including training)	$ 12,000.00
TOTAL	**$30,000.00**

TOTAL CAPITAL REQUIREMENTS		
Equipment per Test Station	Number of Test Stations	Total Project Equipment Cost
$30,000	75	$2,250,000

Return Period on Investment

An estimate of about 1200 inspections per year (a very conservative estimate, but likely to increase with increasing vehicle population) is carried out on average, with a net income of USD18.00 per inspection. The return period can be calculated considering the following:

Activity	Details	Estimated Activity Cost per inspection
Labour (for one technician)	Estimated time of test is 1 hour with a minimum wage of US$2 per hour	US$2.00
Electricity Cost	$0.15/kW/hr	US$1.00
Maintenance Cost & Calibration	10% of total cost per inspection	US$2.50
Total		***US$5.50***
Grand*	**15% of total is incorporated to final figure for a worse case scenario**	**US$6.325 (approximated to US$6.5)**

* Depreciation not included in calculation

Given that the net cash flow per inspection is approximately US$11.50, the return period per garage on this investment can be calculated to be approximately **2.2 years/ garage.**