CLEAN DEVELOPMENT MECHANISM

CDM-MP74-A02

Information note

Draft Framework: Development of new top-down methodology for the efficient operation of public transportation system

Version 01.0

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. The CDM Executive Board (hereinafter CDM EB), at its 89th meeting, considered a concept note prepared jointly by the Methodologies Panel (MP) at its 69th meeting (MP 69) and by the Small-Scale Working Group (SSCWG) at its fiftieth meeting (SSCWG 50) and agreed to initiate work in the development of a new top-down methodology for the improved operation of public transportation, such as traffic management measures, improved programming of transit routes, implementation of systems for urban transport management and so forth.

2. The MP at its 74th meeting considered an information note prepared by the secretariat on the draft framework for a new methodology for improving the operation of public transportation, identifying which are the elements that can be applied to identify the baseline, assess additionality, calculate emission reductions and develop the monitoring plan.

2. Purpose

3. The purpose of this call for public inputs is to invite stakeholders to provide their inputs on this draft framework consisting of methodological elements covering project types discussed under para 2 above. The scope of the public input includes but is not limited to the issues highlighted in the sections below.

4. The public inputs will be taken into account when preparing the draft revised methodology to be recommended to the Board at a future meeting.

3. Key issues and proposed solutions

5. N/A

4. Impacts

6. N/A

5. Subsequent work and timelines

7. The comments received at of the call for public inputs will be taken into account for the development of a draft new methodology for improving the operation of public transportation, which will broaden the applicability of the CDM.

8. The secretariat will present the draft new methodology to the MP.

6. Recommendations to the Board

9. Not applicable (call for public inputs).

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1. Procedural background

1. The CDM Executive Board (hereinafter CDM EB), at its 89th meeting, considered a concept note prepared jointly by the Methodologies Panel (MP) at its 69th meeting (MP 69) and by the Small-Scale Working Group (SSCWG) at its fiftieth meeting (SSCWG 50) and agreed to initiate work in the following areas:

   (a) Development of a new top-down methodology for lightweight, two- or three-wheeled personal transportation infrastructure, including technologies/measures for bicycles, electric bicycles and tricycles, to shift from or reduce the use of fossil fuel in transportation; and

   (b) Development of a new top-down methodology for the improved operation of public transportation, such as traffic management measures, improved programming of transit routes, implementation of systems for urban transport management and so forth.

2. The scope of this document only covers the mandate concerning para 1(b) above.

2. Purpose and Scope

3. The document aims to provide a draft framework to facilitate the development by the MP of a new methodology covering the efficient operation of public transportation systems.

4. The document provides the following:

   (a) A review of measures to improve the efficiency of operation of public transportation identified in different sources (Transport NAMAs, review of methodologies from SLoCaT[1], the Declaration on Climate Leadership from UITP[2], BRT Standard from ITDP[3]), such as:

      (i) Intelligent Transportation Systems (ITS) that prioritise transit modes;

      (ii) Interventions in bus routes;

      (iii) Implementation of a control center, or improvement of its operation;

   (b) Review of the proposed methodologies SSC-NM091 and NM0275. Although these methodologies were not approved, they included very useful elements for the measures included under paragraph 4 (a). The reviews focussed on how the issues that came up during assessment that lead to non-approval could be addressed. It was also useful from the perspectives of assessment of the types of projects, applicability conditions, baseline, additionality, calculation of ERs and monitoring.

   (c) Initial proposal in terms of key methodological elements (e.g. scope, applicability, baseline, additionality, monitoring).

1 Partnership on Sustainable Low Carbon Transport.

2 International Association of Public Transport.

3 Institute for Transportation and Development Policy.

3. Review of measures that improve the operation of the public transportation

3.1. Intelligent Transportation Systems (ITS)

5. According to the USDOT (United States Department of Transport)[4], "ITS is an operational system of various technologies that, when combined and managed, improve the operating capabilities of the overall system." For example, it can be a phone application that people use to take the fastest route between the origin and the destination, avoiding real-time traffic or a series of devices (such as GPS, tolls and sensors in vehicles) to better coordinate the traffic management in large cities.

6. The USDOT developed a complete taxonomy of 16 application areas of ITS, with sub-categories for each area, as indicated in the publication *Intelligent Transportation Systems Benefits, Costs, and Lessons Learned: 2014 Update Report*[5]. The technologies that are relevant for efficient operation of public transportation involve:

   (a) Use of sensors in vehicles and in the infra-structure: the communication between vehicles and the infra-structure allows for an improved operation of traffic lights, for example, by giving priority transit to buses;

   (b) Dissemination of information via dynamic message signs (DMS) to users of the roads and public transportation systems: this allows the user to program alternative routes in case of heavy traffic jam or accident or to plan its journey based on the estimated time of arrival of buses;

   (c) Use of automated vehicle location (AVL) and computer aided dispatch (CAD): these measures allow for a better management of the dispatch of different types of vehicles from the fleet;

   (d) Use of transit fare payments: the use of magnetic cards instead of cash allows for a fast boarding of passengers in public transportation and, consequently, decreases the dwell times in stops. A similar measure is an off-board fare collection where the passenger pays the ticket before entering the bus and shows the validated ticked to the driver.

7. These technologies can reduce emissions of greenhouse gases from fuel combustion in the public transport vehicles by reducing fuel consumption either on absolute terms or per unit service provided. Generally speaking, the measures mentioned all permit operation with less idling and/or stop-and-go driving, increasing fuel efficiency and reducing greenhouse gas emissions per distance travelled.

4 USDOT (United States Department of Transport); History of Intelligent Transportation System, 2016.

5 Available at <http://www.itsknowledgeresources.its.dot.gov/its/bcllupdate/pdf/BCLL_2014_Combined_JPO-FINAL.pdf>, accessed on 20/05/2017.

3.2. Changes/improvements in bus routes

8. Different types of changes/improvements in bus routes can take pace in order to improve the efficiency of public transportation:

   (a) **Re-design of existing routes:** re-design of existing routes may involve, for example, moving a bus route from congested roads to secondary streets, re-design the route in order to allow for connections in strategic locations (connect with another route, mass rapid transportation systems, high demand locations, etc.);

   (b) **Changes in the existing infra-structure:** implementation of viaducts, tunnels or other changes in the infra-structure in dedicated bus lanes that are not part of a BRT system to allow buses to move without traffic disturbances.;

   (c) **Construction of a priority lane for buses:** these lanes are implemented for the priority or exclusive usage of buses. Differently from a BRT, these lanes do not serve trunk routes. The operation of the lines can be throughout the day or only during peak hours;

   (d) **Replacement of long routes:** replacing long routes by short ones makes the operation of the lines easier and more predictable;

   (e) **Express service:** during peak hours, the number of stops are reduced in order to allow a fast journey between bus stops with higher demand;

   (f) **Queue jump lane:** reserved bus lanes with a dedicated traffic light located at intersections that allow buses to move before the other vehicles, avoiding long queues;

   (g) **Use of high-quality pavement in dedicated bus lanes that are not part of a BRT system:** use of high quality pavement[6] ensures a quality service by minimizing the need for maintenance and by providing a more comfortable journey for the passengers;

   (h) **Rehabilitation of roads/routes:** rehabilitation of bus routes with new pavement ensures a faster journey for the passengers by improving the average speed of the buses (avoiding stoppages or driving at slow speeds).

9. These technologies can reduce emissions of greenhouse gases from fuel combustion in the public transport vehicles by providing the same service for passengers with fewer buses and/or with buses operating at higher fuel efficiency due to less idling and stop-and-go conditions.

3.3. Control Centers

10. The use or optimization of control centers allows the operator to directly monitor the operation of buses, metros, etc., identify problems and provide a rapid response and adjust the dispatch of vehicles to the demand (including the quantity and size of buses).

[6] According to the BRT standard from ITDP, a high-quality pavement has a thirty-year life span and the type of pavement can be of asphalt, jointed plain concrete pavement (JPCP) and continuously reinforced concrete pavement (CRCP).

11. Control centers can provide the following types of services:

    (a) Control the spacing of buses;

    (b) Record passenger boarding and adjust the dispatch of buses and trains for future demands;

    (c) Use of AVL (Automated Vehicle Location), CAD (Computer-Aided Dispatch) and bus tracking and performance monitoring.

12. These strategies can reduce emissions of greenhouse gases from buses by reducing fuel consumption by buses when transporting the same number of passengers using fewer or shorter buses.

4. Review of the proposed methodologies SSC-NM091 and NM0257

4.1. SSC-NM091: Emission reduction through implementation of intelligent transport systems in transport sector

13. A new methodology SSC-NM0091 was proposed to the SSC WG in 2013. The methodology involved the use of ITS for commuting (either in passenger vehicles, like buses, cars, etc.) or in freight Transportation through roadways to determine which is the fastest route from a start point to a destination point. Without the ITS, the traveller would have used the shortest route, independently on the level of traffic congestion in the route.

14. The final recommendation from the SSC WG, including the reasons for rejection, can be accessed on <https://cdm.unfccc.int/methodologies/SSCmethodologies/pnm/byref/SSC-NM091>.

15. The main ways a new methodology could overcome the shortcomings of the proposed SSC NM-0091 would be by: limiting the application of ITS to transit transport modes, provide better definitions and explanations of monitoring requirements, and calculating project emissions as actual fuel consumption of the vehicles operating within the project boundary.

4.2. NM0257: “GHG Reductions through Supply Optimization Measures of Public Transport”

16. A new methodology NM00257 was proposed to the MP in 2008. The methodology was proposed for projects that aim to optimize the supply of buses (such as controlling the dispatch and the size of buses during off-peak hours) without major infrastructure changes on pre-defined routes within a given city or identified geographical area.

17. The final recommendation from the Meth Panel, including the reasons for rejection, can be accessed on <https://cdm.unfccc.int/methodologies/PAmethodologies/pnm/byref/NM0257>.

18. The main ways a new methodology could overcome the shortcomings of the proposed NM0257 would be by: providing clear definitions and monitoring instructions, addressing level of service obligations, delimiting the project boundary adequately, and applying an

equation for emission reductions that can reflect if emissions are increased unintentionally by the project activity (negative emission reductions).

5. Proposed key methodological elements for the framework of a new methodology

19. This section will identify the possible elements of the framework for the proposed methodology, having in mind the discussion on sections 3 and 4.

5.1. Scope

20. This methodology calculates emission reductions from efficiency improvements in the operation of bus-based public transportation routes or systems resulting from individual measures or combinations of measures that enable incremental improvements in operational efficiency. Technology changes in bus fuel efficiency are not included.

5.2. Applicability

21. Applicability condition 1: the proposed new methodology will be applicable for project activities that improve the operation of public transportation by buses through the following measures (stand alone or combination):

    (a) implementation of ITS measures (such as sensors in the vehicles and in the infra-structure, AVL and CAD) to improve the operation of buses, e.g. by allowing for traffic priority for buses, and adjust the dispatch to the demand. The use of DMS (Dynamic Message Signs) to disseminate information about the time of arrival of buses is only allowed if used in conjunction with other ITS measures;

    (b) Changes/improvements in bus routes that allow for a fast journey between the origin and final destination. The interventions can be:

        (i) re-design of bus routes – moving bus routes to secondary streets, allows the route to connect with strategic locations;

        (ii) implementation of viaducts, tunnels or other narrowly localized changes in the infra-structure in dedicated bus lanes that are not part of a BRT system;

        (iii) Implementation of priority lanes for buses that is not part of a BRT system. The lanes can work under priority for the whole day or under peak hours;

        (iv) Implementation of an express service connecting high demand stops by reducing the number of intermediate stops during peak hours;

        (v) Implementation of a bus queue jump lane;

        (vi) Use of high-quality pavement in existing dedicated bus routes;

        (vii) Rehabilitation of the pavement of the existing bus routes/lanes.

    Rationale: please refer to the review of the measures above.

    [Stakeholders are invited to propose additional measures that improve the operation of the public transportation and result in reductions of CO_2 emissions]

22. Applicability Condition 2: The project activity shall not reduce the number of passenger-kilometres travelled on the affected bus route, compared to the baseline situation. In case of the number of passenger-km decreases during the crediting period, proper justifications shall be provided.

Rationale: This requirement ensures that at least the same level of service is being provided between the baseline and project scenarios.

23. Applicability condition 3: The project proponent shall not implement measures to improve the operation of the public transportation system other than the ones under this project activity during the crediting period.

Rationale: This requirement ensures that emissions reductions calculated using procedures under this proposed methodology are attributable to the project activity.

5.3. Project boundary

24. The project boundary includes the routes in which project changes/improvements and measures are applied and, if applicable, routes that are unchanged by the project activity but whose operation will be affected by the project, and all the buses operating these routes. The greenhouse gas targeted is CO_2.

5.4. Baseline scenario

25. Requirement 1: the baseline scenario would be the continued operation of the bus route(s) without the implementation the project activity.

5.5. Additionality

26. Requirement 1: Additionality will be demonstrated by explaining that the project activity would not have occurred due to at least one of the barriers indicated in the latest version of the methodological tool “Demonstration of additionality of small-scale project activities”.

Rationale: This type of project is not expected to result in emission reductions beyond 60,000 tCO_2e/year since it involves the application of measures that improve an existing mode of transport, and not a shift on the way passengers are transported. Therefore, this methodological framework is being developed as a small-scale methodology.

[Stakeholders are invited to comment on the use of performance benchmarks to determine the additionality, which would be the indicators and the thresholds]

5.6. Emission reductions

5.6.1. Baseline Emissions

27. Requirement 1: baseline emissions will be calculated based on the amount of CO_2 emitted per passengers transported in the absence of the measures, in tCO_2e/pkm. To determine this factor, PPs/CMEs can either:

(a) Use information on number of passengers transported, and their average travel distances, type and quantity of the different types of fossil fuels and electricity consumed by the buses travelling in the baseline route during the 3 years prior to

the starting date of the project activity (minimum of 1 year if data is not available); or

(b) Undertake a baseline campaign before the implementation of the measures, if information referred in item 27(a) is not available. Guidance on how to undertake the campaign can be provided in the methodology, including the minimum length, seasonality (avoid periods of school vacations), control area, etc.

[Stakeholders are invited to propose additional details on the specifications of the baseline campaign]

Rationale: the requirement on baseline campaign aims to provide flexibility for projects that do not have historical data available to determine the baseline emissions. Specific guidance may be provided on how to conduct the baseline campaign, including sampling and survey requirements.

28. Requirement 2: The baseline emission calculation shall take into account autonomous improvement due to the natural replacement of existing buses by new and more efficient ones during the crediting period. This can be done using information available at the level pf the public transportation authority (e.g. a bus fleet model) or using a default rate of autonomous improvement.

Rationale: the requirement addresses situations where more efficient buses are included in the fleet, replacing high-CO_2 emitting vehicles.

[Stakeholders are invited to propose default rate of autonomous improvement factors]

29. Requirement 3: The baseline needs also to be adjusted in case there are circumstances such as historical trend of steadily increasing (or decreasing) operational efficiency in passenger-kilometre (for example due to exogenous increases traffic congestion), changes in fuel type, significant change in maintenance practices and fleet replacement.

30. Requirement 4: If fuel switching takes place during the crediting period, baseline emissions shall be adjusted based on the fuel used in the project situation (i.e. if the project buses switch from diesel to natural gas, emission reductions are calculated on the basis of natural gas).

Rationale: This requirement broadens the applicability of the methodology while ensuring that emission reductions will be calculated in a conservative way.

5.6.2. Project Emissions

31. Requirement 1: project emissions will be calculated based on the amount of CO_2 emitted by the total fuel used by buses travelling through the route, in tCO_2e.

32. Requirement 2: In case project emissions are higher than baseline emissions [in a year] (for example, if the buses drive in a higher speed to reach the destination faster), guidance from paragraph 18 of EB 21 shall be followed, e.g. “In these cases, proposed new methodologies should stipulate that if a project activity temporarily results in “negative emission reductions”, i.e. baseline emissions minus project emissions minus leakage effects are negative, any further CERs will only be issued when the emissions increase has been compensated by subsequent emission reductions by the project activity”.

Rationale: this requirement addresses one of the issues for rejecting NM0091 and is in line with EB guidance.

5.6.3. Leakage

33. Requirement 1: No leakage needs to be taken into account.

5.7. Data and parameters not monitored

34. Requirement 1: the following parameters are required at validation:

    (a) Quantity of passengers transported in the baseline route;

    (b) Trip distance of the passengers on the baseline route;

    (c) Fuel consumed in the baseline journey: type, quantity, NCV, CO_2 emission factor;

    Rationale: based on these parameters, a dynamic baseline emission factor per passenger-km (in tCO_2e/pkm) will be determined for the bus route(s) involved in the project scenario. The baseline emissions will, therefore, be calculated by multiplying this baseline emission factor by the quantity of passengers transported in the project scenario.

5.8. Data and parameters monitored

35. Requirement 1: the following parameters need to be monitored:

    (a) Quantity of passengers-kilometres transported in the project route;

    (b) Trip distance of the passengers on the baseline route

    (c) Fuel consumed in the project scenario by all vehicles travelling in the project route: type, quantity, NCV, CO_2 emission factor;

    Rationale: project emissions will be determined directly, through the fossil fuels used by the buses in the project scenario.

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Document information

Version	*Date*	*Description*
01.0	11 October 2017	MP 74, Annex 2 A call for public input will be issued for this document.

Decision Class: Regulatory
Document Type: Information Note
Business Function: Methodology
Keywords: new methodology, top down methodology, transport