CDM: form for proposed new small scale methodologies (F-CDM-SSC-NM) (version 01)

(To be used for proposing a new small scale methodology in accordance with article 15 and 16 of the simplified modalities for small-scale CDM project activity categories. This form is not to be used in case of large scale methodologies).

Name of person/entity submitting this form:	Name: Daiki Nose Entity: Pacific Consultants Co., Ltd. Name: Yoshihiro Mizuno Entity: Pacific Consultants Co., Ltd.
Title of the proposed small scale methodology:	Introduction of fuel efficiency improvement technologies for motorcycles
Please suggest type to which the new proposed methodology (category) belongs to:	☐ Type I Renewable energy projects ☐ Type II Energy efficiency improvements ☒ Type III Other project activities

Information for completing the form

For proposing a new small scale methodology all sections below should be completed. Approved small scale methodologies shall be used as a reference for language and structure used. If necessary, attach files or refer to sources of relevant information.

1. **Technology/measure: please specify and provide reference to the exact technology/measure the proposed small scale methodology is applicable to and describe in detail the applicability conditions of the proposed methodology.**

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Technology/measure

1. This methodology is for project activities providing appropriate motorcycle maintenance.
2. Projects applying this methodology enhance the provision of maintenance activities for motorcycles.
3. Appropriate maintenance activities include, for example, cleaning air cleaner elements, cleaning spark plug electrodes, and changing engine oil.
4. By providing these maintenance techniques, the operating performance of the motorcycle improves; for example, it will operate with better fuel combustion efficiency and less engine friction. As a consequence, CO2 emissions associated with fossil fuel combustion from the motorcycles maintained are reduced due to a decrease in fuel consumption in litres per kilometre.
5. The project activity of motorcycle maintenance should be provided once every three months to ensure the improvement of fuel economy.
6. The maintenance described herein can also provide co-benefit effects, including a reduction in hydrocarbon (HC) and carbon monoxide (CO) emissions, which cause air pollution.

Applicability

7. This methodology covers distances for commuting from motorcycle owner's home to company within the project boundary.
8. This methodology is applicable to:
   (a) Motorcycles using gasoline as fuel
   (b) Motorcycles with engine displacement of less than 150cc
   (c) Motorcycles with a properly functioning odometer (essential for calculating travel distance for monitoring)
   (d) A region that has no mandatory motorcycle investigation system or where such a system exists but is unenforced
9. The methodology is not applicable to:
   (a) Motorcycles using a power source other than gasoline
   (b) Motorcycles with a non-functioning odometer
10. Project participants shall take note of and maintain records of each project motorcycle's identification

number.

11. The applicability of this methodology is limited to projects that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

2. Boundary: please specify the project boundary of the proposed methodology.

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12. The project boundary is an area of approximately 40 km in radius from the project site, and covers motorcycles that are the part of the project activity.
13. The project boundary also includes the geographical area covering the physical commuting routes along which these motorcycles operate.

3. Baseline: please specify the baseline scenario and the way baseline emissions are calculated.

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14. The baseline scenario is a situation in which motorcycles continue to be used, but receive no maintenance or less maintenance than indicated above (defined hereinafter as "un-maintained" motorcycles). This scenario results in more fossil fuel consumption than in the case of the project activity.
15. The baseline emissions are calculated by the following formulae.

$$BE_y = \sum BE_{dc,y}$$

Where:

BE_y : Total baseline emissions in year *y* (tCO2)
$BE_{dc,y}$: Total baseline emissions of motorcycles in engine displacement class *dc* in year *y*.

$$BE_{dc,y} = (SN_{p,dc,y} \text{ or } N_{p,dc,y}) \times BFE_{dc,y} \times AD_{PL,commuting,p,y} \times EF_{CO2,j} \times NCV_j \times D_j$$

Where:

$SN_{p,dc,y}$ (in option 1) : Statistical number of project motorcycles *p* in engine displacement class *dc* in year *y*
$N_{p,dc,y}$ (in option 2) : Number of project motorcycles *p* in engine displacement class *dc* in year *y*
$BFE_{dc,y}$: Representative value of baseline fuel economy of motorcycle in each engine displacement class *dc* in year *y* (litre/km)
$AD_{PL,commuting,p,y}$: Average annual commuting distance of project motorcycles *p* in year *y* (km)
$EF_{CO2,j}$: CO2 emission factor of fuel type *j* (tCO2/MJ)
NCV_j : Net calorific value of fuel type *j* (MJ/t)
D_j : Density of fuel type *j* (g/cm^3)

16. Project participants shall first determine the baseline fuel economy in each engine displacement class *dc*, e.g. <100cc, 100-125cc and ≤150cc.
17. Engine displacement classes shall be determined in view of circumstances in the host country.
18. The baseline fuel economy shall be determined using one of options below.

Option 1: Sample survey based on confidence interval

19. The parameter $BFE_{dc,y}$ shall be determined by statistical method based on $BFE_{sample,\ dc,\ y}$ obtained from baseline motorcycles in a sample survey and $BFE_{sample,\ dc,\ y}$ is calculated according to the following formula:

$$BFE_{sample,\ dc,\ y} = FC_{BL,\ sample,\ dc,\ y} / TD_{BL,\ sample,\ dc,\ y}$$

Where:

$FC_{BL,\ sample,\ dc,\ y}$:
Amount of fuel consumed by a sample un-maintained motorcycle in engine displacement class *dc* during

sample survey in year *y*

This value is obtained by measuring the actual fuel consumption of a sample un-maintained motorcycle operating in comparable traffic conditions (i.e., in the same city) during the sample survey. It is measured based on the amount of fuel needed to fill the fuel tank after use of the motorcycle in a defined period, with the tank having been filled at the beginning of the sample survey.

$TD_{BL, sample, dc, y}$:
Travel distance of the sample un-maintained motorcycle with fuel consumption of $FC_{BL, sample, dc, y}$

This value is obtained by measuring the actual travel distances of the sample un-maintained motorcycle with fuel consumption of $FC_{BL, sample, dc, y}$. The travel distance is read from the odometer. Project participants are required to record the readings on the odometer.

Both parameter values must be obtained from a given motorcycle at the same time.

20. In order to conduct a sample survey to determine $BFE_{dc,y}$ in each engine displacement class *dc*, measurements shall be taken on a representative sample of motorcycles and any $BFE_{dc,y}$ shall comply with a 90% confidence interval and a ±10% error margin to determine the sample size. Measurement principles and techniques used for the baseline sample shall be identical to the project sample. The upper 95% confidence interval is taken.

Example of a baseline fuel economy data matrix in Option 1

Engine displacement class *dc*	Percentage of motorcycles in the sample survey (%)	Statistical number of project motorcycles $SN_{p,dc,y}$	Baseline fuel economy $BFE_{dc,y}$
dc1(<100cc)	q1	$SN_{p,dc1,y}$ = q1 x PMs	$BFE_{dc1,y}$
dc2(100cc-125cc)	q2	$SN_{p,dc2,y}$ = q2 x PMs	$BFE_{dc2,y}$
dc3(≤150cc)	q3	$SN_{p,dc3,y}$= q3 x PMs	$BFE_{dc3,y}$
	q1+q2+q3=100%	$SN_{p,dc1,y}$+ $SN_{p,dc2,y}$+ $SN_{p,dc3,y}$=Total number of project motorcycles (PMs)	

Option 2: Sample survey based on a defined number of motorcycles

21. In Option 2, a defined number of baseline motorcycles shall be the subject of the project activity: baseline motorcycles will be used as project motorcycles.
22. The parameter $BFE_{dc,y}$ in this option shall be determined by $BFE_{p, dc,y}$ of a defined number of project motorcycles before maintenance, and $BFE_{p, dc,y}$ is calculated according to the following formula:

$$BFE_{p, dc,y} = FC_{BL, p, dc, y} / TD_{BL, p, dc, y}$$

Where:
$FC_{BL, p, dc, y}$:
The consumed amount of fuel by a project motorcycle *p* in engine displacement class *dc* during a sample survey in year *y*

This value is obtained by measuring the actual fuel consumption of an un-maintained project motorcycle. It is measured based on the amount of fuel needed to fill the fuel tank after use of the motorcycle in a defined period, with the tank having been filled at the beginning of the sample survey.

$TD_{BL, p, dc, y}$:
Travel distances of the un-maintained project motorcycle with fuel consumption of $FC_{BL, p, dc, y}$

This value is obtained by measuring the actual travel distances of the un-maintained project motorcycle with fuel consumption of $FC_{BL, p, dc, y}$. The travel distance is read from the odometer. Project participants are required to record the readings on the odometer.

Both parameter values must be obtained from a given motorcycle at the same time.

23. The $BFE_{dc,y}$ is the average value of $BFE_{p,\ dc,y}$ in engine displacement class *dc*. $BFE_{p,\ dc,y}$ shall be averaged by the $N_{p,dc,y}$.

Example of a baseline fuel economy data matrix in Option 2

Engine displacement class *dc*	Number of baseline motorcycles (=project motorcycles) $N_{p,dc,y}$	Baseline fuel economy $BFE_{dc,y}$
dc1(<100cc)	$N_{p,dc1,y}$	$BFE_{dc1,y}$
dc2(100cc-125cc)	$N_{p,dc2,y}$	$BFE_{dc2,y}$
dc3(>150cc)	$N_{p,dc3,y}$	$BFE_{dc3,y}$
	$N_{p.dc1,y}+ N_{p.dc2,y}+ N_{p.dc3,y}$=Total number of project motorcycles	

4. Leakage: please specify if leakage emissions can occur and how they should be calculated.

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24. No leakage calculation is required.
25. Travel distances may increase with better fuel economy, resulting in additional CO2 emissions. The improvement of fuel economy due to the project activity would offset those increases, however, because better fuel economy would decrease the fuel consumption of motorcycles operated for uses other than commuting.

5. Project activity emissions: please specify possible project activity emissions and how they should be calculated.

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26. Project emissions from motorcycles provided maintenance are calculated by the following formulae:

$$PE_y = \sum PE_{dc,y}$$

Where:

PE_y : Total project emissions in year *y* (tCO2)
$PE_{dc,y}$: Total project emissions of motorcycles in engine displacement class *dc* in year *y*

$$PE_{dc,y} = N_{p,dc,y} \times PFE_{dc,y} \times AD_{PL,commuting,p,y} \times EF_{CO2,j} \times NCV_j \times D_j$$

$N_{p,dc,y}$: Number of project motorcycles *p* in engine displacement class *dc* in year *y*
$PFE_{dc,y}$: Representative value of improved fuel economy of project motorcycle *p* in engine displacement class *dc* in year *y* (litre/km)
$AD_{PL,commuting,p,y}$: Average annual commuting distance of project motorcycles *p* in year y (km)
$EF_{CO2,\ j}$: CO2 emission factor of fuel type *j* (tCO2/MJ)
NCV_j : Net calorific value of fuel *j* (MJ/t)
D_j : Density of fuel type *j* (g/cm^3)

27. $PFE_{dc,y}$ is determined using the values of actual improvement of fuel economy of project motorcycles *p* after the project activity of maintenance is provided to them.
28. The project fuel economy shall be determined using one of options below. Project participants shall choose Option A when Option 1 is chosen for the determination of baseline fuel economy, and likewise, Option B for Option 2.

Option A: Sample survey based on confidence interval

29. The parameter $PFE_{dc,y}$ is determined by statistical method based on $PFE_{p, dc, y}$ obtained from project fuel economy survey and $PFE_{p, dc, y}$ is calculated according to the following formula:

    $PFE_{p, dc, y} = FC_{PL, p, dc, y} / TD_{PL, p, dc, y}$

    $FC_{PL, p, dc, y}$:
    Amount of fuel consumed by a project motorcycle *p* in engine displacement class *dc* during a project fuel economy survey in year *y*

    This value is obtained by measuring the actual fuel consumption of a project motorcycle during the project fuel economy survey in year *y* and measured based on the amount of fuel needed to fill the fuel tank after use of the motorcycle in a defined period, with the tank having been filled at the beginning of the sample survey.

    $TD_{PL, p, dc, y}$:
    Travel distances of project motorcycles *p* in engine displacement class *dc* with fuel consumption of $FC_{PL, p, dc, y}$

    This value is obtained by measuring the actual travel distances of the project motorcycle with fuel consumption of $FC_{PL, p, dc, y}$. The travel distance is read from the odometer. Project participants are required to record the readings on the odometer.

    Both parameter values must be measured from a given motorcycle at the same time.

30. In order to determine the $PFE_{dc,y}$ in each engine displacement class *dc*, measurements shall be taken on representative project motorcycles in accordance with statistical methods (use 90% confidence interval and ±10% error margin to determine the sample size).Measurement principles and techniques used shall be identical to those in the baseline sample. The lower 95% confidence interval is taken for any $PFE_{dc,y}$.

Option B: Sample survey based on a defined number of motorcycles

31. The baseline motorcycles measured in Option 2 in the determination of $BFE_{dc,y}$ shall be the project motorcycles in this option .
32. The parameter $PFE_{dc,y}$ shall be determined by $PFE_{p, dc ,y}$ and $PFE_{p, dc ,y}$ is calculated according to the following formula:

    $PFE_{p, dc ,y} = FC_{PL, p, dc, y} / TD_{PL, p, dc, y}$

    Where:
    $FC_{PL, p, dc, y}$:
    Amount of fuel consumed by a project motorcycle *p* in engine displacement class *dc* during a project fuel economy survey in year *y*.

    This value is obtained by measuring the actual fuel consumption of a project motorcycle during the project fuel economy survey in year *y* and measured based on the amount of fuel needed to fill the fuel tank after use of the motorcycle in a defined period, with the tank having been filled at the beginning of the project fuel economy survey.

    $TD_{PL, p, dc, y}$:
    Travel distances of a project motorcycle *p* in engine displacement class *dc* with fuel consumption $FC_{PL, p, dc, y}$

    This value is obtained by measuring the actual travel distances of a project motorcycle with fuel consumption of $FC_{PL, p, dc, y}$. The travel distance is read from the odometer. Project participants are required to record the readings on the odometer.

    Both parameter values must be measured from a given motorcycle at the same time.

33. The $PFE_{dc,y}$ is the average value of $PFE_{p,\ dc\ ,y}$ in engine displacement class *dc*. $PFE_{p,\ dc\ ,y}$ shall be averaged by the $N_{p,dc,y}$.

Example of a project fuel economy data matrix in Options A and B

Engine displacement class *dc*	Number of project motorcycles $N_{p,dc,y}$	Project fuel economy $PFE_{dc,y}$
dc1(<100cc)	$N_{p,dc1,y}$	$PFE_{dc1,y}$
dc2(100cc-125cc)	$N_{p,dc2,y}$	$PFE_{dc2,y}$
dc3(>150cc)	$N_{p,dc3,y}$	$PFE_{dc3,y}$
	$N_{p,dc1,y}$+ $N_{p,dc2,y}$+ $N_{p,dc3,y}$=Total number of project motorcycles (PMs)	

Paragraph 34 and 35 below are for both Option A and B.

34. In order to ensure the persistence of the maintenance effect (i.e., improvement of fuel economy), the fuel economy of the project motorcycles (which are the basis of the determination of the $PFE_{dc,y}$) will be examined when maintenance is conducted, once every three months. If the maintenance effect declines, $PFE_{dc,y}$ shall be adjusted using a fuel economy adjustment factor, FE_{ad}, which shall be averaged by $N_{p,dc,y}$. For example, if the improvement of fuel economy due to the maintenance effect declines 20% on average, 20% of total mission reductions between the maintenance times shall be abandoned.

35. $AD_{PL,commuting,p,y}$ is determined by interview or by questionnaire completed by the motorcycle owner when maintenance is provided to project motorcycle *p*.

6. Monitoring: Please specify which parameters should be monitored and how they should be monitored.

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36. Parameters not monitored.

Table: Parameters not monitored

Parameter	Item	Monitoring method
$EF_{CO2,j}$	CO2 emission factor of fuel type *j* (tCO2/MJ)	IPCC default value
NCV_j	Net calorific value of fuel *j* (MJ/t)	IPCC default value
D_j	Density of fuel type *j* (g/cm^3)	International value

37. In order to identify the each project motorcycle separately, project participants shall record adequate information to identify specific owners and their motorcycles (e.g., owner's name, motorcycle manufacturer and model, engine displacement, registration number and purchase date).

38. Parameters monitored: All monitored data shall be recorded electronically and be kept for at least two years after the final crediting period.

Table: Parameters monitored

Parameter	Item	Monitoring method	Frequency
$BFE_{dc,y}$	Baseline fuel economy in engine displacement class *dc* in year y (litre/km)	Sample survey in year *y*. The fuel economy data based on the sample survey shall comply with the 90% confidence interval and 10% margin of error requirement, and the upper value of 95% confidence interval shall be taken in each engine displacement class *dc*.	Annually

$PFE_{dc,y}$	Project fuel economy in engine displacement class *dc* in year y (litres/km)	Sample survey of project motorcycles in year y. The fuel economy data based on the sample survey shall comply with the 90% confidence interval and 10% margin of error requirement, and the lower value of 95% confidence interval shall be taken in each engine displacement class *dc*.	Once every three months
$AD_{PL,commuting,p,y}$	Average annual commuting distance of project motorcycles in year *y* (km)	Interview or questionnaire for motorcycle owners when maintenance is provided to project motorcycles	Annually

7. Project activity under a programme of activities: if the proposed methodology is also intended for application to a project activity under a programme of activities (CPA of PoA) guidance on consideration of leakage when applying to the CPA of PoA shall be provided.

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39. Not intended for application to a CPA of PoA.

Date you are delivering the contribution:	31/03/2011

Information to be completed by the secretariat	
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