CLEAN DEVELOPMENT MECHANISM

AMS-III.S

Small-scale Methodology

Introduction of low-emission vehicles/technologies to commercial vehicle fleets

Version 04.0

Sectoral scope(s): 07

United Nations
Framework Convention on
Climate Change

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key parameter

Typical project(s)	Introduction and operation of new less-greenhouse-gas-emitting vehicles (e.g. CNG, LPG, electric or hybrid) for commercial passengers and freight transport, operating on routes with comparable conditions. Retrofitting of existing vehicles is also applicable
Type of GHG emissions mitigation action	(a) Fuel switch. Displacement of more-GHG-intensive vehicles

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology is for project activities introducing low-greenhouse gas emitting vehicles for commercial passenger (including public transportation), material and freight transport, operating in comparable traffic conditions[1] and on similar terrain. Retrofitting of existing vehicles (e.g. switching from high greenhouse gas intensive to low greenhouse gas intensive fossil fuel) is also included in the methodology.

2.2. Applicability

3. Types of low-emission vehicles to be introduced include but are not limited to:

   (a) Compressed natural gas (CNG) vehicles;

   (b) Electric vehicles;

   (c) Liquid petroleum gas (LPG) vehicles;

   (d) Hybrid vehicles with electrical and internal combustion motive systems.

4. Types of vehicles covered by the methodology include but not limited to:

   (a) Buses, jeepneys, commuter vans and tricycles for public transport;

   (b) Trucks for freight transport, waste collection or other services with regular routes.

[1] Traffic conditions including, for example traffic density and average vehicle speed.

5. Project participants must demonstrate that:

   (a) The project activity is unlikely to change the level of service[2] provided on comparable routes before the project activity;[3]

   (b) The project activity does not include measures to bring about a modal switch (e.g. shift from bus transport to underground train system) in transport.

6. Project participants shall identify the following parameters:

   (a) The level of service of the project activity fleets for example the average/total number of passengers or tonnage transported and the average distance the passengers or freight was transported (per route or per vehicle) on an annual basis.

7. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

2.3. Entry into force

8. The date of entry into force of the revision is 14 days after the date of publication of the EB 70 meeting report on the 7 December 2012.

3. Normative references

9. Project participants shall apply the "General guidelines for SSC CDM methodologies" and "Guidelines on the demonstration of additionality of small-scale project activities" (previously known as Attachment A to Appendix B) provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> mutatis mutandis.

10. This methodology also refers to the latest approved versions of the following tools:

   (a) "Tool to calculate baseline, project and/or leakage emissions from electricity consumption";

   (b) "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

4. Definitions

11. The definitions contained in the Glossary of CDM terms shall apply.

[2] The level of service here refers to the overall level of service of the project activity and differences between the type of baseline and project vehicles are allowable.

[3] That is by showing that the frequency of operations is not decreased by the project activity, the characteristics of the travel route - distance, start and end points and the route itself and/or that the capacity introduced by the project activity is sufficient to service the level of passenger/freight transport previously provided.

5. Baseline methodology

5.1. Boundary

12. The project boundary includes the following:

Fleet to which low emission vehicles are introduced;

(a) The geographical area in which these vehicles operate;

(b) Auxiliary facilities such as fuelling stations, workshops and service stations that are used by the vehicles in the feet.

13. The conditions which govern the operation of the fleet (e.g. tariffs, regulations) should be homogeneous within the project boundary.

5.2. Baseline emissions

14. The baseline vehicles that would have provided the same transportation service level should be identified following the related and relevant requirements for Type II and III Greenfield projects in the "General guidelines for SSC CDM methodologies".

15. The first step to determine the baseline emissions is to calculate a baseline emission factor per passenger or per tonne of goods per kilometre for the baseline vehicle (*BEF$_i$*). The baseline emission factor is determined by dividing the emissions from the total annual distance travelled by each baseline vehicle before the project begins (*D$_i$*) by the total annual passengers or volume of goods transported by each baseline vehicle (*P$_i$*) times the annual average distance of transportation per person or tonne before the project begins.

$$BEF_i = \frac{\sum_j \sum_i D_i \times \eta_{BLV_i} \times NCV_j \times EF_{CO2,j}}{P_i \times dp_i} \quad \text{Equation (1)}$$

Where:

BEF_i	=	Baseline emission factor per passenger or ton of goods per kilometre for the baseline vehicle *i* (t CO_2/passenger km or t CO_2/ton km)
P_i	=	Total annual passengers or tons of goods transported by each baseline vehicle *i* (passengers or tons)
dp_i	=	The annual average distance of transportation per person or tonne of freight by each baseline vehicle *i* (km)
D_i	=	Total annual distance travelled by each baseline vehicle *i* (km)
η_{BLV_i}	=	Fuel efficiency of baseline vehicle *i* (qty of fuel/km, see paragraph 19)

NCV_j = Net calorific value of fuel *j* (MJ/Unit qty of fuel)

$EF_{CO2,j}$ = CO_2 emission factor of fuel used by baseline vehicle (t CO_2/MJ energy content of fuel, country specific data or IPCC default value)

16. In the baseline calculations, the remaining lifetime of the vehicles replaced shall be taken into account in accordance with the guidance provided by the CDM Executive Board (EB 22, annex 2).

17. If electricity is used by the vehicles, the associated emissions shall be estimated as per the *"*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*".*

18. The total baseline emissions are calculated on an annual basis using the monitored data as below.

$$BE_y = \sum P_{i,y,k} \times BEF_I \times dp_{i,y} \qquad \text{Equation (2)}$$

Where:

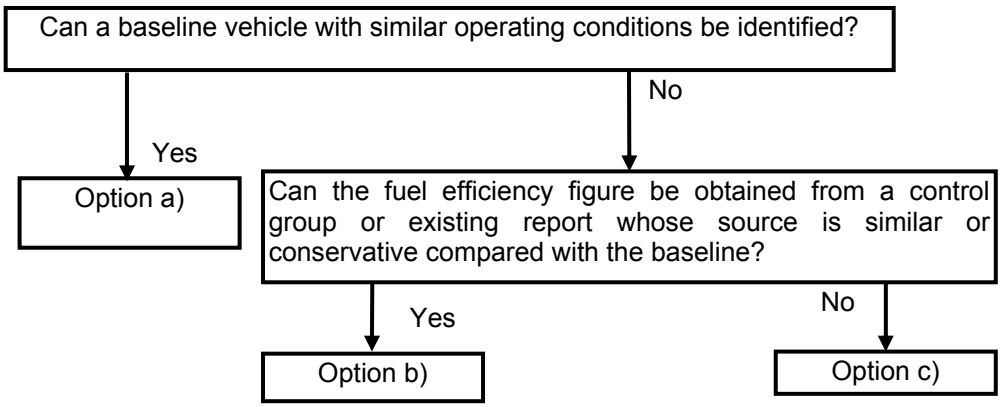
$P_{i,y,k}$ = Total annual passengers or tons of goods transported by each project vehicle *i* in year *y* on route *k* taking into account provisions of section 6.1

BE_y = Total baseline emissions in year *y* (t CO_2/yr)

$dp_{i,y}$ = Annual average distance of transportation per passenger or tonne of goods by project vehicle *i* in year *y* (km) taking into account the provisions of section 6.1

19. The baseline vehicle fuel efficiency (η_{BLV}) is determined as follows (in order of preference):

Figure 1. Determination of the baseline vehicle fuel



(a) When a specific baseline vehicle can be identified, that is a vehicle used in the same area and with similar operating conditions and this vehicle will not be replaced over the life of the project, the following applies: η_{BLV} is determined from the average operational data of the vehicle(s) under baseline operating conditions, using at least one year of operational data, if that data is available. Otherwise data on fuel efficiency can be obtained from the manufacturer's specifications, if it can be demonstrated that the value is conservative given the operating conditions of the baseline vehicles.

This may be the case when the project activity introduces new vehicles, and the baseline vehicle is also new and provides a similar service.

In project activities where baseline vehicles include non-standard vehicles such as jeepneys or tricycles, which are assembled locally, and for which manufacturers´ data is not available, the fuel efficiency may be determined using one of the following two options:

(i) Measure the actual fuel consumption and corresponding distance travelled of a sample of baseline vehicles operating in comparable traffic situations with a similar age or newer, a similar or smaller engine size, a similar or lower passenger/goods load capacity, and a similar weight or lighter and other relevant factors to distinguish vehicles with different fuel consumption rates. Sample vehicles shall be randomly chosen in accordance with the latest version of the "General guidelines for sampling and surveys for CDM project activities and programme of activities" using a 90% confidence interval and a 10% error margin to determine the sample size. The lower bound of 95% confidence interval shall be used as the Fuel Efficiency;

(ii) Use a fuel efficiency value from a peer-reviewed literature source or report authored by a nationally/internationally recognized independent third party or a research institute under the following two conditions to ensure conservative value:

a. The fuel efficiency value was derived from measurements taken under highway driving conditions or similar non-urban traffic conditions;

b. The fuel efficiency value~~s~~ for baseline vehicles was derived with characteristics leading to similar or lower emissions as compared to the baseline vehicles, for example use fuel efficiency values for vehicles of a similar age or newer, a similar or smaller engine size, a similar or lower passenger/goods load capacity, and a similar weight or lighter and other relevant factors to distinguish vehicles with different fuel consumption rate;

(b) If no specific baseline vehicle can be identified or appropriate operational data is not available, then fuel efficiency should be obtained through a statistically significant control group or existing statistics that are regularly updated. Such a control group or the source of data must have similar or conservative characteristics with respect to vehicle age (equal or newer), traffic conditions (equal or better), and air conditioning. The choice of such control group will be, in descending order:

(i) Fleet of the same company operating simultaneously with the project activity;

(ii) Fleet of company with similar operations operating simultaneously with the project activity;

(iii) Host country statistics;

(iv) IPCC or other international data.

Under this option fuel, efficiency is monitored throughout the project crediting period thus gradual efficiency improvements of the fleet or gradual deterioration of driving conditions would automatically be incorporated into the project efficiency levels;

(c) Other cases, where neither Option (a) nor (b) is feasible then baseline fuel efficiency is determined by using the fuel efficiency of top 20% of the fleet before project activity, as determined according to travel distance of each vehicle for the previous three years or according to manufacturers' specifications of the comparable new baseline vehicles. If no data exists for the time period, a shorter period can be chosen, with a minimum period of one year.

20. Note that under all Options (a) till (c), if the identified baseline vehicle does not have air conditioning then the data used should also be from vehicles without air conditioning.

5.3. Project activity emissions

21. Project emissions are determined by monitoring the consumption of fuel or energy consumed by the vehicles introduced, according to the following formula:

$$PE_y = \sum_j \sum_i FC_{i,j,y} \times NCV_j \times EF_{CO2,j,y} \quad \text{Equation (3)}$$

Where:

PE_y	=	Total project emissions in year *y* (t CO_2/yr)
$FC_{i,j,y}$	=	Consumption of fuel *j* by vehicle *i* in year *y* (quantity of fuel)
NCV_J	=	Net calorific value of fuel *j* (as obtained by country specific data or IPCC default value)
$EF_{CO2,j,y}$	=	CO_2 emission factor of fuel used by vehicle (t CO_2/energy content of fuel, country specific data or IPCC default value)

22. For electric vehicles, the emissions from the production of electricity used will constitute the project emissions. This will be determined as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

23. For hybrid vehicles that can run on fossil fuels and electricity, the emissions resulting from the fossil fuel use should also be included in the direct emissions, in addition to emissions from electricity used. The emissions from fossil fuel consumption shall be as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

24. In the case where electric vehicles consuming grid electricity are introduced, project activity emissions are calculated as follows:

$$PE_y = \sum_i EC_{i,y} \times EF_{elec} \qquad \text{Equation (4)}$$

Where:

PE_y = Total project emissions in year *y* (t CO_2/yr)

$EC_{i,y}$ = Consumption of electricity by vehicle *i* in year *y*

EF_{elec} = CO_2 emission factor of electricity, as determined as per the methods of AMS-I.D "Grid connected renewable electricity generation"

25. In project activities where the project vehicles have air conditioning whereas the baseline vehicles do not, then leakage of HFC shall be taken into account. If data is available this should be calculated for the specific AC units and operating conditions of the vehicles in questions. Otherwise a default value of 400 kg of CO_2e/year should be used for each vehicle.

5.4. Leakage

26. No leakage calculation is required.

6. Monitoring methodology

27. Relevant parameters shall be monitored as indicated in section 6.1 below. The applicable requirements specified in the "General guidelines for SSC CDM methodologies" (e.g. calibration requirements, sampling requirements) are also an integral part of the monitoring guidelines specified in the tables below and therefore shall be referred by the project participants.

6.1. Data and parameters monitored

Data / Parameter table 1.

Data / Parameter:	$DT_{PJ,i,y,k}$
Data unit:	–
Description:	Total distance travelled by vehicle *i* in year *y* on route *k* (km/yr)
Source of data:	Driver logs and/or route maps
Measurement procedures (if any):	Driver logs and/or route maps, confirmed by odometer reading
Monitoring frequency:	Annual
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 2.

Data / Parameter:	η_{BLVi}
Data unit:	–
Description:	Efficiency of baseline vehicle (quantify of fuel/km)
Source of data:	As detailed in paragraph 19
Measurement procedures (if any):	As detailed in paragraph 19
Monitoring frequency:	At the start of the crediting period
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 3.

Data / Parameter:	$FC_{i,j,y}$ $EC_{i,y}$
Data unit:	–
Description:	Consumption of fuel *j* (or electricity) by vehicle *i* in year *y* (quantity of fuel or electricity consumed)
Source of data:	Purchase or consumption records the higher value is taken to ensure conservativeness
Measurement procedures (if any):	–
Monitoring frequency:	Annual
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 4.

Data / Parameter:	NCV_j
Data unit:	–
Description:	Net calorific value of fuel *j* (energy content of fuel/quantity of fuel)
Source of data:	Country specific data or IPCC default value
Measurement procedures (if any):	–
Monitoring frequency:	–
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 5.

Data / Parameter:	$EF_{CO2,j,y}$
Data unit:	–
Description:	CO_2 emission factor of fuel used by project vehicles (t CO_2/energy content of fuel)
Source of data:	–
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 6.

Data / Parameter:	$EF_{CO2,j}$
Data unit:	–
Description:	CO_2 emission factor of fuel used by baseline vehicles (t CO_2/energy content of fuel)
Source of data:	Country specific data or IPCC default value
Measurement procedures (if any):	–
Monitoring frequency:	–
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 7.

Data / Parameter:	EF_{elec}
Data unit:	–
Description:	CO_2 emission factor of grid electricity used by project vehicle (t CO_2/MWh)
Source of data:	–
Measurement procedures (if any):	As per AMS-I.D procedures and the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"
Monitoring frequency:	As per AMS-I.D procedures and the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 8.

Data / Parameter:	P_i
Data unit:	–
Description:	Total annual passengers or goods transported by each baseline vehicle
Source of data:	–
Measurement procedures (if any):	Monitored data before project begins
Monitoring frequency:	At the start of the crediting period
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 9.

Data / Parameter:	$P_{i,y,k}$
Data unit:	–
Description:	Total annual passengers or goods transported by each project vehicle *i*n year *y* on route *k*
Source of data:	Data monitored during the project, e.g. driver logs, ~~and~~ route maps, ~~plus~~ sales receipts/invoices, ticketing data
Measurement procedures (if any):	–
Monitoring frequency:	Annual
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 10.

Data / Parameter:	D_i
Data unit:	–
Description:	Total annual distance travelled by each baseline vehicle
Source of data:	–
Measurement procedures (if any):	Monitored data before project begins
Monitoring frequency:	At the start of crediting period
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 11.

Data / Parameter:	dp_i
Data unit:	–
Description:	Annual average distance of transportation per person or tonne of freight by each baseline vehicle *i*
Source of data:	Monitored through company/operators records
Measurement procedures (if any):	–
Monitoring frequency:	At the start of crediting period
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 12.

Data / Parameter:	$dp_{i,y}$
Data unit:	–
Description:	Annual average distance of transportation per person or tonne of freight by each project vehicle *i*
Source of data:	Monitored through company/operators records
Measurement procedures (if any):	–
Monitoring frequency:	Annual
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 13.

Data / Parameter:	$D_{k,y}$
Data unit:	–
Description:	Distance of route *k* in year *y*
Source of data:	Monitored through company/operators records
Measurement procedures (if any):	–
Monitoring frequency:	Annual
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 14.

Data / Parameter:	$SL_{k,y}$
Data unit:	–
Description:	Service level in terms of total passengers or volume of goods on route *k* in year *y*
Source of data:	Monitored from company/operator records, or vehicles based on, e.g. driver logs, route maps, and sales receipts
Measurement procedures (if any):	–
Monitoring frequency:	Annual
QA/QC procedures:	–
Any comment:	–

Data / Parameter table 15.

Data / Parameter:	$SL_{BL,k}$
Data unit:	–
Description:	Service level in terms of total passengers or volume of goods carried on route *k* in the baseline
Source of data:	Determined from company/operators records, e.g. driver logs, route maps, sales receipts
Measurement procedures (if any):	–
Monitoring frequency:	At start of crediting period
QA/QC procedures:	–
Any comment:	–

28. Service level determined by the number of passengers or volume of goods times the average distance transported per person or per tonne of freight ($SL_{k,y}$) shall be capped at the baseline level ($SL_{BL,k}$). Emission reductions beyond this level will not be counted.

6.2. Project activity under a programme of activities

29. The following conditions apply for use of this methodology in a project activity under a programme of activities:

30. If the project activity involves fossil fuel switching measures, leakage resulting from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary shall be considered. The guidance provided in the leakage section of ACM0009 “Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas” shall be followed in this regard.

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Document information

Version	*Date*	*Description*
04.0	23 November 2012	EB 70, Annex 29 Revision to clarify: (a) The requirement for identifying vehicle routes in the methodology; (b) The baseline fuel efficiency determination for Non-Standard Vehicles; and (c) The scrapping of replaced Vehicles in the case of PoAs.
03.0	2 March 2012	EB 66, Annex 60 Revision to: (a) To clarify the requirements on the level of service and simplify the requirements on operation of route; (b) To include the reference to "General guidelines to SSC CDM methodologies" for identification of the baseline vehicles for Greenfield projects; (c) To allow the use of manufacturers' specifications as an option to determine baseline fuel efficiency of the comparable new baseline vehicles.
02	30 July 2010	EB 55, Annex 32 Revision to: (a) Include retrofitting of vehicles, further elaboration of types of vehicles covered, to replace fixed route requirements with conditions to prove comparability of routes featuring in baseline and project scenarios; (b) Under the PoA section leakage provisions pertaining to project activities involving fossil fuel switch referring to ACM0009 procedures have been retained while the textual guidelines in the methodology pertaining to the same topic has been excluded to avoid redundancies.
01	30 November 2007	EB 36, Annex 23 Initial adoption.

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