MRV Methodology Title: "Improvement of Fuel Efficiency for Taxies in Vietnam" (Draft Ver. 3.0)

Note: This methodology is drafted as the result of the GEC's JCM Demonstration/Feasibility Study in JFY2012. Therefore, this draft methodology is not officially approved by any governments involved in JCM, and is subject to change in the future.

Note: The following CDM methodologies are referred to develop the draft of MRV methodology.

AMS-III.C : Emission Reductions by electric and hybrid vehicles

AMS-III.BC : Emission reductions through improved efficiency of vehicle fleets

AMS-III.AT : Transportation Energy efficiency Activities installing digital tachograph system

"Guidelines Standardized Baseline for the Transport Sector", (hereinafter called Guidelines)

1. Title of Methodology

"*Improvement of Vehicle/Fuel Efficiency and or transit efficiency for Taxies in Vietnam*"

2. Summary of the Methodology for the Project

This methodology is applicable to the project that improves vehicle/fuel efficiency or transit efficiency for taxies in Vietnam. Guidelines are referred for the following term definition.

(Vehicle/Fuel Efficiency Measures)

Vehicle/Fuel efficiency measures improve the vehicle and or fuel efficiency and thereby reduce carbon emissions per distance unit e.g. through usage of low carbon fuels, vehicle improvements, driver training etc. No significant change of the vehicle size, the load factor or of usage types occur. The indicator used in vehicle/fuel efficiency is emissions per kilometer. The comparison bases for these types of measures are comparable operating vehicles.

(Transit Efficiency Measures)

Transit efficiency measures increase occupied rate of taxis or decrease non-occupied drive distance through vehicle dispatch measures or put taxi stand. These measures reduce emissions per paid mileage km which are therefore used as indicator. The difference of improved transit efficiency to vehicle/fuel efficiency is that in transit efficiency improvements the vehicles, fuel and driving techniques remains the same and only the circumstances such as taxi stand or dispatch system are changed. The comparison bases for transit efficiency measures are operating vehicles of the same mode.

(Combined Measures)

Interventions may include vehicle efficiency plus transit efficiency measures e.g. vehicle efficiency plus improved vehicle dispatch measures. In combined cases always the indicator paid mileage km shall be taken as transit efficiency will always reflect changes in both types of efficiency.

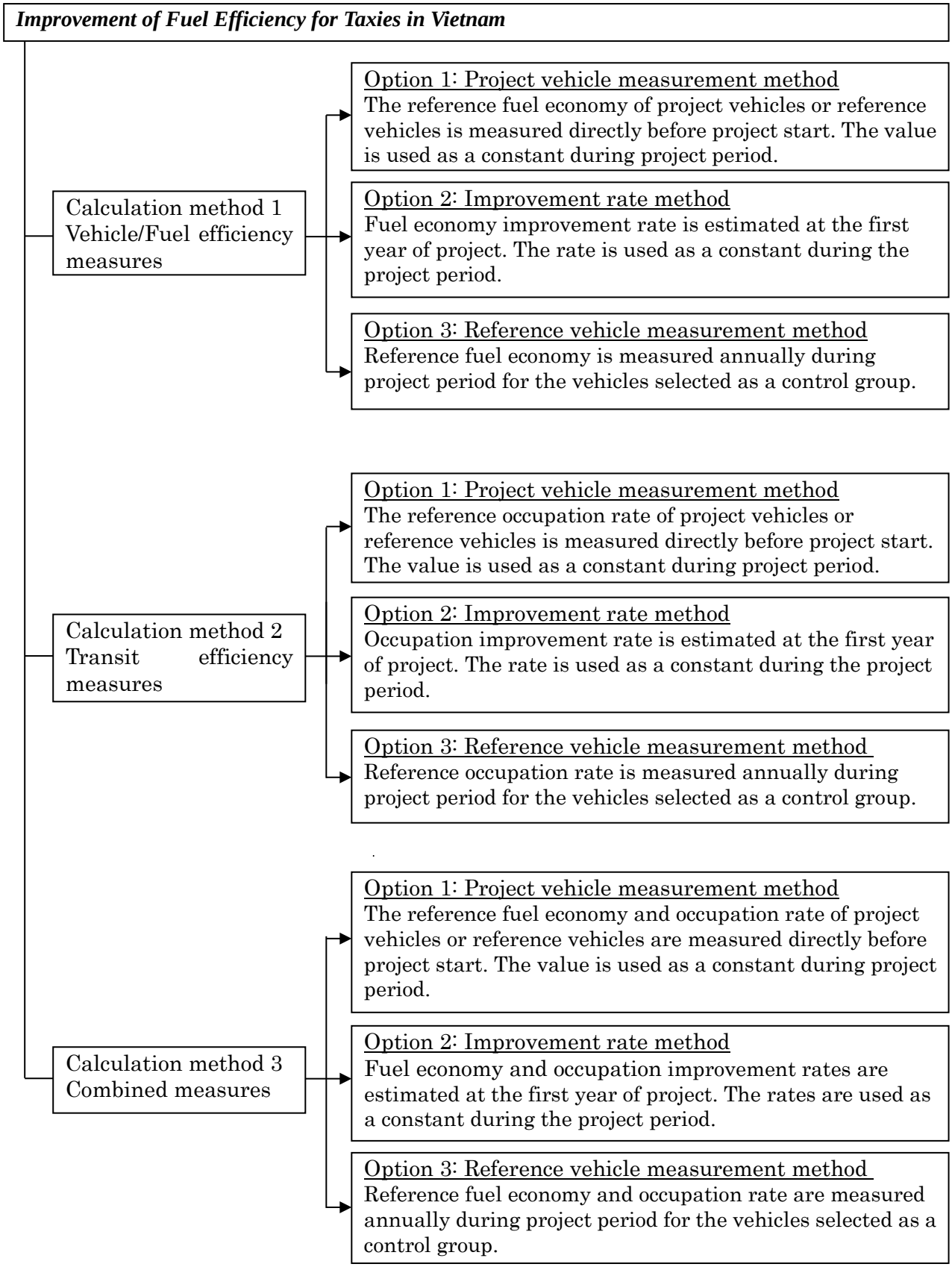
3. Eligibility Criteria

This methodology is applicable to projects that fully satisfy the following cases.

		Check
Case 1	The project activity is for improvement of vehicle/fuel efficiency and or transit efficiency for taxi operation in Vietnam.	☐
Case 2	The taxi vehicles are ICE vehicle, Electric vehicle or Hybrid vehicle.	☐
Case 3	At least, driving distance, paid mileage and fuel consumption of taxi vehicles in the project activity are recorded and managed.	☐
Case 4	The technical assistance and/or the financial aid from developed country including Japan are introduced for the project activity of taxi fuel efficiency improvement.	☐

4. Selection of Calculation Method

To calculate the reference emission, the project developer must refer to the calculation method best-suited for his/her project using the flow chart below.



5. Necessary Data for Calculation

The data that requires presetting in the planning stage of the project or monitoring after the start of the project is determined below based on the calculation method selected in section 4. If the data shown below is imported, a calculation tool is provided in this methodology that will allow you to measure emission reductions.

5.1 Common to Calculation method 1to 3

(1) Monitoring and input after project starts

Description of data	Value	Units
NCV_x: Net calorific value of fuel type x		J/mass or volume units of fuel
$EF_{CO2,x}$: Carbon emission factor for fuel type x		gCO2/J

5.2 Calculation method 1:For increased vehicle/fuel efficiency activities

(1) In the planning stage, enter the data to determine fuel consumption rate per driving distance of the reference

Description of data	Value	Units
$RFC_{i(x)}$: Specific fuel consumption of vehicle category i before project start		(mass or volume units of fuel/km)
p_{VE} : Fuel efficiency improve rate by vehicle/fuel efficiency measures for option 2 only		%

(2) Monitoring and input after project starts

Description of data	Value	Units
$PFC_{i(x),y}$: Specific fuel consumption of vehicle category i in year y		(mass or volume units of fuel/km)
$DD_{i,y}$: Relevant activity level of the project (total driving distance) in year y		km

5.3 Calculation method 2: For increased transit efficiency activities

(1) In the planning stage, enter the data to determine fuel consumption rate per paid mileage of the reference

Description of data	Value	Units
$RFC_{i(x)}$: Specific fuel consumption of vehicle category i before project start		(mass or volume units of fuel/km)
$PMR_{i,}$: Occupation rate by vehicle category i before project start		%
p_{TE} : occupation improve rate by transit efficiency measures for option 2 only		(%)

(2) Monitoring and input after project starts

Description of data	Value	Units
$PFC_{i(x),y}$: Specific fuel consumption of vehicle category i in year y		(mass or volume units of fuel/km)
$PMR_{i,y}$:Occupation rate by vehicle category i in year y		%
$PD_{i,y}$: Relevant activity level of the project (total paid mileage)		km

5.4 Calculation method 3: For combined measure

(1) In the planning stage, enter the data to determine fuel consumption rate per paid mileage of the reference

Description of data	Value	Units
$RFC_{i(x),y}$: Specific fuel consumption of vehicle category i in year y		(mass or volume units of fuel/km)
$PMR_{i,y}$: Occupation rate by vehicle category i in year y		%
p_{VE} : Fuel efficiency improve rate by vehicle/fuel efficiency measures for option 2 only		%
p_{TE} : occupation improve rate by transit efficiency measures for option 2 only		(%)

(2) Monitoring and input after project starts

Description of data	Value	Units
$PFC_{i(x),y}$: Specific fuel consumption of vehicle category i in year y		(mass or volume units of fuel/km)
$PMR_{i,y}$:Occupation rate by vehicle category i in year y		%
$PD_{i,y}$: Relevant activity level of the project (total paid mileage)		km

6. Terms and Definitions

Term	Definition
p_{VE} : Fuel efficiency improve rate by vehicle/fuel efficiency measures (%)	$REF_{VE,i,y} = PEF_{VE,i,y}/(1 - p_{VE})$ Where: $REF_{VE,i,y}$: Reference emission factor for vehicle type i in year y (gCO2/km) $PEF_{VE,i,y}$: Project emission factor for vehicle type i in year y (gCO2/km)
p_{TE} : occupation improve rate by transit efficiency measures (%)	$PMR_{i,y,ref} = PMR_{i,y} - p_{TE}$ Where: $PMR_{i,y}$: Project occupation rate by vehicle category i in year y (%) $PMR_{i,y,ref}$: Reference occupation rate by vehicle category i in year y (%)
Occupation rate	The rate of paid mileage distance against total drive distance (%)

7. Project Boundaries

The project boundary shall include the following GHG emission sources and GHG emissions.

- The geographical scope sets the national boundary of Vietnam
- The taxies introduced project activity for increased vehicle/fuel efficiency and or transit efficiency
- In case of gaseous fuels CH4 emission shall be included
- In addition, it is necessary to check so as not to double-count the emission reductions because of the project vehicles being inclusive of the other projects such as CDM, PoA or NAMAs.

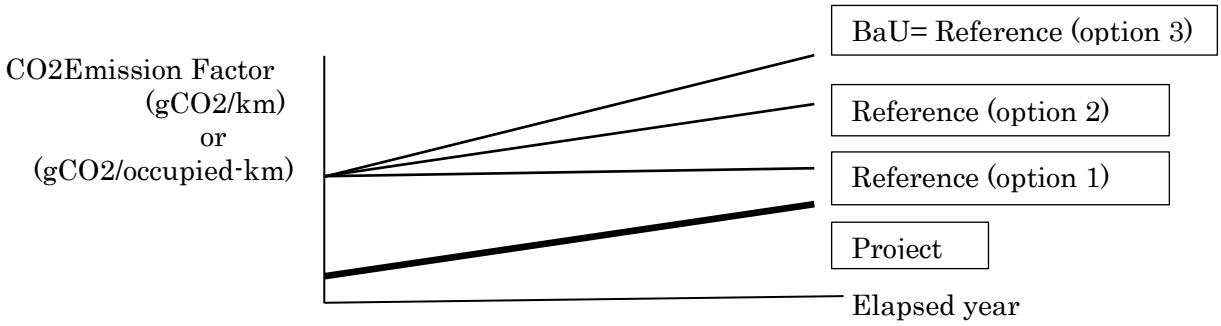
8. Reference Scenario

The reference scenario for increased vehicle/fuel efficiency and or transit efficiency is continuation of operating comparable vehicles. For example, fuel efficiency of reference vehicle may be determined by measuring the actual fuel consumption of a sample of

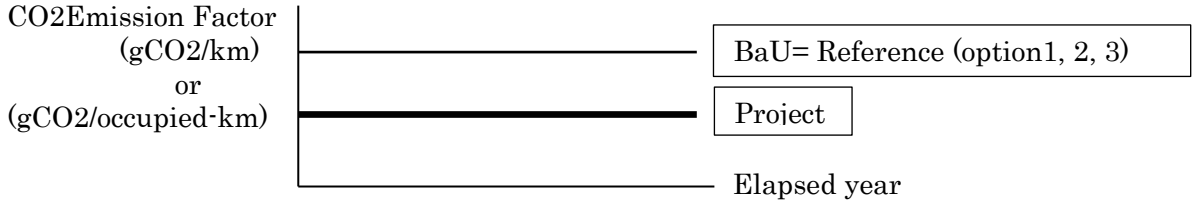
comparable vehicles operating in comparable traffic situations. Comparable vehicles are those with similar age structure, motorization and passenger capacity. Comparable traffic situations are considered as vehicles operating in the same city.

Based on the reference scenario, reference emission factor is set from the selection of three options depending on the reference emission variation.

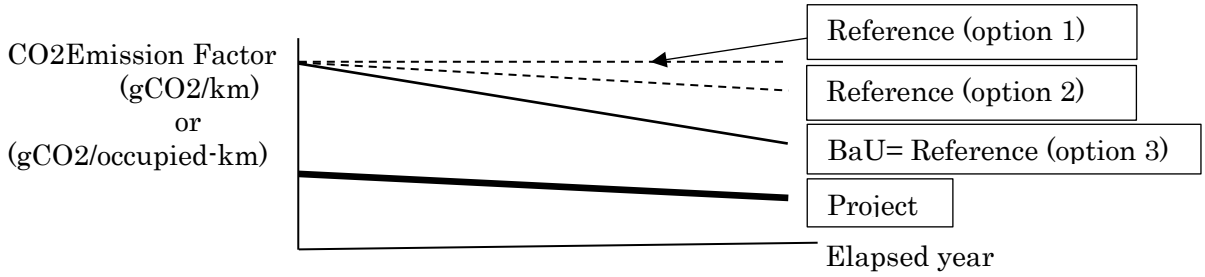
1) Reference emission factor increase



2) Reference emission factor is constant



3) Reference emission factor decrease



9. Reference Emissions and Calculation

The reference emissions are calculated by vehicle category. Vehicle category shall be determined conservatively and be based on the fuel type used, the vehicle model and other relevant factors to distinguish vehicles with different occupation rates and fuel consumption rates.

Monitoring shall apply to all the vehicles or sample vehicles within boundary. Sample vehicles shall be randomly chosen referring to the latest version of "The Standard for sampling and surveys for CDM project activities and programme of activities".

Monitoring vehicles and monitoring method for reference emissions estimation are shown on the following table;

Table Monitoring vehicles and monitoring method for reference emissions estimation

Monitoring vehicles	Estimation method for reference fuel economy and/or occupation rate
Project vehicles (all vehicles or sample)	Estimate based on at least one year of operation records and preferably three years. (Option1,2)
Reference vehicles (control group)	Estimate based on at least one year of operation records and preferably three years (Option1), or estimate based on the operation records for the first year of project period. (option1,2)
Reference vehicles (control group)	Estimate based on the annual operation records during project period.

9.1 Calculation method 1: Increased vehicle/fuel efficiency activities

The reference emissions shall be determined using either of the following three options:

Option 1: Project vehicles measurement method

The reference emission factor is determined on the basis of emissions per kilometer ($REF_{VE,i}$) . Vehicle fuel efficiency for existing vehicle or specific reference vehicle is determined as the average annual fuel consumption (*FC*) divided by the average distance travelled (*D*) by each vehicle categories based on at least one year of historical data and preferably three years.
Once measured, the reference vehicle fuel efficiency will be fixed throughout the project period.

$$REF_{VE,i} = RFC_{i(x)} \cdot NCV_x \cdot EF_{CO2,x}$$

$$RE_{VE,y} = \sum_i \left(REF_{VE,i} \times DD_{i,y} \right)$$

Where:

$REF_{VE,i}$	Reference Emission Factor for vehicle/fuel efficiency measures for vehicle type i (gCO2/km)
$RFC_{i(x)}$	Reference fuel consumption of vehicle category i (mass or volume units of fuel/km)
NCV_x	Net calorific value of fuel type x (J/mass or volume units of fuel)
$EF_{CO2,x}$	Carbon emission factor for fuel type x (gCO2/J)
$RE_{VE,y}$	Reference CO2 emissions for increased vehicle/fuel efficiency activities (tCO2/y)
$DD_{i,y}$	Total distance driven by vehicle category i in year y during project period (km/y)

Option 2: Improvement rate method

The reference fuel economy is measured in accordance with the procedure of Option.1. Project fuel economy in the first year of project period is measured. The fuel economy improvement rate is calculated from the reference fuel economy and the first year project fuel economy. The reference fuel economy of second and the latter year of project period is estimated using the rate and project fuel economy of each year. The rate will be fixed throughout the project period.

The fuel consumption specification data observed on manufacturer's specification of project vehicles and comparable vehicles are posiible to set the fuel economy omprovement rate. The driving mode to get the specification data should be the same.

$$REF_{VE,i,y} = PEF_{VE,i,y} / \left(1 - p_{VE,i(x)}\right)$$

$$RE_{VE,y} = \sum_i \left(REF_{VE,i,y} \times DD_{i,y} \right)$$

Where :

$REF_{VE,i,y}$	Reference Emission Factor for vehicle/fuel efficiency measures for vehicle type i in year y during project period (gCO2/km)
$PEF_{VE,i(x)}$	Project Emission Factor for vehicle/fuel efficiency measures for vehicle type i (gCO2/km)
$p_{VE,i(x)}$	Fuel efficiency improve rate by Vehicle/fuel efficiency measures for vehicle category i (%)
$RE_{VE,y}$	Reference CO2 emissions for increased vehicle/fuel efficiency activities (tCO2/y)
$DD_{i,y}$	Total distance driven by vehicle category i in year y during project period (km/y)

Option 3: Reference vehicles measurement method

Reference emission factor is estimatedfrom annual monitoring results during project period.

$$REF_{VE,i,y} = RFC_{i(x),y} \cdot NCV_x \cdot EF_{CO2,x}$$

$$RE_{VE,y} = \sum_i \left(REF_{VE,i,y} \times DD_{i,y} \right)$$

Where:

$REF_{VE,i,y}$	Reference Emission Factor for vehicle/fuel efficiency measures for vehicle type i in year y(gCO2/km)
$RFC_{i(x),y}$	Reference fuel consumption of vehicle category i in year y (mass or volume units of fuel/km)
NCV_x	Net calorific value of fuel type x (J/mass or volume units of fuel)
$EF_{CO2,x}$	Carbon emission factor for fuel type x (gCO2/J)
$RE_{VE,y}$	Reference CO2 emissions for increased vehicle/fuel efficiency activities in year y (tCO2/y)
$DD_{i,y}$	Total distance driven by vehicle category i in year y during project period (km/y)

9.2 Calculation method 2: Increased transit efficiency activities

Reference Emission Factor for transit efficiency measures by vehicle category i ($REF_{TE,i}$) shall be determined using either of the three following options:

Option 1: Project vehicles measurement method

The reference occupancy rate necessary to calculate reference emission factor for existing vehicle or specific reference vehicle is determined as the average annual piad mileage divided by the average annual driving distance (*D*) by each vehicle categories based on at least one year of historical data and preferably three years.

Once measured, the reference vehicle fuel efficiency will be fixed throughout the project period.

The reference fuel economy per kilometer driven is set in accordance with the procedure for Option.1 of calculation method 1. Reference emission factor is determined as reference fuel economy per kilometer driven devided by reference occupancy rate.

$$REF_{VE,i} = RFC_{i(x)} \cdot NCV_x \cdot EF_{CO2,x}$$

$$REF_{TE,i} = \frac{REF_{VE,i}}{PMR_{i,ref}}$$

$$RE_{TE,y} = \sum_i \left(REF_{TE,i} \times PD_{i,y} \right)$$

Where:

$REF_{VE,i}$ Reference Emission Factor for vehicle/fuel efficiency measures for vehicle type i during project period (gCO2/km)

$RFC_{i(x)}$ Reference fuel consumption of vehicle category i (mass or volume units of fuel/km)

NCV_x Net calorific value of fuel type x y (J/mass or volume units of fuel)

$EF_{CO2,x}$ Carbon emission factor for fuel type x (gCO2/J)

$RE_{TE,y}$ Reference CO2 emissions for increased transit efficiency activities during the period of year y (tCO2/y)

$REF_{TE,i}$ Reference Emission Factor for transit efficiency measures for vehicle type i (gCO2/paid mileage km)

$PMR_{i,ref}$ Reference occupation rate by vehicle category i (%)

$PD_{i,y}$ Total paid mileage by vehicle category i project vehicles in year y during project period (paid mileage km/y)

Option 2: Improving rate method

The reference emission factor is determined in accordance with the procedure of Option.1. Project occupancy rate measured in the first year of project period. The occupancy rate improvement rate is calculated as the difference between the reference and project occupancy rate. The reference emissions second and the latter year of project period is estimated using the determined rate and project emission factor of each year. The rate will be fixed throughout the project period.

$$REF_{TE,i,y} = PEF_{TE,i,y} \times \left(\frac{PMR_{i,y}}{PMR_{i,y} - p_{TE,i(x)}} \right)$$

$$RE_{TE,y} = \sum_i \left(\left(REF_{TE,i,y} \times PD_{i,y} \right) \right)$$

Where :

$REF_{TE,i,y}$ Reference Emission Factor for transit efficiency measures for vehicle type i in year y (gCO2/paid mileage km)

$PEF_{TE,i,y}$ Project emission factor for transit efficiency measures for vehicle type i in year y (gCO2/paid mileage km)

$PMR_{i,y}$ Occupation rate by vehicle category i in year y (%)

$p_{TE,i(x)}$ occupation improve rate by transit efficiency measures in year y (%)

$RE_{TE,y}$ Reference CO2 emissions for increased transit efficiency in year y (tCO2/y)

$PD_{i,y}$ Total paid mileage by vehicle category i project vehicles in year y (paid mileage km/y)

Option 3: Reference vehicles measurement method

Reference emission factor is estimatedfrom annual monitoring results during project period.

$$REF_{VE,i} = RFC_{i(x)} \cdot NCV_x \cdot EF_{CO2,x}$$

$$REF_{TE,i,y} = \frac{REF_{VE,i}}{PMR_{i,ref,y}}$$

$$RE_{TE,y} = \sum_i \left(REF_{TE,i,y} \times PD_{i,y} \right)$$

Where:

$REF_{VE,i}$ Reference Emission Factor for vehicle/fuel efficiency measures for vehicle type i during project period (gCO2/km)

$RFC_{i(x)}$ Reference fuel consumption of vehicle category i (mass or volume units of fuel/km)

NCV_x	Net calorific value of fuel type x y (J/mass or volume units of fuel)
$EF_{CO2,x}$	Carbon emission factor for fuel type x (gCO2/J)
$RE_{TE,y}$	Reference CO2 emissions for increased transit efficiency activities during the period of year y (tCO2/y)
$REF_{TE,i,y}$	Reference Emission Factor for transit efficiency measures for vehicle type i in year y (gCO2/paid mileage km)
$PMR_{i,ref,y}$	Reference occupation rate by vehicle category i in year y (%)
$PD_{i,y}$	Total paid mileage by vehicle category i project vehicles in year y during project period (paid mileage km/y)

9.3 Calculation method 3: Combined measures

In the case of combined measure with vehicle/fuel efficiency meaures and transit efficiency measures, reference emission factor by vehicle category i ($REF_{TE,i}$) shall be determined using either of the three following options:

Option 1: Project vehicles measurement method

$$REF_{VE,i} = RFC_{i(x),} \cdot NCV_x \cdot EF_{CO2,x}$$

$$REF_{TE,i} = \frac{REF_{VE,i}}{PMR_{i,ref}}$$

$$RE_{TE,y} = \sum_i \left(REF_{TE,i} \times PD_{i,y}\right)$$

Where:

$REF_{VE,i}$	Reference Emission Factor for vehicle/fuel efficiency measures for vehicle type i during project period (gCO2/km)
$RFC_{i(x)}$	Reference fuel consumption of vehicle category i (mass or volume units of fuel/km)
NCV_x	Net calorific value of fuel type x y (J/mass or volume units of fuel)
$EF_{CO2,x}$	Carbon emission factor for fuel type x (gCO2/J)
$RE_{TE,y}$	Reference CO2 emissions for increased transit efficiency activities during the period of year y (tCO2/y)
$REF_{TE,i}$	Reference Emission Factor for transit efficiency measures for vehicle type i (gCO2/paid mileage km)
$PMR_{i,ref}$	Reference occupation rate by vehicle category i (%)
$PD_{i,y}$	Total paid mileage by vehicle category i project vehicles in year y during project period (paid mileage km/y)

Option 2: Improvement rate method

$$REF_{TE,i,y} = PEF_{VE,i,y} / \left\{\left(1 - p_{VE,i(x)}\right) \cdot \left(PMR_{i,y} - p_{TE,i(x)}\right)\right\}$$

$$RF_{TE,y} = \sum_i \left(\left(REF_{TE,i,y} \times PD_{i,y}\right)\right)$$

Where :

$REF_{TE,i,y}$	Reference Emission Factor for transit efficiency measures for vehicle type i in year y (gCO2/paid mileage km)
$PEF_{VE,i,y}$	Project Emission Factor for vehicle/fuel efficiency measures for vehicle type i in year y (gCO2/km)
$PMR_{i,y}$	Occupation rate by vehicle category i in year y (%)
$p_{VE,i(x)}$	Fuel efficiency improve rate by Vehicle/fuel efficiency measures for vehicle category i (%)
$p_{TE,i(x)}$	occupation improve rate by transit efficiency measures in year y

$RE_{TE,y}$ Reference CO2 emissions for increased transit efficiency activities during the period of year y (tCO2/y)
$PD_{i,y}$ Total paid mileage by vehicle category i project vehicles in year y (paid mileage km/y)

Option 3: Reference vehicles measurement method
Reference emission factor is estimatedfrom annual monitoring results during project period.

$$REF_{VE,i,y} = RFC_{i(x),y} \cdot NCV_x \cdot EF_{CO2,x}$$
$$REF_{TE,i,y} = \frac{REF_{VE,i,y}}{PMR_{i,ref,y}}$$
$$RE_{TE,y} = \sum_i \left(REF_{TE,i,y} \times PD_{i,y}\right)$$

Where:
$REF_{VE,i,y}$ Reference Emission Factor for vehicle/fuel efficiency measures for vehicle type i during project period in year y (gCO2/km)
$RFC_{i(x),y}$ Reference fuel consumption of vehicle category I in year y (mass or volume units of fuel/km)
NCV_x Net calorific value of fuel type x y (J/mass or volume units of fuel)
$EF_{CO2,x}$ Carbon emission factor for fuel type x (gCO2/J)
$RE_{TE,y}$ Reference CO2 emissions for increased transit efficiency activities during the period of year y (tCO2/y)
$REF_{TE,i,y}$ Reference Emission Factor for transit efficiency measures for vehicle type i in year y (gCO2/paid mileage km)
$PMR_{i,ref,y}$ Reference occupation rate by vehicle category i in year y (%)
$PD_{i,y}$ Total paid mileage by vehicle category i project vehicles in year y during project period (paid mileage km/y)

10. Project Emissions and Calculation

10.1 Calculation method 1: Increased vehicle/fuel efficiency activities

$$PEF_{VE,i,y} = PFC_{i(x),y} \cdot NCV_x \cdot EF_{CO2,x}$$
$$PE_{VE,y} = \sum_i \left(PEF_{VE,i,y} \times DD_{i,y}\right)$$

Where:
$PEF_{VE,i,y}$ Project Emission Factor for vehicle/fuel efficiency measures for vehicle type i in year y (gCO2/km)
$PFC_{i,x,y}$ Project fuel consumption of vehicle category i using fuel type x in year y (mass or volume units of fuel/km)
NCV_x Net calorific value of fuel type x (J/mass or volume units of fuel)
$EF_{CO2,x}$ Carbon emission factor for fuel type x (gCO2/J)
$PE_{VE,y}$ Project CO2 emissions for increased vehicle/fuel efficiency activities during the period of year y (tCO2/y)
$DD_{i,y}$ Total distance driven by vehicle category i project vehicles in year y during project period (km)

10.2 Calculation method 2: Increased transit efficiency activities

$$PEF_{VE,i,y} = PFC_{i(x),y} \cdot NCV_x \cdot EF_{CO2,x}$$

$$PEF_{TE,i,y} = \frac{PEF_{VE,i,y}}{PMR_{i,y}}$$

$$PE_{TE,y} = \sum_{i} \left(PEF_{TE,i,y} \times PD_{i,y} \right)$$

Where:

$PEF_{VE,i,y}$	Project emission factor for project vehicle type i in year y (gCO2/km)
$PFC_{i(x),y}$	Project fuel consumption of vehicle category i using fuel type x in year y (mass or volume units of fuel/km)
NCV_x	Net calorific value of fuel type x (J/mass or volume units of fuel)
$EF_{CO2,x}$	Carbon emission factor for fuel type x (gCO2/J)
$PEF_{TE,i,y}$	Project emission factor for transit efficiency measures for vehicle type i in year y (gCO2/paid mileage km)
$PMR_{i,y}$	occupation rate by vehicle category i in year y (%)
$PE_{TE,y}$	Project CO2 emissions for increased transit efficiency activities in year y (tCO2/y)
$PD_{i,y}$	Total paid mileage by vehicle category i project vehicles in year y (km)

10.3 Calculation method 3: Combined measure

Calculation method of project emission for combined measure activity is same to calculation method 2 shown on the above.

11. Leakage emissions and Calculation

No leakage calculation is required.

12. Calculation of Emission Reduction

Emission reductions are calculated from specific reference emissions and project emissions.

For Increased vehicle/fuel efficiency activities

$$ER_{VE,y} = RE_{VE,y} - PE_{VE,y}$$

Where:

$ER_{VE,y}$	Emission reductions for vehicle/fuel efficiency measures in year *y* [tCO2/y]
$RE_{VE,y}$	Reference emissions for vehicle/fuel efficiency measures in year *y* [tCO2/y]
$PE_{VE,y}$	Project emissions for vehicle/fuel efficiency measures in year *y* [tCO2/y]

For Increased transit efficiency activities

$$ER_{TE,y} = RE_{TE,y} - PE_{TE,y}$$

Where:

$ER_{TE,y}$	Emission reductions for Increased transit efficiency activities in year *y* [tCO2/y]
$RE_{TE,y}$	Reference emissions for Increased transit efficiency activities in year *y* [tCO2/y]
$PE_{TE,y}$	Project emissions for Increased transit efficiency activities in year *y* [tCO2/y]

For combined measure activities

$$ER_{TE,y} = RE_{TE,y} - PE_{TE,y}$$

Where:

$ER_{TE,y}$	Emission reductions for combined measure activities in year *y* [tCO2/y]
$RE_{TE,y}$	Reference emissions for combined measure activities in year *y* [tCO2/y]
$PE_{TE,y}$	Project emissions for combined measure activities in year *y* [tCO2/y]

13. Monitoring

The project developers must monitor the parameters described in the table below based on the calculation method of the selected GHG emission reductions.

13.1 Reference emissions (Calculation method 1: for increased vehicle/fuel efficiency activities)

Option 1

Parameter	Description	Measurement Method
$RFC_{i(x)}$	Reference fuel consumption of vehicle category i (mass or volume units of fuel/km)	a) Collecting distance driven and fuel consumption from monthly operation report of comparable vehicles. b) Fuel consumption are summed up the purchase amount from retailer invoices and inputting to an spread sheet manually. The distance driven are based on GPS (preferred), other electronic means or odometer

Option 2

Parameter	Description	Measurement Method
$p_{VE,i(x)}$	Fuel efficiency improve rate by vehicle/fuel efficiency measures for vehicle category i (%)	a) Set default value from collecting data in the from demonstration test before project start. b) set from the fuel consumption specification data observed on manufacturer's specification of project vehicles and comparable vehicles

13.2 Reference emissions (Calculation method 2: for increased transit efficiency activities)

Option 1

Parameter	Description	Measurement Method
$RFC_{i(x)}$	Reference fuel consumption of vehicle category i (mass or volume units of fuel/paid mileage km)	a) Collecting distance driven and fuel consumption from monthly operation report of comparable vehicles. b) Fuel consumption are summed up the purchase amount from retailer invoices and inputting to an spread sheet manually. The distance driven are based on GPS (preferred), other electronic means or odometer

Option 2

Parameter	Description	Measurement Method
$p_{TE,i(x)}$	Fuel efficiency improve rate by transit efficiency measures for vehicle category i (%)	Collecting the data from demonstration test before project start.

13.3 Project emissions (Calculation method 1: for increased vehicle/fuel efficiency activities)

Parameter	Description	Measurement Method
$DD_{i,y}$	Total distance driven by vehicle category i project vehicles in year y during project period (km)	a) Collecting distance driven and fuel consumption from monthly operation report of comparable vehicles. b)Based on GPS (preferred), other electronic means or odometer. Continuously, aggregated at least annually
$PFC_{i(x),y}$	Project fuel consumption of vehicle category i in year y (mass or volume units of fuel/km)	a) Collecting distance driven and fuel consumption from monthly operation report of comparable vehicles. b) Fuel consumption are summed up the purchase amount from retailer invoices and inputting to an spread sheet manually. The distance driven are based on GPS (preferred), other electronic means or odometer

13.4 Project emissions (Calculation method 2: for increased transit efficiency activities)

Parameter	Description	Measurement Method (e.g.)
$PD_{i,y}$	Total paid mileage by vehicle category i project vehicles in year y (km)	Based on transactions from taxi drivers. Continuously, aggregated at least annually
$PFC_{i(x),y}$	Project fuel consumption of vehicle category i in year y (mass or volume units of fuel/paid mileage km)	a) Collecting distance driven and fuel consumption from monthly operation report of comparable vehicles. b) Fuel consumption are summed up the purchase amount from retailer invoices and inputting to an spread sheet manually. The distance driven are based on GPS (preferred), other electronic means or odometer

13.5 Other common monitoring parameters

The following parameters are common in monitoring through the methodology.

Parameter	Description	Measurement Method
NCV_x	Net calorific value of fuel type x (J/mass or volume units of fuel)	a) Value provided by the fuel supplier b) Regional or national default value c) IPCC default values
$EF_{CO2,x}$	Carbon emission factor for fuel type x (gCO2/J)	

Annex: Information on the calculation tool

[Attachment to Project Designe Document] Monitoring Plan and Ex-ante Estimation of Emission Reductions -input sheet- 2012/12/14 Ver2.0

1. Monitoring plan and input values for ex-ante estimation

[Monitoring pattern]

Pattern A	Method based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Pattern B	Method based on the amount of transaction which is measured directly using metering instruments (Data used: commercial evidence such as invoices)
Pattern C	Method based on the actual measurement using metering instruments (Data used: measured values)
Others	Method other than Pattern A, B, and C

13.1 Reference emissions (Calculation method 1: for increased vehicle/fuel efficiency activities)

Option 1

Parameters	Description of data	Estimated Values	Units	Monitoring pattern	Source of data	Measurement methods and procedures	Monitoring frequency	QA/QC procedures	Other comments
$RFC_{i,x,y}$	Referential fuel consumption of vehicle category i using fuel type x in year y		(mass or volume units of fuel/km)	B	Based on fuelling station reports for control group vehicle	collecting puchase amount from retailer invoices and inputing to an spread sheet manually	Continuously, aggregated at least annually	Control with fuel invoices	Control group vehicles are set before project start
$NCV_{x,y}$	Net calorific value of fuel type x in year y		(J/mass or volume units of fuel)	A	a) Value provided by the fuel supplier b) Regional or national default value c) IPCC default values as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	measurements should be undertaken in line with national or international fuel standards Data at the lower limit of the uncertainty at a 95% confidence interval	For (a) : the NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For (b): review the appropriateness of the values annually For (c): any future revision of the IPCC Guidelines should be taken into account	Verify if the values under (a), (b) and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol 2 of the 2006 IPCC Guidelines. If the values fall below this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b) or (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards	The parameter is used for baseline as well as project emissions and vehicle owners or operators can buy fuel from a variety of sources (fuel stations). In practice therefore it is considered to be simpler to determine the parameter using options (b) or (c)
$EF_{CO2,x,y}$	Carbon emission factor for fuel type x in year y		(gCO2/J)	A					

Table Default value RFC vehicles Urban Usage

Vehicle category	unit	for Gasoline	for Diesel
Cars	km/l	9	11
Taxis	km/l	8	11
Motorcycles	km/l	60	-
Motorized 3-wheelers	km/l	22	24
Large urban buses	km/l	1.8	2.2

Option 2

Parameters	Description of data	Estimated Values	Units	Monitoring pattern	Source of data	Measurement methods and procedures	Monitoring frequency	QA/QC procedures	Other comments
p_{VE}	Fuel efficiency improve rate by vehicle/fuel efficiency measures		(%)	C	surveys data	collecting the data from demonstration test	The data is updated at least in the years 1 and 4 of the project period.	Verified monitoring devices are installed and they are calibrated once a year. Verification and calibration shall meet international standard on corresponding monitoring devices.	

13.2 Reference emissions (Calculation method 2: for increased transit efficiency activities)

Option 1

Parameters	Description of data	Estimated Values	Units	Monitoring pattern	Source of data	Measurement methods and procedures	Monitoring frequency	QA/QC procedures	Other comments
$RFC_{i,x,y}$	Referential fuel consumption of vehicle category i using fuel type x in year y		(mass or volume units of fuel/km)	B	Based on fuelling station reports for control group vehicle	collecting purchase amount from retailer invoices and inputting to an spread sheet manually	Continuously, aggregated at least annually	Control with fuel invoices	Control group vehicles are set before project start
$NCV_{x,y}$	Net calorific value of fuel type x in year y		(J/mass or volume units of fuel)	A	a) Value provided by the fuel supplier b) Regional or national default value c) IPCC default values as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	measurements should be undertaken in line with national or international fuel standards Data at the lower limit of the uncertainty at a 95% confidence interval	For (a) : the NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For (b): review the appropriateness of the values annually For (c): any future revision of the IPCC Guidelines should be taken into account	Verify if the values under (a), (b) and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol 2 of the 2006 IPCC Guidelines. If the values fall below this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b) or (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards	The parameter is used for baseline as well as project emissions and vehicle owners or operators can buy fuel from a variety of sources (fuel stations). In practice therefore it is considered to be simpler to determine the parameter using options (b) or (c)
$EF_{CO2,x,y}$	Carbon emission factor for fuel type x in year y		(gCO2/J)	A					

Table Default value RFC vehicles Urban Usage

Vehicle category	unit	for Gasoline	for Diesel
Cars	paid mileage km/l	4.5	5.5
Taxis	paid mileage km/l	4	5.5
Motorcycles	paid mileage km/l	30	-
Motorized 3-wheelers	paid mileage km/l	11	12
Large urban buses	paid mileage km/l	0.9	1.1

Option 2

Parameters	Description of data	Estimated Values	Units	Monitoring pattern	Source of data	Measurement methods and procedures	Monitoring frequency	QA/QC procedures	Other comments
p_{TE}	Fuel efficiency improve rate by transit efficiency measures		(%)	C	surveys data	collecting the data from demondtration test	The data is updated at least in the years 1 and 4 of the project period.	Verified monitoring devices are installed and they are calibrated once a year. Verification and calibration shall meet international standard on corresponding monitoring devices.	

13.3 Project emissions (Calculation method 1: for increased vehicle/fuel efficiency activities)

Parameters	Description of data	Estimated Values	Units	Monitoring pattern	Source of data	Measurement methods and procedures	Monitoring frequency	QA/QC procedures	Other comments
DDi,y	Total distance driven by vehicle category i project vehicles in year y during project period		(km)	B	taxi operator	Based on GPS (preferred), other electronic means or odometer	Continuously, aggregated at least annually		
PFCi,x,y	Project fuel consumption of vehicle category i using fuel type x in year y		(mass or volume units of fuel/km)	B	Based on fuelling station reports for project group vehicle	collecting purchase amount from retailer invoices and inputting to an spread sheet manually	Continuously, aggregated at least annually	Control with fuel invoices	N/A
$NCV_{x,y}$	Net Calorific value of fuel type x in year y		(J/mass or volume units of fuel)	A	a) Value provided by the fuel supplier b) Regional or national default value c) IPCC default values as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	measurements should be undertaken in line with national or international fuel standards Data at the lower limit of the uncertainty at a 95% confidence interval	For (a) : the NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For (b): review the appropriateness of the values annually For (c): any future revision of the IPCC Guidelines should be taken into account	Verify if the values under (a), (b) and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol 2 of the 2006 IPCC Guidelines. If the values fall below this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b) or (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards	The parameter is used for baseline as well as project emissions and vehicle owners or operators can buy fuel from a variety of sources (fuel stations). In practice therefore it is considered to be simpler to determine the parameter using options (b) or (c)
$EF_{CO2,x,y}$	Carbon emission factor for fuel type x in year y		(gCO2/J)	A					

13.4 Project emissions (Calculation method 2: for increased transit efficiency activities)

Parameters	Description of data	Estimated Values	Units	Monitoring pattern	Source of data	Measurement methods and procedures	Monitoring frequency	QA/QC procedures	Other comments
PDi,y	Total paid mileage by vehicle category i project vehicles in year y		(km)	B	taxi operator	Based on transactions from taxi drivers	Continuously, aggregated at least annually		
PFCi,x,y	Project fuel consumption of vehicle category i using fuel type x in year y		(mass or volume units of fuel/km)	B	Based on fuelling station reports for project group vehicle	collecting puchase amount from retailer invoices and inputing to an spread sheet manually	Continuously, aggregated at least annually	Control with fuel invoices	N/A
$NCV_{x,y}$	Net Calorific value of fuel type x in year y		(J/mass or volume units of fuel)	A	a) Value provided by the fuel supplier b) Regional or national default value c) IPCC default values as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	measurements should be undertaken in line with national or international fuel standards Data at the lower limit of the uncertainty at a 95% confidence interval	For (a) : the NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For (b): review the appropriateness of the values annually For (c): any future revision of the IPCC Guidelines should be taken into account	Verify if the values under (a), (b) and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol 2 of the 2006 IPCC Guidelines. If the values fall below this range, collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b) or (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards	The parameter is used for baseline as well as project emissions and vehicle owners or operators can buy fuel from a variety of sources (fuel stations). In practice therefore it is considered to be simpler to determine the parameter using options (b) or (c)
$EF_{CO2,x,y}$	Carbon emission factor for fuel type x in year y		(gCO2/J)	A					

[Attachment to Project Designe Document] Ex-ante Estimation of Emission Reductions - calculation method 1

Option 1

1. Calculations for emission reductions	Value	Units	Parameter
Emission reductions during the period of year y	0.00	tCO_2/y	ER_y

2. Set values for calculation of project emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{f,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33.0	GJ/kl	0.0693	tCO_2/GJ	0.0555	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO_2/GJ	0.0889	L/km
	LPG	50.8	GJ/t	0.0599	tCO_2/GJ	0.0777	Nm3/km
	Natural gas	43.5	GJ/1000Nm	0.051	tCO_2/GJ	0.0666	kg/km
	Electricity	1.0	-	0.456	tCO_2/MWh	0.9898	kwh/km
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

3. Calculations for project emissions

				Value		
Reference emissions during the period of year y				0.00	tCO2/y	RE_y
	vehicle category 1			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance		10,000,000	km/yr	$DD_{i,y}$
	vehicle category 2			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance		10,000,000	km/yr	$DD_{i,y}$
	vehicle category 3			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance		10,000,000	km/yr	$DD_{i,y}$
	vehicle category 4			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance		10,000,000	km/yr	$DD_{i,y}$
	vehicle category 10			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance		10,000,000	km/yr	$DD_{i,y}$

4. Set values for calculation of reference emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{f,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	(1)						
	(2)						
	(3)						
	(4)						
	(5)						
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

5. Calculations for reference emissions

				Value		
Reference emissions during the period of year y				0.00	tCO2/y	RE_y
	vehicle category 1			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance			km/yr	$DD_{i,y}$
	vehicle category 2			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance			km/yr	$DD_{i,y}$
	vehicle category 3			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance			km/yr	$DD_{i,y}$
	vehicle category 4			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance			km/yr	$DD_{i,y}$
	vehicle category 10			0.00	tCO2/y	i
		Fuel type		Select from list		x
		Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		0.000	-	NCV_x
		CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
		Total drive distance			km/yr	$DD_{i,y}$

[Attachment to Project Designe Document] Ex-ante Estimation of Emission Reductions - calculation method 1

Option 2

1. Calculations for emission reductions	Value	Units	Parameter
Emission reductions during the period of year y	155.37	tCO_2/y	ER_y

2. Set values for calculation of project emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{f,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33.0	GJ/kl	0.0693	tCO_2/GJ	0.0555	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO_2/GJ	0.0889	L/km
	LPG	50.8	GJ/t	0.0599	tCO_2/GJ	0.0777	Nm3/km
	Natural gas	43.5	GJ/1000Nm	0.051	tCO_2/GJ	0.0666	kg/km
	Electricity	1.0	-	0.456	tCO_2/MWh	0.9898	kwh/km
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

3. Calculations for project emissions

				Value		
Reference emissions during the period of year y				1,398.36	tCO2/y	RE_y
	vehicle category 1	vios		1,269.23	tCO2/y	i
		Fuel type		Gasoline		x
		Specific fuel consumption rate		0.05550	L/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		33.000	GJ/kl	NCV_x
		CO2 emission factor of fossil fuel		0.06930	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		10,000,000	km/yr	$DD_{i,y}$
	vehicle category 2	innova		2.54	tCO2/y	i
		Fuel type		Gasoline		x
		Specific fuel consumption rate		0.05550	L/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		33.000	GJ/kl	NCV_x
		CO2 emission factor of fossil fuel		0.06930	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		20,000	km/yr	$DD_{i,y}$
	vehicle category 3	calora		4.43	tCO2/y	i
		Fuel type		Natural gas		x
		Specific fuel consumption rate		0.06660	kg/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		43.500	GJ/1000Nm3	NCV_x
		CO2 emission factor of fossil fuel		0.05100	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		30,000	km/yr	$DD_{i,y}$
	vehicle category 4	Hilux		5.91	tCO2/y	i
		Fuel type		Natural gas		x
		Specific fuel consumption rate		0.06660	kg/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		43.500	GJ/1000Nm3	NCV_x
		CO2 emission factor of fossil fuel		0.05100	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		40,000	km/yr	$DD_{i,y}$
	vehicle category 10	poncho		14.78	tCO2/y	i
		Fuel type		Natural gas		x
		Specific fuel consumption rate		0.06660	kg/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		43.500	GJ/1000Nm3	NCV_x
		CO2 emission factor of fossil fuel		0.05100	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		100,000	km/yr	$DD_{i,y}$

4. Set values for calculation of reference emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{f,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33	GJ/kl	0.0693	tCO2/GJ	0.06166667	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO2/GJ	0.09875556	L/km
	LPG	50.8	GJ/t	0.0599	tCO2/GJ	0.08634444	Nm3/km
	Natural gas	43.5	GJ/1000Nm	0.051	tCO2/GJ	0.074	kg/km
	Electricity	1	-	0.456	tCO2/MWh	1.09977778	kwh/km
	(6)	0	0	0	0	0	0
	(7)	0	0	0	0	0	0
	(8)	0	0	0	0	0	0
	(9)	0	0	0	0	0	0
	(10)	0	0	0	0	0	0

5. Calculations for reference emissions

				Value		
Reference emissions during the period of year y				1,553.73	tCO2/y	RE_y
	vehicle category 1	vios		1,410.26	tCO2/y	i
		Fuel type		Gasoline	0	x
		Specific fuel consumption rate		0.06167	L/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		33	GJ/kl	NCV_x
		CO2 emission factor of fossil fuel		0.0693	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		10,000,000	km/yr	$DD_{i,y}$
	vehicle category 2	innova		2.82	tCO2/y	i
		Fuel type		Gasoline	0	x
		Specific fuel consumption rate		0.06167	L/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		33	GJ/kl	NCV_x
		CO2 emission factor of fossil fuel		0.0693	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		20,000	km/yr	$DD_{i,y}$
	vehicle category 3	calora		4.93	tCO2/y	i
		Fuel type		Natural gas	0	x
		Specific fuel consumption rate		0.07400	kg/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		43.5	GJ/1000Nm3	NCV_x
		CO2 emission factor of fossil fuel		0.051	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		30,000	km/yr	$DD_{i,y}$
	vehicle category 4	Hilux		6.57	tCO2/y	i
		Fuel type		Natural gas	0	x
		Specific fuel consumption rate		0.07400	kg/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		43.5	GJ/1000Nm3	NCV_x
		CO2 emission factor of fossil fuel		0.051	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		40,000	km/yr	$DD_{i,y}$
	vehicle category 10	poncho		16.42	tCO2/y	i
		Fuel type		Natural gas	0	x
		Specific fuel consumption rate		0.07400	kg/km	$RFC_{i(x),y}$
		Net calorific value of fossil fuel		43.5	GJ/1000Nm3	NCV_x
		CO2 emission factor of fossil fuel		0.051	tCO2/GJ	$EF_{CO2,x}$
		Total drive distance		100,000	km/yr	$DD_{i,y}$

	vehicle category	Fuel efficiency improve rate by vehicle/fuel effciency measured
1	vios	10%
2	innova	10%
3	calora	10%
4	Hilux	10%
5	leaf	10%
6	Sai	10%
7	aqua	10%
8	miev	10%
9	alt	10%
10	poncho	10%

[Attachment to Project Designe Document] Ex-ante Estimation of Emission Reductions - calculation method 2

Option 1

1. Calculations for emission reductions	Value	Units	Parameter
Emission reductions during the period of year y	0.00	tCO_2/y	ER_y

2. Set values for calculation of project emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{i,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33.0	GJ/kl	0.0693	tCO_2/GJ	0.0555	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO_2/GJ	0.0889	L/km
	LPG	50.8	GJ/t	0.0599	tCO_2/GJ	0.0777	Nm3/km
	Natural gas	43.5	GJ/1000Nm	0.051	tCO_2/GJ	0.0666	kg/km
	Electricity	1.0	-	0.456	tCO_2/MWh	0.9898	kwh/km
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

3. Calculations for project emissions

Reference emissions during the period of year y			0.00	tCO2/y	RE_y
vehicle category 1			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 2			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 3			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 4			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 10			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$

4. Set values for calculation of reference emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{i,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	(1)						
	(2)						
	(3)						
	(4)						
	(5)						
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

5. Calculations for reference emissions

Reference emissions during the period of year y			0.00	tCO2/y	RE_y
vehicle category 1			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 2			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 3			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 4			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 10			0.00	tCO2/y	i
	Fuel type		Select from list		x
	Specific fuel consumption rate		0.00000	-	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		0.000	-	NCV_x
	CO2 emission factor of fossil fuel		0.00000	-	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$

[Attachment to Project Designe Document] Ex-ante Estimation of Emission Reductions - calculation method 2

Option 2

1. Calculations for emission reductions	Value	Units	Parameter
Emission reductions during the period of year y	8,978.77	tCO_2/y	ER_y

2. Set values for calculation of project emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{i,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33.0	GJ/kl	0.0693	tCO_2/GJ	0.0555	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO_2/GJ	0.0889	L/km
	LPG	50.8	GJ/t	0.0599	tCO_2/GJ	0.0777	Nm3/km
	Natural gas	43.5	GJ/1000Nm	0.051	tCO_2/GJ	0.0666	kg/km
	Electricity	1.0	-	0.456	tCO_2/MWh	0.9898	kwh/km
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

3. Calculations for project emissions

Reference emissions during the period of year y			48,741.92	tCO2/y	RE_y
vehicle category 1	vios		2,820.51	tCO2/y	i
	Fuel type		Gasoline		x
	Specific fuel consumption rate		0.05550	L/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		33.000	GJ/kl	NCV_x
	CO2 emission factor of fossil fuel		0.06930	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 2	innova		2,820.51	tCO2/y	i
	Fuel type		Gasoline		x
	Specific fuel consumption rate		0.05550	L/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		33.000	GJ/kl	NCV_x
	CO2 emission factor of fossil fuel		0.06930	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 3	calora		3,283.38	tCO2/y	i
	Fuel type		Natural gas		x
	Specific fuel consumption rate		0.06660	kg/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		43.500	GJ/1000Nm3	NCV_x
	CO2 emission factor of fossil fuel		0.05100	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 4	Hilux		3,283.38	tCO2/y	i
	Fuel type		Natural gas		x
	Specific fuel consumption rate		0.06660	kg/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		43.500	GJ/1000Nm3	NCV_x
	CO2 emission factor of fossil fuel		0.05100	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 10	poncho		3,283.38	tCO2/y	i
	Fuel type		Natural gas		x
	Specific fuel consumption rate		0.06660	kg/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		43.500	GJ/1000Nm3	NCV_x
	CO2 emission factor of fossil fuel		0.05100	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		45%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$

4. Set values for calculation of reference emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{i,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33	GJ/kl	0.0693	tCO2/GJ	0.05842105	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO2/GJ	0.09355789	L/km
	LPG	50.8	GJ/t	0.0599	tCO2/GJ	0.0818	Nm3/km
	Natural gas	43.5	GJ/1000Nm	0.051	tCO2/GJ	0.07010526	kg/km
	Electricity	1	-	0.456	tCO2/MWh	1.04189474	kwh/km
	(6)	0	0	0	0	0	0
	(7)	0	0	0	0	0	0
	(8)	0	0	0	0	0	0
	(9)	0	0	0	0	0	0
	(10)	0	0	0	0	0	0

5. Calculations for reference emissions

Reference emissions during the period of year y			57,720.69	tCO2/y	RE_y
vehicle category 1	vios		3,340.08	tCO2/y	i
	Fuel type		Gasoline	0	x
	Specific fuel consumption rate		0.05842	L/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		33	GJ/kl	NCV_x
	CO2 emission factor of fossil fuel		0.0693	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		40%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 2	innova		3,340.08	tCO2/y	i
	Fuel type		Gasoline	0	x
	Specific fuel consumption rate		0.05842	L/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		33	GJ/kl	NCV_x
	CO2 emission factor of fossil fuel		0.0693	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		40%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 3	calora		3,888.21	tCO2/y	i
	Fuel type		Natural gas	0	x
	Specific fuel consumption rate		0.07011	kg/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		43.5	GJ/1000Nm3	NCV_x
	CO2 emission factor of fossil fuel		0.051	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		40%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 4	Hilux		3,888.21	tCO2/y	i
	Fuel type		Natural gas	0	x
	Specific fuel consumption rate		0.07011	kg/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		43.5	GJ/1000Nm3	NCV_x
	CO2 emission factor of fossil fuel		0.051	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		40%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$
vehicle category 10	poncho		3,888.21	tCO2/y	i
	Fuel type		Natural gas	0	x
	Specific fuel consumption rate		0.07011	kg/km	$RFC_{i(x),y}$
	Net calorific value of fossil fuel		43.5	GJ/1000Nm3	NCV_x
	CO2 emission factor of fossil fuel		0.051	tCO2/GJ	$EF_{CO2,x}$
	Occupation rate to DD		40%		$PMR_{i,y}$
	Paid mileage distance		10,000,000	km/yr	$PD_{i,y}$

	vehicle category	Occupation improve rate by transit effciency measures
1	vios	5%
2	innova	5%
3	calora	5%
4	Hilux	5%
5	leaf	5%
6	Sai	5%
7	aqua	5%
8	miev	5%
9	alt	5%
10	poncho	5%

[Attachment to Project Designe Document] Ex-ante Estimation of Emission Reductions - calculation method 3

Option 1

1. Calculations for emission reductions	Value	Units	Parameter
Emission reductions during the period of year y	0.00	tCO_2/y	ER_y

2. Set values for calculation of project emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{f,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33.0	GJ/kl	0.0693	tCO_2/GJ	0.0555	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO_2/GJ	0.0889	L/km
	LPG	50.8	GJ/t	0.0599	tCO_2/GJ	0.0777	Nm3/km
	Natural gas	43.5	GJ/1000Nr	0.051	tCO_2/GJ	0.0666	kg/km
	Electricity	1.0	-	0.456	tCO_2/MWh	0.9898	kwh/km
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

3. Calculations for project emissions

Reference emissions during the period of year y	0.00	tCO2/y	RE_y
vehicle category 1	0.00	tCO2/y	i
Fuel type	Select from list		x
Specific fuel consumption rate	0.00000	-	$RFC_{i(x),y}$
Net calorific value of fossil fuel	0.000	-	NCV_x
CO2 emission factor of fossil fuel	0.00000	-	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 2	0.00	tCO2/y	i
Fuel type	Select from list		x
Specific fuel consumption rate	0.00000	-	$RFC_{i(x),y}$
Net calorific value of fossil fuel	0.000	-	NCV_x
CO2 emission factor of fossil fuel	0.00000	-	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 3	0.00	tCO2/y	i
Fuel type	Select from list		x
Specific fuel consumption rate	0.00000	-	$RFC_{i(x),y}$
Net calorific value of fossil fuel	0.000	-	NCV_x
CO2 emission factor of fossil fuel	0.00000	-	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 10	0.00	tCO2/y	i
Fuel type	Select from list		x
Specific fuel consumption rate	0.00000	-	$RFC_{i(x),y}$
Net calorific value of fossil fuel	0.000	-	NCV_x
CO2 emission factor of fossil fuel	0.00000	-	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$

4. Set values for calculation of reference emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{f,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	(1)						
	(2)						
	(3)						
	(4)						
	(5)						
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

5. Calculations for reference emissions

Reference emissions during the period of year y	0.00	tCO2/y	RE_y
vehicle category 1	0.00	tCO2/y	i
Fuel type	Select from list		x
Specific fuel consumption rate	0.00000	-	$RFC_{i(x),y}$
Net calorific value of fossil fuel	0.000	-	NCV_x
CO2 emission factor of fossil fuel	0.00000	-	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 2	0.00	tCO2/y	i
Fuel type	Select from list		x
Specific fuel consumption rate	0.00000	-	$RFC_{i(x),y}$
Net calorific value of fossil fuel	0.000	-	NCV_x
CO2 emission factor of fossil fuel	0.00000	-	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 3	0.00	tCO2/y	i
Fuel type	Select from list		x
Specific fuel consumption rate	0.00000	-	$RFC_{i(x),y}$
Net calorific value of fossil fuel	0.000	-	NCV_x
CO2 emission factor of fossil fuel	0.00000	-	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 10	0.00	tCO2/y	i
Fuel type	Select from list		x
Specific fuel consumption rate	0.00000	-	$RFC_{i(x),y}$
Net calorific value of fossil fuel	0.000	-	NCV_x
CO2 emission factor of fossil fuel	0.00000	-	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$

[Attachment to Project Designe Document] Ex-ante Estimation of Emission Reductions - calculation method 3

Option 2

1. Calculations for emission reductions	Value	Units	Parameter
Emission reductions during the period of year y	12,185.48	tCO_2/y	ER_y

2. Set values for calculation of project emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{f,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33.0	GJ/kl	0.0693	tCO_2/GJ	0.0555	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO_2/GJ	0.0889	L/km
	LPG	50.8	GJ/t	0.0599	tCO_2/GJ	0.0777	Nm3/km
	Natural gas	43.5	GJ/1000Nr	0.051	tCO_2/GJ	0.0666	kg/km
	Electricity	1.0	-	0.456	tCO_2/MWh	0.9898	kwh/km
	(6)						
	(7)						
	(8)						
	(9)						
	(10)						

3. Calculations for project emissions

Reference emissions during the period of year y	48,741.92	tCO2/y	RE_y
vehicle category 1 vios	2,820.51	tCO2/y	i
Fuel type	Gasoline		x
Specific fuel consumption rate	0.05550	L/km	$RFC_{i(x),y}$
Net calorific value of fossil fuel	33.000	GJ/kl	NCV_x
CO2 emission factor of fossil fuel	0.06930	tCO2/GJ	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 2 innova	2,820.51	tCO2/y	i
Fuel type	Gasoline		x
Specific fuel consumption rate	0.05550	L/km	$RFC_{i(x),y}$
Net calorific value of fossil fuel	33.000	GJ/kl	NCV_x
CO2 emission factor of fossil fuel	0.06930	tCO2/GJ	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 3 calora	3,283.38	tCO2/y	i
Fuel type	Natural gas		x
Specific fuel consumption rate	0.06660	kg/km	$RFC_{i(x),y}$
Net calorific value of fossil fuel	43.500	GJ/1000Nm3	NCV_x
CO2 emission factor of fossil fuel	0.05100	tCO2/GJ	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 10 poncho	3,283.38	tCO2/y	i
Fuel type	Natural gas		x
Specific fuel consumption rate	0.06660	kg/km	$RFC_{i(x),y}$
Net calorific value of fossil fuel	43.500	GJ/1000Nm3	NCV_x
CO2 emission factor of fossil fuel	0.05100	tCO2/GJ	$EF_{CO2,x}$
Occupation rate to DD	45%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$

4. Set values for calculation of reference emissions

	Fuel	$NCV_{i,y}$	unit	$EF_{f,i,y}$	unit	$RFC_{i,y}$	unit
	Select from list		-		-		-
	Gasoline	33	GJ/kl	0.0693	tCO2/GJ	0.06166667	L/km
	Diesel	37.7	GJ/kl	0.0687	tCO2/GJ	0.09875556	L/km
	LPG	50.8	GJ/t	0.0599	tCO2/GJ	0.08634444	Nm3/km
	Natural gas	43.5	GJ/1000Nr	0.051	tCO2/GJ	0.074	kg/km
	Electricity	1	-	0.456	tCO2/MWh	1.09977778	kwh/km
	(6)	0	0	0	0	0	0
	(7)	0	0	0	0	0	0
	(8)	0	0	0	0	0	0
	(9)	0	0	0	0	0	0
	(10)	0	0	0	0	0	0

5. Calculations for reference emissions

Reference emissions during the period of year y	60,927.40	tCO2/y	RE_y
vehicle category 1 vios	3,525.64	tCO2/y	i
Fuel type	Gasoline	0	x
Specific fuel consumption rate	0.06167	L/km	$RFC_{i(x),y}$
Net calorific value of fossil fuel	33	GJ/kl	NCV_x
CO2 emission factor of fossil fuel	0.0693	tCO2/GJ	$EF_{CO2,x}$
Occupation rate to DD	40%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 2 innova	3,525.64	tCO2/y	i
Fuel type	Gasoline	0	x
Specific fuel consumption rate	0.06167	L/km	$RFC_{i(x),y}$
Net calorific value of fossil fuel	33	GJ/kl	NCV_x
CO2 emission factor of fossil fuel	0.0693	tCO2/GJ	$EF_{CO2,x}$
Occupation rate to DD	40%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 3 calora	4,104.23	tCO2/y	i
Fuel type	Natural gas	0	x
Specific fuel consumption rate	0.07400	kg/km	$RFC_{i(x),y}$
Net calorific value of fossil fuel	43.5	GJ/1000Nm3	NCV_x
CO2 emission factor of fossil fuel	0.051	tCO2/GJ	$EF_{CO2,x}$
Occupation rate to DD	40%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$
vehicle category 10 poncho	4,104.23	tCO2/y	i
Fuel type	Natural gas	0	x
Specific fuel consumption rate	0.07400	kg/km	$RFC_{i(x),y}$
Net calorific value of fossil fuel	43.5	GJ/1000Nm3	NCV_x
CO2 emission factor of fossil fuel	0.051	tCO2/GJ	$EF_{CO2,x}$
Occupation rate to DD	40%		$PMR_{i,y}$
Paid mileage distance	10,000,000	km/yr	$PD_{i,y}$

	vehicle category	Fuel efficiency improve rate by vehicle/fuel effciency
1	0	10%
2	0	10%
3	0	10%
4	0	10%
5	0	10%
6	0	10%
7	alt	10%
8	0	10%
9	0	10%
10	0.0687	10%

	vehicle category	Occupation improve rate by transit effciency measures
1	vios	5%
2	innova	5%
3	calora	5%
4	Hilux	5%
5	leaf	5%
6	Sai	5%
7	aqua	5%
8	miev	5%
9	alt	5%
10	poncho	5%