

FY 2007 CDM/JI Feasibility Study (FS) Programme Report

Fuel Efficiency Improvement and Pollution Abatement in Public Transportation in
Metro Manila, the Philippines
Executive Summary

March 2008

Mitsubishi UFJ Securities, Co. Ltd.

Summary of Feasibility Study on Fuel Efficiency Improvement and Pollution Abatement in public transportation in Metro Manila, The Philippines

1. Basic Elements for the implementation of the Project

1.1. Summary of the proposed project and background of the project proposal

This project is to improve fuel efficiency of 60,000 Jeepneys operating in Metro Manila by replacing obsolete old engines. The Project aims to achieve GHG emission reductions by better fuel efficiency.

In the Philippines, the country faces various environmental problems attribute to rapidly increasing population and growing economic activities. Especially, the air quality in Metro Manila is in the level where causing health damages to humans and continue to worsen the situation. The major cause of the problem is said to be the pollutions from emissions by road transportations.

The government of the Philippines have been implementing various measures to counter these issues, but have not been fully successful to date.

With these background, in early 2007, Mitsubishi UFJ Securities was asked for advise by Mr. Ely Anthony R. Ouano, the then Director of Environmental Management Bureau of the Department of Environment & Natural Resources, and Ms. Joy Goco, the Secretary of Inter-governmental Committee on Climate Change, concerning possible development of the Project as CDM. This has led to proposal of the Project to CDM/JI Feasibility Study Programme.

1.2. Description of the host county

The host country of the Project is the Philippines.

The Philippine is a constitutional republic with separation of powers. The President is the head of state. In January 2001, after corruption of Estrada administration, Arroyo was promoted to president from vice-president.

The Philippines government promoted the fiscal reconstruction and deregulation and achieved foreign investment and export driven high economic growth. Due to Asian Currency Crisis in 1997, the Philippines recorded negative growth in 1998. Eventually, agriculture and manufacturing industry recovered and the economic growth rate from 2002 to 2006 shifted around 5%.

For the purpose of corresponding to a worldwide oil price increase and the global warming, the government of the Philippines aims at promotion of a comprehensive energy policy. In its 2004-2010 Medium-Term Philippine Development Plan, tackling the energy issues is one of the priority areas.

1.3. CDM approval criteria and approval process of the Philippines

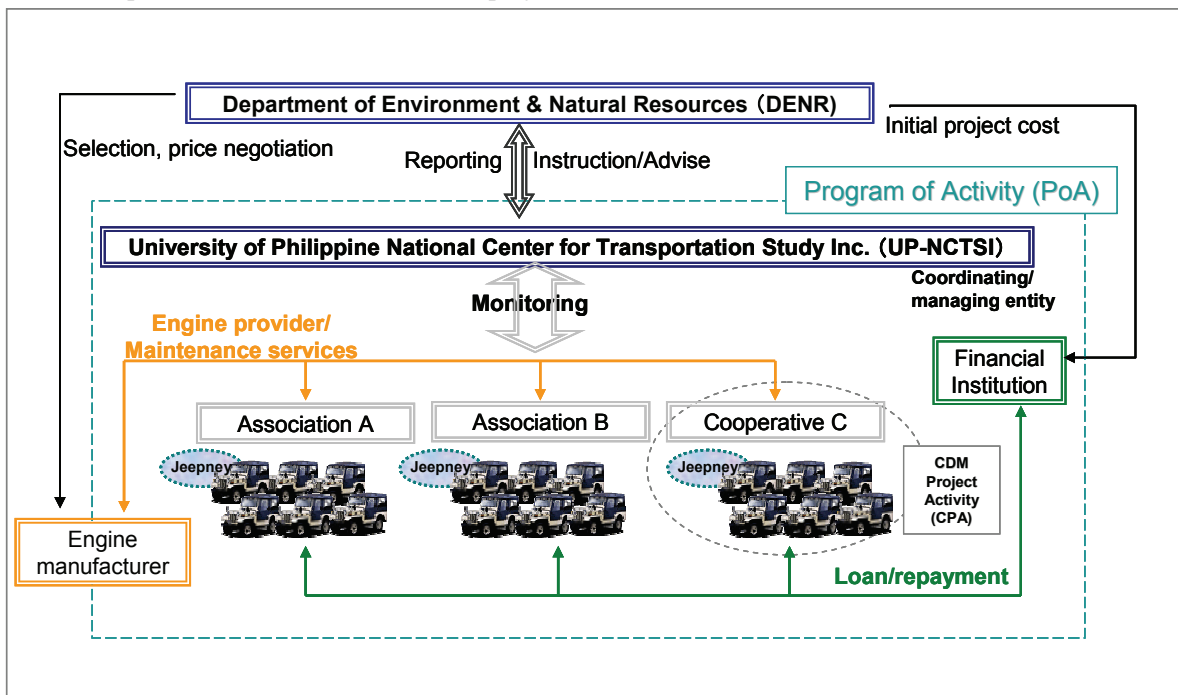
The Philippines ratified the Kyoto protocol on Nov. 20, 2003. On Aug. 31, 2005, Executive Order was issued to establish DNA in the Department of Environment and Natural Resources.

In Jan. 2006, CDM Helpdesk was established under Environmental Management Bureau (EMB) of DENR. DENR is a secretariat for DNA. DNA is composed of the following two committees and a secretariat.

1. CDM Steering Committee
2. CDM Technical Evaluation Committees
3. CDM Secretariat

1.4. Implementation framework of the project

The implementation framework of this project is as follows.



- *Department of Environment and Natural Resources(DENR)*

In this project, DENR is responsible for funding the Project by coordinating with multinational donors and governmental financial institutions. DENR will also provide necessary instruction and advice for smooth implementation of the overall project.

DENR will establish a feasible financial scheme through local governmental and private banks and coordinate with engine manufacturer to make selection on engine, negotiate price, and discuss appropriate engine replacement scheme.

- *University of the Philippines National Center for Transportation Study, Inc. (UP-NCTSI)*

UP-NCTSI is a cooperating entity of Mitsubishi UFJ Securities for this study. UP-NCTSI is an expert of overall transport sector in the Philippines and has an extensive knowledge and understanding specifically on unique characteristics of Jeepney operations.

UP-NCTSI takes the role of coordinating/managing entity of the Programme of Activity and be responsible for the implementation of the Project. UP-NCTSI will also work closely with DENR in providing necessary assistance in coordinating with financial institutions and engine manufactures concerned.

- *Jeepney Associations and Transport Sector Cooperatives*

From the study, it became evident that assistance and support from Jeepney Associations and Transport Cooperatives are necessary for a successful implementation of the Project,

In this project, Jeepney Association/Transport Cooperative will be a unit of CDM Programme Activity (CPA). Each CPA is expected to coordinate amongst them to support the coordinating/managing entity to promote smooth implementation of the Project.

2. Project planning

2.1. Detailed description of the Project

The Project is composed of two components; replacement of obsolete second-hand engines to new one and the provision of periodical inspection and maintenance.

Jeepney is a popular mode of public transportation which is in the form of shared-taxi accommodating 15-20 people. In the Philippines, there are 220,000 Jeepneys operating of which about 60,000 are in Metro Manila.

Originally, Jeepney was produced by utilizing jeeps brought into the country by the United States during the World War II and Japanese trucks exported to the country after the war. Most often, the Jeepneys use second-hand diesel-fed engines manufactured by Japanese car makers with 2-4 ton capacity.

In Metro Manila, 92% of Jeepneys in operation use second-hand diesel-fed engines from Isuzu. Since there is no custom of periodic maintenance of vehicle, most of the Jeepney drivers/operators continue to use engines without any maintenance until it breakdowns. Also, even in the event of breakdowns, patchwork repair work will be done by drivers/operators themselves.

In order to gain maximum output of the Project, provision of periodical inspection and maintenance services of the new engine is important. In this project, new engines will be purchased on condition that there will be one-year manufacturer's guarantees and free maintenance services provided. Also, under the Project, participating drivers/operators are obliged to go through periodical maintenance services provided by the manufacturer.

With cooperation by the manufacturer, the Project will also provide training sessions to each CPA on how to conduct maintenance and check-up of the vehicles. For those new engines more than one year old after replacement, CPA will be responsible for providing proper maintenance and inspections to all Jeepneys that are included in the CPA throughout their crediting period.

Replacement of engines will not only result in emission reductions and pollution abatement, but also lead to drastic reduction in the fuel cost for drivers/operators due to improved fuel efficiency.

2.2. Project participants

University of the Philippines National Center for Transportation Study, Inc. (UP-NCTSI) and Mitsubishi UFJ Securities, Co., Ltd. are the Project participants for the Project.

UP-NCTSI is a project proponent and also a coordinating/managing entity of the Programme of Activity (PoA). MUS participates in the Project as CDM adviser.

2.3. Project site

The Project site is in Metro Manila, the Philippines. The Project targets Jeeneys currently in operation in Metro Manila. Upon successful implementation of the Project, similar project can also be realized for Jeepneys operating in other areas of the country.

2.4. Financing scheme

In this project, majority of the Project cost will be for procurement of new engines. DENR is making its efforts to coordinate with other government offices for national budget. DENR is also under negotiation with external financial institutions to secure additional funding required for the Project. The Project plans to establish a special fund under local financial institution to manage the Project cost secured by DENR. The local financial institution will make loans to individual drivers/operators through the fund.

The loan repayments subtracted for the amount of interest repayments from previous year will be return to the fund for new loans. The proceeds from sales of Certified Emission Reductions generated will also be added to the fund. This scheme will increase the number of new engines to be procured by the Project every year.

In order to maximize benefit of the project and bring about a wide range of spin-off effects, a financial scheme was considered to have individual drivers/operators participating in the Project pay for their own engines and repay installments. Based on the result of the study, the range of the new engines acceptable to most of drivers/operators is considered to be maximum of PHP 300,000. Also, new engine is like to bring average fuel efficiency of 5.22km/ℓ up to 10-14km/ℓ. This will enable drivers/operators to even make monthly repayments by the money saved due to reduced fuel cost.

The study also revealed that the average amount of repayments should be around PHP200/day or PHP4,000/day. Based on the following assumptions, in ten year time, the project is expected to cover about 26,000 Jeepneys which is almost half of its original target.

Initial project cost:	PHP 2 billion (Approx. Yen 5 billion)
Engine cost :	PHP 280,000/engine
Emission reductions:	8.4tCO ₂ e/year per Jeepney
CER price:	USD20/tCER

Exchange rate:	USD1/PHP42
Monthly repayments	PHP4,000
Interest rate:	5%
Repayment period:	7years

2.5. Application of Programme of Activities to the Project

In order to develop the Project as CDM, it is important to grasp whole picture of Jeepney operations and to gather baseline information that is best reflecting actual situation. However, in reality, Jeepney is categorized as rebuilt vehicle and there is only few research or survey available to set an appropriate baseline at the moment. For this reason, in this study, the field survey has been designed to document the operational, vehicle, and drivers/operators' basic information. Estimated sample size is around 3,000.

The Project intends to exchange engines for individual Jeepney with final target of 60,000 Jeepneys. Setting one Jeepney as one CPA will be likely to make the procedure to cumbersome.

During the study, through interview with various entities concerned, it was identified that the Jeepney operations are rather well organized under Jeepney Associations and Transport Sector Cooperatives. It was confirmed that obtaining necessary cooperation from these groups is key to successful implementation of the Project.

In this respect, the unit of CPA for the Project will be a Jeepney Association and a Transport Cooperative. Replacement of engines and the provision of periodical inspection and maintenance will be done by each CPA.

The first CPA for the Project will be 323 Jeepneys operated by University of the Philippine at Diliman (UP-Diliman). The UP-Diliman has its own Jeepney operations system within campus which runs on fixed routes. The organizational characteristics of Jeepneys are similar to that of others operating outside campus.

3. Summary of project design document (PDD)

3.1. Project boundary

The project boundary of this PoA is those Jeepneys operating within Metro Manila. Some of the

Jeepneys in Metro Manila have the routes The Jeepney routes go across regional boundaries. The Project will not include those Jeepneys in the CPA.

3.2. Project period

According to the guideline by CDM Executive board, the duration of the PoA should not exceed 28 years. CPA will be added to the PoA during the duration of the PoA. Taking into account the average life time of new engine, the duration of this PoA will be from 2008 to 2036 for 28 years. Each CPA will be on 10 years fixed crediting period.

3.3. Baseline methodology

Currently there are no approved methodologies applicable to the Project. The proposed new methodology, *SSC-149 Transportation Energy Efficiency Activities using Retrofit Technologies*, which is developed for Envirofit Tricycle-Taxi Retrofit Program for Vigan and Puerto Princesa in the Philippines whose nature of project activity is very similar to the Project.

During this study, the proposed methodology was further analyzed and it was concluded that amongst existing methodologies, SSC-149 is one of the most applicable ones. While carefully following the discussion of SSC-149 by the Small Scale CDM Working Group, the draft PoA-DD, CPA-DD, and Specific-CPA-DD were prepared by applying SSC-149.

3.4. Calculation of baseline emissions

Baseline emissions will be energy consumption due to by existing vehicles.

The basic formula used to calculate emission reduction through the replacement of existing engines is the following:

Step 1. Estimating apparent fuel consumption at a common energy unit (TJ)

$$FC_{\text{base}} = m_{\text{fuel}} * CF$$

FC_{base} : Baseline energy consumption of retrofit vehicle per year (TJ / year)

CF : Conversion Factor of fuel (TJ/103ton)

m_{fuel} : Annual consumed fuel mass (tons/year)

$$m_{\text{fuel}} = v_{\text{fuel}} * \rho * T * 1\text{ton}/1000\text{kg}$$

- m_{fuel} : Annual consumed fuel mass (tons/year)
- v_{fuel} : Volume of fuel consumed per day (li/hour)
- T: Number of operational hours in a year (hours/yr)
- ρ : Fuel Density (kgfuel/liter)

Step 2. Multiply energy consumption by carbon emission factor to calculate carbon content.

$$\text{Carbon content} = \text{FC}_{\text{base}} (\text{TJ/year}) * \text{CEF} (\text{tC/TJ})$$

$$\text{CCFC}_{\text{base}} = \text{FC}_{\text{base}} (\text{TJ/year}) * \text{CC} (\text{tC/TJ})$$

CC: Carbon content of fossil fuel used (tC/TJ)

Step 3. Converting to CO₂ emissions

$$\text{BE}_y = \text{CCFC}_{\text{base}} * \text{mole ratio} * N$$

BE_y: baseline emissions on year y

Mole ratio: mole ratio of carbon to carbon dioxide (44/12)

N: number of retrofit vehicles

3.5. Calculation of project emissions

Project emissions will be energy consumption due to by the retrofitted vehicles. The formula is basically the same as baseline emissions except for the parameters to be used for annual fuel consumption.

3.6. Leakage

Under the Project, the old engines will be bought back by the manufacturers on site and will be brought to auto dismantler for scrapping. Therefore, there will be no leakage due to implementation of the Project.

3.7. Emissions reductions

The emission reductions were calculated based on *SSC-149 Transportation Energy Efficiency Activities using Retrofit Technologies*. The baseline emissions, project emission, and emission reductions from 60,000 Jeepneys are estimated as follows.

Emission Reductions	=	Baseline Emissions	–	Project Emissions	–	Leakage
		1,013,552		506,776		0

$$= 506,776\text{tCO}_2\text{e/year (8.44tCO}_2\text{e/year per Jeepney)}$$

Emission reductions from the first CPA are estimated to be 2,728tCO_{2e}/year.

3.8. Additionality

a) Additionality of PoA

1. Investment barriers

This is the project promoted by Department of Environment and Natural Resources (DENR). In this project, majority of the Project cost will be for procurement of new engines. However, due to high engine cost, DENR alone cannot afford to replace 60,000 engines for the project.

The Project cannot be realized without CDM. Implementing the Project as CDM may help bring in public funding from overseas or investment by private sector interested in obtaining CERs as return.

2. Common practice barriers

Ever since they were first build back in post World War, the Jeepneys have always utilizing second-hand engines mostly from Japan. Since Jeepneys are classified as rebuilt vehicle, there is no regulation concerning operation of Jeepney such as age limitation of engines or importation of second-hand engines.

b) Additionality of CPA

1. Investment barriers

From the study, it was clear that the second-hand engines that are currently in use are around PHP80,000~PHP120,000. Whereas brand new engine is about PHP300,000. Due to high investment cost, the installation of new engines in the Jeepney sector will not likely to realize without the program.

2. Common practice barriers

Ever since they were first build back in post World War, the Jeepneys have always utilizing second-hand engines mostly from Japan. Since Jeepneys are classified as rebuilt vehicle, there is no regulation concerning operation of Jeepney such as age limitation of engines or importation of second-hand engines.

3.8. Monitoring

SSC-149 Transportation Energy Efficiency Activities using Retrofit Technologies requires the following items to be monitored.

- Number of retrofit vehicles operated under the small-scale CDM project activity
- Annual fuel consumption
- Annual hours traveled
- The changes in service level of vehicles (control group)

Monitoring should be conducted for each CPA. When neglecting the leakage, the methodology requires including a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other.

3.10. Environmental Impact

In the Philippines, DENR is responsible for issues concerning Environmental Impact Analysis for project.

Based on discussion with DENR, it was confirmed that the project does not require Environmental Impact Analysis. To confirm this fact, a Certificate of Non-Coverage (CNC) was issued to the Project.

3.11. Stakeholder's Comment

A consultation meeting was held on November 21, 2007. Attendees included representatives from Department of Energy, Department of Environment and Natural Resources –Environmental Management Bureau, Department of Transportation and Communication –Office of Transport Cooperatives, Land Transportation Franchising Regulatory Board, and Land Transportation Office –Motor Vehicle Inspection System. There were also participants

from United Transport Federation of Makati, a public utility jeepney association.

The initial findings of the study were presented as the main topic of the consultation meeting. Basic information derived from the surveys as well as related information from the initial reports were also highlighted in the presentation. The participants were divided into two groups and representatives from each group raised questions and also provided their views on the project. The meeting has confirmed overall understanding and expectation to the project by many participants.

For the purpose of further promote discussion with relevant stakeholders concerned and gathering information/data required for the project, an additional second meeting was held.

4. Towards project implementation

Amongst various issues concerning project information, the most important ones are the role of coordinating/managing entity and financing of the project.

The Project is related to Jeepney which is a public transportation that is unique to the Philippines. Coordination efforts with various stakeholders are necessary.

Throughout the study, interviews and consultations have been conducted. At the very beginning, some of the representatives from major Jeepney associations and cooperatives were showing rather skeptic attitude toward the Project. However, close to the end of the study, many of them became very supportive of the Project and started to show their expectation for successful implementation of the Project.

In order to materialize the Project and continue to generate carbon credits throughout long project duration, an entity with good understanding and familiarity on stakeholders who has a capacity to coordinate and manage overall project is indispensable.

The effects of the Project largely depend on the number of Jeepneys to be included in the Project. Currently, the project is still seeking for additional funding to add on to existing budget secured by the government. The CERs generated from replacement of one engine is very small. The sales of CERs will still not be sufficient for the Project to procure new engines. The project needs to seek additional funds not only from public financing, but also from private sectors by demonstrating positive social and environmental impacts which the Project can bring about.