CLEAN DEVELOPMENT MECHANISM

CDM-EB86-AA-A12

Concept note

Broadly applicable methodology for transport applications

Version 01.0

United Nations
Framework Convention on
Climate Change

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1. Procedural background

1. The Executive Board of the clean development mechanism (hereinafter referred as the Board) at its eighty-first meeting (EB 81) agreed under the 2015 management plan (MAP 2015) to include the “Top down development of Methodologies/Standardized baselines and tools (including initial concept note covering, inter alia: cities and rural electrification, aviation, agriculture and international financing institutions)”.

2. Subsequently at EB 82, the Board considered the project concept note on the development of new methodologies to broaden the applicability of the clean development mechanism (CDM) and adopted the workplan for this project, as contained in document CDM-EB82-A07-INFO. The Board agreed on the development of methodologies in the areas of aviation, renewable energy, electrification and household energy supply. With regard to methodologies for cities, transport, biofuels and agriculture, the Board requested the secretariat to elaborate concept notes on each specific area for its consideration before the development of the methodologies.

3. This work relates to the activity ‘244 Top down development of Methodologies/Standardized baselines and tools’ under objective 1(c): ‘Develop simplified and user-friendly standards and procedures that increase efficiency and ensure environmental integrity’ with a resource allocation as referred to in table 4 on page 7 of the Management plan 2015 (EB81, annex 1).

2. Purpose

4. The purpose of this concept note is to identify barriers for CDM transport sector projects and gaps in available CDM methodologies for transport sector and propose potential options to address them.

3. Key issues and proposed solutions

3.1. Method of analysis

5. This concept note was developed in consultation with the Methodologies Panel (MP) and Small-Scale Working Group (SSC WG) as per the following method and outline:

   (a) Enlist measures covered by CDM methodologies (e.g. matrix of measures and methodologies);

   (b) Elucidate barriers, bottlenecks and needs for improvement, including but not limited to data requirements (baseline setting, measurement/survey/sampling requirements, value addition, cost/benefit etc.);

   (c) Discuss measures and methods covered by other initiatives for greenhouse gas (GHG) reduction (e.g. the World Bank (WB) initiatives, Global Environment Facility (GEF) initiatives, Verified Carbon Standard (VCS)) and nationally appropriate mitigation actions (NAMAs) developed or planned for development;

   (d) Discuss needs and options for improvement;

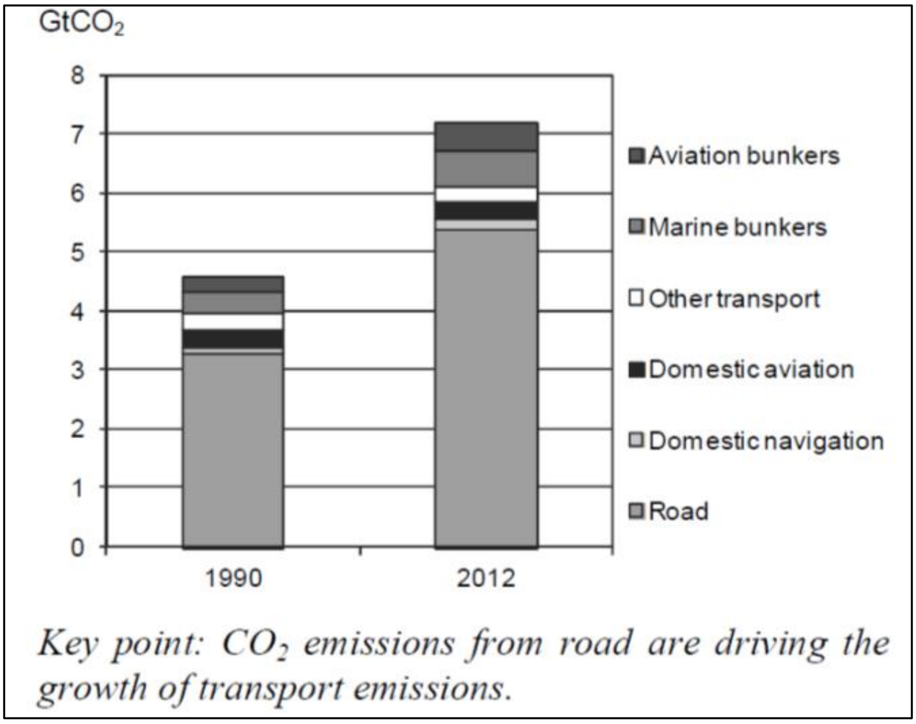
(e) Discuss options/needs to integrate all measures under one broadly applicable methodology;

3.2. Emissions from transport sector

6. Transport is one of the major carbon dioxide (CO_2) emission sources and in 2012 it accounted for 23 per cent of the total global CO_2 emissions.[1] Worldwide, more than half of oil consumption is for transport. Without strong new policies, fuel use for road transport is projected to double between 2010 and 2050.[2]

7. The fast emissions growth in the transport sector has been driven by emissions from the road sector, which increased by 64 per cent since 1990 and accounted for about three quarters of transport emissions in 2012. Emissions from marine and aviation bunkers increased by 66 per cent and 80 per cent respectively in 2012 as compared to 1990, at a rate even faster than those from road.[1]

Figure 1. CO_2Carbon dioxide emissions from transport



Source: CO_2 emissions from fuel combustion *Highlights* (2014 Edition), International Energy Agency

8. In terms of the mitigation of CO_2 emissions under the CDM, the transport sector has had only a limited share of projects. The CDM has 16 methodologies and only 30 registered

[1] CO_2 emissions from fuel combustion *Highlights* (2014 Edition), International Energy Agency.

[2] UNEP Emissions Gap Report (2014).

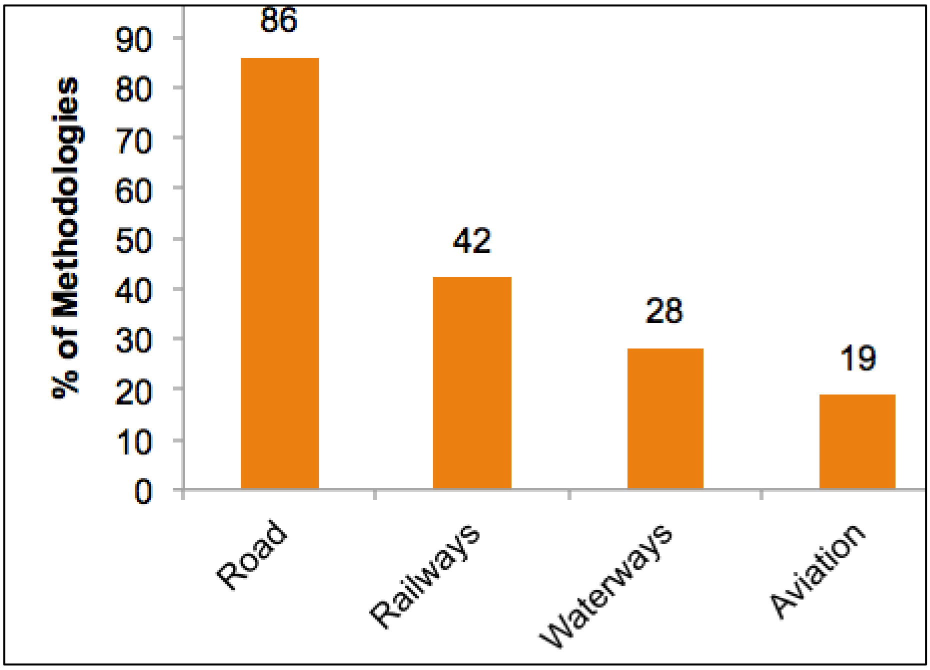
projects (out of 7,645)[3] covering the transport sector. The transport sector constitutes only 0.085 per cent of total certified emission reductions (CERs) issued under the CDM.[4]

3.3. Review and analysis of transport methodologies

3.3.1. Literature study

9. The SLoCaT[5] Partnership has compiled a detailed qualitative assessment of 66 transport GHG emission methodologies and tools including CDM methodologies, which cover a range of transport subsectors and include methodologies for both passenger and freight transport. The analysis demonstrates that GHG methodologies developed to date cover the majority of transport subsectors for sustainable transport infrastructure and services. While more than 80 per cent of methodologies reviewed to date are related to the roadway sector, a significant percentage of methodologies consider other modes including railways (42 per cent), waterways (28 per cent) and aviation (19 per cent).

Figure 2. Transport subsectors assessed (percentage of methodologies)



Source: <http://www.slocat.net/news/1452>.

10. While the majority of methodologies tend to be detailed in character and data requirements, there are also a growing number of sketch tools[6] (representing more than 20 per cent of methodologies) that provide order-of-magnitude emissions estimates where data is scarce.

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[3] Up to 1 June 2015.

[4] Up to 1 June 2015.

[5] <http://www.slocat.net/news/1452>.

[6] Sketch models enable the estimation of emissions in both “project” and “no-project” scenarios and can be used for evaluating short to long-term impacts of projects.

11. **It is important to note that SLoCaT observed that there are relatively few methodologies to quantify impacts of transport demand management, non-motorized transport, and urban freight, which are essential pieces of a comprehensive set of sustainable transport infrastructure and services.** Further, while determining the baseline scenario, about 60 per cent of methodologies reviewed (e.g. city-level inventories, fleet-level assessments, and freight supply chains) consider an analysis period of more than a single year, and the remaining 40 per cent of methodologies limit the analysis to one year before the implementation of the project. The study noted that it is crucial to consider longer-term impacts, since almost all transport projects may yield positive impacts after several decades, a time frame well within a project's useful life.

12. An Inter-American Development Bank study[7] compared the CDM methodologies with the emissions models used in connection with projects implemented under the GEF (see the table reproduced in figure 3 below), which are known as Transport Emissions Evaluation Models for Projects (TEEMP).[8] The TEEMP tool includes worksheets for bus rapid transit (BRT) that allow for different levels of user data input. The CDM approved methodologies for BRT projects (AM0031) and mass rapid transit projects (ACM0016) have more stringent requirements that include extensive local data collection. The study noted that stringent GHG measurement and analysis methods must be used to access transport-related funding under the CDM, which are required to ensure the environmental integrity of the carbon offsets delivered by CDM projects. **The study concluded that, because of its restrictive rules, requirements, and auditing procedures, CDM data collection and analysis is frequently of limited use for broader sustainable transport and urban development planning**.

Figure 3. Models and methodologies for quantifying GHG emission reductions for different transport mitigation strategies

PUBLIC TRANSPORTATION IMPROVEMENTS		
TRANSPORT MITIGATION STRATEGY	**TEEMP MODELS**	**CDM METHODOLOGY**
1. Public transport operation improvements		
2. Transit fare system improvements		
3. Public transportation system integration in priority corridors		
4. Bus rapid transit	BRT Projects	AM0031, ACM0016
5. Light rail, metro rail, and commuter rail systems	LRT/MRT Projects Railway Projects	ACM0016
6. Bus useful life regulation and vehicle phase-out, and vehicle scrappage programs		
7. Cable cars for mass rapid transit systems		AMS-III.U.

7 Mitigation strategies and accounting methods for greenhouse gas emissions from transportation, Inter-American Development Bank, 2013.

8 TEEMP is one of the sketch models currently in use <http://cleanairasia.org/portal/TEEMPTool>.

NON-MOTORIZED TRANSPORTATION POLICES		
TRANSPORT MITIGATION STRATEGY	TEEMP MODELS	CDM METHODOLOGY
1. New and improved sidewalks and pedestrian crossings	Pedestrian Projects	
2. Traffic calming		
3. Improved bicycle infrastructure, networks, and supporting facilities	Bike Sharing Bikeways	
PRICING MOTOR VEHICLE USE		
TRANSPORT MITIGATION STRATEGY	TEEMP MODELS	CDM METHODOLOGY
1. Motor fuel taxes and subsidies		
2. Road pricing		
3. Congestion pricing		
4. Cordon pricing		
LAND USE STRATEGIES		
TRANSPORT MITIGATION STRATEGY	TEEMP MODELS	CDM METHODOLOGY
1. Urban planning codes and practices		
2. Transit oriented development		
3. Car-free zones and restricted traffic streets		
PARKING PRICING AND MANAGEMENT		
TRANSPORT MITIGATION STRATEGY	TEEMP MODELS	CDM METHODOLOGY
1. Parking pricing	Pricing	
2. Managing on-street parking supply	Pricing	
3. Establishing maximum or reducing minimum parking requirements		
COMMUTER TRAVEL REDUCTION POLICIES		
TRANSPORT MITIGATION STRATEGY	TEEMP MODELS	CDM METHODOLOGY
1. Flexible time schedules		
2. Compressed work weeks and telework	Commuter Strategies	
3. Ride-share matching incentives	Commuter Strategies	
4. Tax incentives for alternative mode use and disincentives for employer provided free parking	Commuter Strategies	
MOTOR VEHICLE ACCESS AND USE		
TRANSPORT MITIGATION STRATEGY	TEEMP MODELS	CDM METHODOLOGY
1. Car-sharing		
2. Motor vehicle registration fees and taxes		
3. Motor vehicle quota systems		
4. License plate restrictions		
SYSTEM OPERATIONS AND MANAGEMENT		
TRANSPORT MITIGATION STRATEGY	TEEMP MODELS	CDM METHODOLOGY
1. Reduce national speed limits on motorways		
2. Eco-driving and vehicle maintenance programs	Eco-Driving	
3. Intelligent transportation systems		

ROADWAY CAPACITY EXPANSION OR REDUCTION		
TRANSPORT MITIGATION STRATEGY	**TEEMP MODELS**	**CDM METHODOLOGY**
1. Roadway capacity expansion/reduction	Expressway	
MULTIMODAL FREIGHT STRATEGIES		
TRANSPORT MITIGATION STRATEGY	**TEEMP MODELS**	**CDM METHODOLOGY**
1. Enhancement of intermodal freight infrastructure		AM0090
2. Freight pricing and management		
3. Regional freight distribution centers, inland ports, and logistics parks		
VEHICLE ENERGY EFFICIENCY AND FUEL SWITCHING		
TRANSPORT MITIGATION STRATEGY	**TEEMP MODELS**	**CDM METHODOLOGY**
1. Electric and hybrid vehicles		AMS-III.C.
2. Useful life regulation and vehicle phase-out, and vehicle scrappage programs		
3. Retrofit technologies		AMS-III.AA.
4. Energy efficiency activities using post-fit idling stop device		AMS-III.AP.
5. Installing digital tachograph systems		AMS-III.AT.
6. Low-emission vehicles/technologies to commercial vehicle fleets		AMS-III.S.
7. Introduction of bio-CNG		AMS-III.AQ.
8. LNG buses		AMS-III.AY.

Source: *Mitigation strategies and accounting methods for greenhouse gas emissions from transportation*, Inter-American Development Bank, 2013.

3.3.2. Methodology-measure matrix

13. To systematically analyse included measures and prevailing gaps, further analysis of existing CDM transport methodologies was undertaken. For that purpose the four main variables below were considered:

(a) Type of transport service provided;

(b) Project mode of transport or project activity;

(c) Baseline mode of transport or baseline activity;

(d) Measures covered.

14. The following “measures” for transport mitigation (categories of action leading to transportation emission reductions) were considered:

(a) Measure A: Fuel switch within one mode;

(b) Measure B: Energy efficiency improvement within one mode;

(c) Measure C: Modal shift from a higher to lower GHG mode;

(d) Measure D: Avoided travel of motorized modes (includes fully avoided trips and shortened trips, which could result from e.g. urban planning or behavioural changes).

15. In all cases, an “activity unit” would need to be defined as the amount of transport service provided. The exact characteristics to identify the transport service would vary based on the specific project type; for example, the activity unit could be defined based on tonne-km, passenger-km, or other units. For some specific cases, the activity level could be as simple as “number of trips”. This would be acceptable for project types where the transport is sufficiently homogeneous (for example ski-lift, product from mine to port, established public transport routes), and where one would not expect the project to affect the route or frequency of trips (basically fuel switch and energy efficiency actions within one mode).

16. Table 1 and table 2 below include a measure-methodology matrix depicting existing measures included in the approved methodologies.

Table 1. Minimum requirements for baseline setting and project emissions monitoring for different project types

“Measure” / category of action	Baseline to identify	Baseline emissions	Project activity units to monitor	Project emissions to monitor
A. Fuel switch within one mode	Fuel type	Amount of baseline fuel used per each activity unit of the project (in tCO_2/activity unit or GJ/activity unit) times the emission factor (tCO_2/GJ)	Activity units of transport service provided	Quantity of emissions from project fuel
B. Energy efficiency improvement within one mode	Technology type	Energy units of baseline technology per each activity unit of the project (GJ/activity unit) times the emission factor (tCO_2/GJ)	Activity units of transport service provided	Quantity of emissions from project fuel
C. Modal shift from a higher to lower GHG mode	Mode, including its fuel and technology; potentially also its typical trip characteristics	Amount of emissions in baseline per each unit of project activity (since modal shift may involve fuel change, efficiency change, and/or route changes) (tCO_2/activity unit)	Activity units of transport service provided	Quantity of emissions from project fuel

"Measure" / category of action	**Baseline to identify**	**Baseline emissions**	**Project activity units to monitor**	**Project emissions to monitor**
D. Avoided travel of motorized modes[9]	Activity level in a mode, including its fuel and technology	Amount of emissions in baseline per each unit of baseline activity and activity units of transport service provided in baseline	Activity units of transport service provided	Quantity of emissions from project fuel

9 Avoided travel can be reduced travel distance, travel time or complete avoidance of the travel.

Table 2. Service type, project and baseline mode, measures covered and projects registered using approved CDM methodologies

Methodologies	Service	Project mode/activity	Baseline mode/activity	Measure A	Measure B	Measure C	Measure D	Used by CDM projects
AM0031	Passenger	Bus rapid transit, intra-city	Mixed modes	-	-	YES	-	YES (10 projects registered)
AM0101	Passenger	High-speed rail, inter-city	Mixed road-based modes (e.g. cars, buses, and motorcycles), conventional and existing high-speed rail, water-based transport modes and domestic air travel	-	-	YES	-	NO
ACM0016	Passenger	Mass rapid transit systems (light rail transit, BRTs etc.)	Mixed modes	-	-	YES	-	YES (9 projects registered)
AM0090	Cargo	Water or rail transportation	Trucks	-	-	YES	-	NO
AM0110	Cargo (liquid)	Pipeline	Trucks	-	-	YES	-	NO
AMS-III.C.	Passenger and cargo	Electric or hybrid vehicles	Fossil fuel based vehicles	YES	-	-	-	YES (6 projects registered)
AMS-III.S.	Passenger and cargo	Low-emission vehicles	Fossil fuel based vehicles	-	YES	-	-	NO
AMS-III.T.	Passenger and cargo	Use of alternative fuel (plant oil)	Use of petro-diesel	YES	-	-	-	YES (1 project registered)
AMS-III.U.	Passenger	Cable cars	Mixed passenger modes	-	-	YES	-	YES (1 project registered)

Methodologies	Service	Project mode/activity	Baseline mode/activity	Measure A	Measure B	Measure C	Measure D	Used by CDM projects
AMS-III.AA.	Passenger	Retrofit	Fossil fuel based vehicles	-	YES	-	-	NO
AMS-III.AK.	Passenger and cargo	Use of alternative fuel (biodiesel)	Use of petro-diesel	YES	-	-	-	NO
AMS-III.AP.	Passenger	Idling stop device	Vehicles without idling stop device	-	YES	-	-	NO
AMS-III.AQ.	Passenger and cargo	Use of alternative fuel (bio-CNG)	Fossil fuel based vehicles	YES	-	-	-	YES (1 project registered)
AMS-III.AT.	Passenger and cargo	Digital tachograph systems	Vehicles without digital tachograph system	-	YES	-	-	YES (1 project registered)
AMS-III.AY.	Passenger	Use of alternative fuel (LNG)	Use of petro-diesel	YES	-	-	-	NO
AMS-III.BC.	Passenger and cargo	Improved efficiency	Fossil fuel based vehicles	-	YES	-	-	NO

3.3.3. Consultation with stakeholders

17. One stakeholder suggested that the data needs, mainly concerning surveys, are the major bottlenecks. Methodologies with narrow applicability designed for specific project types are not favoured and useful in the context of complex urban transportation systems as per this input.

18. Another input[10] highlights the challenges below:

(a) Numerous parameters to be monitored which take a long time for the designated operational entity/secretariat to verify and check their accuracy;

(b) The monitoring method specified by the CDM methodology is not practical in some cases;

(c) Lack of clear guidelines for measurement, reporting and verification (MRV) approaches such as in sampling.

[10] Presentation made by Jane Romero of IGES at workshop entitled “Workshop on Transport Sector and NAMAs: assessing data readiness for MRV” on 9 February 2012, Manila, Philippines. <http://pub.iges.or.jp/modules/envirolib/upload/3948/attach/03_Jane_Romero.pdf>

3.3.4. Analysis of transport methodologies in other schemes

3.3.4.1. Service type, project and baseline mode and measures covered by existing VCS methodologies

Table 3. Service type, project and baseline mode and measures covered by existing VCS methodologies

Methodology	Service	Project mode/ activity	Baseline mode/ activity	Measure A	Measure B	Measure C	Measure D	Used by VCS projects
VM0020: "Transport Energy Efficiency from Lightweight Pallets, v1.0"	Cargo	Energy efficiency	Fossil fuel based vehicles with heavy weight pallets	-	YES	-	-	NO
VMR0004: "Revisions to AMS-III.BC to Include Mobile Machinery, v1.0"	Machinery e.g. earthmovers	Mobile machinery	Fossil fuel based mobile machinery	-	YES	-	-	NO
VM0019 Fuel Switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets, v1.0	Passenger and cargo	Use of alternative fuel (ethanol)	Gasoline	YES	-	-	-	YES (1 project registered)
VCS Methodology VM0028 Methodology for Carpooling	Passenger	Carpooling	Single occupancy	-	-	-	YES	NO

3.3.4.2. Service type, project and baseline mode and measures covered by existing Joint Crediting Mechanism (JCM) methodologies

Table 4. Service type, project and baseline mode and measures covered by existing JCM methodologies[11]

Methodology	Service	Project mode/ activity	Baseline mode/ activity	Measure A	Measure B	Measure C	Measure D
VN_AM001 “Transportation energy efficiency activities by installing digital tachograph systems”	Cargo	Digital tachograph systems	Vehicles without digital tachograph system	-	YES	-	-

[11] One project is registered using approved JCM methodology VN_AM001.

3.3.4.3. Service type, project and baseline mode and measures covered by existing J-Credit Scheme (Japan's domestic crediting scheme) methodologies

Table 5. Service type, project and baseline mode and measures covered by existing J-Credit Scheme methodologies[12]

Methodology	Service	Project mode/ activity	Baseline mode/ activity	Measure A	Measure B	Measure C	Measure D
EN-S-012 Introduction of electric vehicles	Passenger and cargo	Electric vehicles	(Newly introduced) Gasoline vehicles in the similar type with top-runner efficiency standards, (Renewal) Vehicle before upgrade or standard vehicle	YES	-	-	-
EN-S-013 Improving delivery efficiency of Propane gases utilizing IT	Cargo (gas)	Monitoring system of propane gases demand utilizing IT	Delivery vehicles without utilizing IT monitoring system	-	-	-	YES
EN-S-018 Renewal of electric marine vessels	Passenger and cargo	Electric marine vessels	Fossil fuel marine vessels	YES	-	-	-

[12] These methodologies work under baseline conditions in Japan. No projects are registered using approved J-Credit Scheme methodologies in transport sector.

Methodology	Service	Project mode/ activity	Baseline mode/ activity	Measure A	Measure B	Measure C	Measure D
EN-S-023 Introduction and utilization of digital tachograph and other equipment that support eco-drive	Cargo	Digital tachograph systems	Vehicles without digital tachograph system	-	YES	-	-
EN-S-029 Introduction of natural gas vehicles	Passenger and cargo	Natural gas vehicles	Newly introduced) Gasoline vehicles in the similar type with top-runner efficiency standards, (Renewal) Vehicle before upgrade or standard vehicle	YES	-	-	-
EN-S-034 Installation of car navigation systems with environmentally-friendly driving systems	Passenger and cargo	Car navigation systems with environmentally-friendly driving assistance	Vehicles without car navigation systems with environmentally-friendly driving assistance	-	YES	-	-
EN-S-035 Energy efficiency improvement of land transportation of marine container	Cargo	Efficient use of empty container between import and export shippers through connection	Use of empty container between import shippers and a port and use of empty container between a port and export shippers without connection	-	-	-	YES

Methodology	Service	Project mode/ activity	Baseline mode/ activity	Measure A	Measure B	Measure C	Measure D
EN-S-037 Switch to cooperative delivery	Cargo	Cooperative delivery	Single delivery	-	-	-	YES

3.3.4.4. Service type, project and baseline mode and measures covered by NAMAs seeking support for implementation[13]

Table 6. Service type, project and baseline mode and measures covered by NAMAs seeking support for implementation

NAMAs	Service	Project mode/ activity	Baseline mode/ activity	Measure A	Measure B	Measure C	Measure D
NS-175: Federal Road Freight Transport NAMA for owner operators and smaller fleet carriers	Cargo	Modernization of fleets by technologies and training for truck drivers	Inefficient truck fleets	-	YES	-	-
NS-36: Rehabilitation of arterial roads in Serbia	Passenger and cargo	Rehabilitation of arterial roads	Higher fuel consumption	-	YES	-	-

[13] <http://www4.unfccc.int/sites/nama/SitePages/Home.aspx> (accessed on 12 June 2015).

NAMAs	Service	Project mode/ activity	Baseline mode/ activity	Measure A	Measure B	Measure C	Measure D
NS-65: Sustainable Urban Transport Initiative	Passenger and cargo	Low-carbon urban transport (high quality public transport, non-motorized transport, parking management, traffic management, spatial planning, alternative fuels and vehicle efficiency)	-	YES	YES	YES	YES
NS-126: Santiago Transport Green Zone (STGZ)	Passenger and cargo (mostly passenger)	Low-emission taxis, buses, non-motorized vehicles, bicycle lanes, traffic management	-	-	-	YES	YES
NS-127: Colombia TOD NAMA	Passenger and cargo (mostly passenger)	Transit-Oriented Development that reduces total vehicle kilometres travelled (VKT) in private vehicles (by use of non-motorized trips, increasing share of transit trips and driving shorter average trip lengths)	Higher vehicle kilometres travelled (VKT) in private vehicles	-	-	YES	YES

3.4. Analysis of transport methodologies

3.4.1. Gap analysis

19. CDM methodologies cover three measures (i.e. measure A: fuel switch within one mode; measure B: energy efficiency improvement within one mode; and measure C: modal shift from a higher to lower GHG mode) out of four measures and do not have any methodology for measure D: avoided travel of motorized modes. However, in the case of large-scale methodologies, all five methodologies cover measure C. Small-scale methodologies, by contrast, mostly cover measures A and B. In terms of the transport subsector, approved CDM methodologies cover all major sectors except aviation. Large-scale CDM methodologies are focused on modal switch by the introduction of mass rapid transit systems such as BRT and light rail transit (LRT) for city passengers; high-speed rail systems for inter-city passengers; water and rail transport for cargo and pipeline transport of liquid fuels. Small-scale CDM methodologies are focused on fuel switch using electric, hybrid, plant oil, biodiesel, bio compressed natural gas (bioCNG) and liquefied natural gas (LNG) for passenger and cargo transport. Small-scale methodologies also cover energy efficiency of road vehicles by introducing low-emission vehicles, retrofit of existing vehicles and some specific efficiency activities: post-fit idling stop device and digital tachograph systems. One small-scale methodology covers modal switch by introducing mass rapid transit systems such as cable cars.

20. VCS lists seven methodologies related to the transport sector, out of which six are approved VCS methodologies and one is a revision to a CDM methodology. Out of these seven, three are not directly related to transport activities (they belong to other sectoral scopes) such as washing jet engines, use of sulphur instead of bitumen binder for pavements and use of sulphur instead of cement in precast concrete production. The remaining four cover measures A, B and D. Two VCS methodologies approved under measure B cover specific activities such as reducing emissions from transport of lighter cargo and expanding a CDM methodology to cover mobile machinery for construction (e.g. earthmovers). One methodology covers fuel switch from gasoline to ethanol while another methodology covers the very specific activity of carpooling.

21. JCM lists only one approved methodology in the transport sector. This methodology covers measure B and a specific efficiency activity (e.g. digital tachograph systems).

22. The J-Credit Scheme (Japan's domestic crediting scheme) lists eight methodologies in the transport sector. First, three methodologies cover measure A (e.g. introduction/replacement of low-carbon vehicles). Second, two methodologies cover measure B with energy-efficient activities in cars (e.g. digital tachograph and car navigation system). Finally, three methodologies cover measure D. These three include demand control of propane, efficient use of marine container through connection between import shippers and export shippers, and cooperative delivery by sharing trucks, all of which will result in the reduction of fuel consumption in the transport sector.

23. A total of eight transport NAMAs were submitted to the NAMA registry seeking support for implementation. Out of the eight, five NAMAs, which had information related to transport activities, were analysed for this note. These NAMAs range from specific activities such as modernization of road freight vehicles and rehabilitation of roads to broad city-level programmes such as sustainable transport initiative, transport green zone and transit-oriented development covering more than one measure.

24. In terms of the gap, the SLoCaT study has highlighted that there are relatively few methodologies to quantify the impacts of transport demand management, non-motorized transport, and urban freight.

3.4.2. Simplification in monitoring requirements

25. CDM methodologies cover most measures. However, large-scale methodologies are skewed towards one measure (modal shift). Moreover, the use of non-motorized transport (measure D) is underrepresented. In addition, many CDM methodologies have a narrow applicability as well as usability.

26. The major monitoring data requirements of CDM methodologies are as follows:

(a) Amount of passengers or cargo (including cargo type) transported;

(b) “Baseline” modal split of passengers via survey;

(c) Amount of project fuel, electricity consumed by the project system/mode or specific fuel/electricity consumption of the baseline or project vehicles;

(d) Distance travelled by project/baseline vehicles; number of project vehicles operated;

(e) Total idling time, number of idling stops;

(f) Quality-related parameters such as: characteristics of project vehicles, characteristics of baseline/project fuel, operation of tachograph systems;

(g) Parameters related to emissions from cultivation of biofuel, oil crop.

27. The Institute of Global Environmental Strategies (IGES) compares the data requirement for BRT projects[14] which seems to suggest some parameters can be further standardized under the CDM although the TEEMP model is not necessarily tailored to a project-based mechanism.

Table 7. Comparison of data requirement - BRT

Indicator	CDM/AM0031	CDM/ACM0016	GEF (TEEMP)
The transport modes used in absence of the BRT project	Passenger survey	Passenger survey	Derived from passenger numbers on new system and overall modal split over the project boundary
Fuel types of different modes	Local statistics	Local statistics	Local statistics or secondary sources
Average speeds	Project data or local statistics	Project data or local statistics	Local observations or secondary sources

[14] Presentation made by Jane Romero of IGES at workshop entitled “MRV’ing Transport NAMAs and Projects” on 12 February 2013, Pasig City, Philippines..

Indicator	CDM/AM0031	CDM/ACM0016	GEF (TEEMP)
Specific fuel consumption by mode and fuel type	Local statistics, national or international literature, or IPCC values multiplied by an annual technology improvement factor of 0.99 for buses, taxis and passenger cars, 0.997 for motorcycles	Local statistics, national or international literature, or IPCC values multiplied by an annual technology improvement factor of 0.99 for all vehicles	GEF default value, assuming 10% fuel efficiency improvement per decade
Fuel emission factor	IPCC values	Fuel supplier statistics, sample measurements, regional or national or IPCC default values	GEF default factors or local data
Average occupancy rate of the vehicles by mode	Project statistics or official statistics	Project statistics or official statistics	Secondary data or local observations
Average trip distance for each mode	Project statistics or official statistics	Project statistics or official statistics	Local statistics or default value (for buses only)
Total number of passengers on the new system	Recorded per entry station	Based on turnpike or electronic ticketing system	Based on operational plan plus a suitable traffic model or derived from use in current bus system using draft BRT model to estimate future ridership

28. The following bottlenecks can be summarized based on the above analysis of the literature and stakeholder feedback:

(a) Narrow applicability: the project activities using CDM transport methodologies need to define the exact dimension of the new system in the registration documentation. A more flexible methodology or approach like programmes of activities could relieve this barrier (UNEP,[15] 2012);

(b) Data-intensive: the Inter-American Development Bank study states that CDM methodologies are often complicated, and when a great deal of data is required, the monitoring requirements can be very expensive;

(c) The use of a survey that needs lot of resources: a stakeholder suggested that the data needs, mainly concerning surveys, are the major bottlenecks.

[15] <http://www.unep.org/urban_environment/PDFs/UNEP_UrbanCDMreport.pdf>.

3.5. Proposed solution for CDM methodologies

29. Based on the above review and analysis, the following is proposed for further consideration:

(a) Development or revision of existing methodologies may potentially cover:

(i) Planning and infrastructure improvements:

a. Transit-oriented development (TOD);

b. Non-motorized transport (e.g. increasing bicycle usage);

c. New routes that shorten travel length and also with improved pavement quality than existing route connecting origin-destination which may also include segregated lanes with different regulatory speeds (e.g. expressways);

d. Developing infrastructure for carbon-neutral travel (e.g. bicycle lanes, bicycle-sharing programmes);

(ii) Technology improvements:

a. Fuel switch from gasoline/diesel to ethanol/biodiesel;

b. New methods of goods delivered in cities (e.g. drones and other innovative delivery services);

(iii) Use of information and communications technology (ICT) to avoid travel:

a. Use of the Global Positioning System (GPS) that saves travel time (using GPS to find faster roads will reduce emissions);

b. Designing smart traffic systems (e.g. use of traffic lights, traffic cameras, sensor-based lights);

(iv) Operational improvements in existing transport:

a. Improve riding quality of existing roads (e.g. pavement rehabilitation);

b. Enhancement of use of non-motorized modes;

c. Car-pooling, meeting demand and supply facilitated through electronic platforms (e.g. companies providing the service sort of shared taxis);

d. Optimize the use of alternative modes of transport (e.g. use of combination of modes, use of waterways, reduce the fuel use due to optimization of overall system);

(v) Various measures to limit the use of personal cars (speed limits, parking policies);

(b) In terms of the scope of the new or revised methodologies, it is recommended that methodologies may cover a few of the technologies/measures listed in the

paragraphs above. However integrating all the measures under one or very few methodologies is not recommended at this point in time. Based on the accumulated experience of consolidating large-scale methodologies, the option of flexible combination of methodologies may be more practical. Although developing an integrated methodology would possibly reduce the need for post-registration changes (PRCs) in case new technologies are to be added in the future, it may also lead to complex methodologies that are difficult to develop and update. However a comprehensive programme design and more flexibility to undertake PRCs may address the issue together with a flexibility to combine methodologies.

(c) Additionally, general improvements to existing CDM methodologies may be considered as follows:

(i) Remove or lighten data-intensive requirements (e.g. survey frequency and precision requirements)[16] or provide default alternatives[17] or provide flexibility for various levels of data availability (tiered approach);

(ii) Where possible, use of technologies like GPS for vehicle tracking to monitor project activity levels (e.g. GPS in mobile phones could be applied, potentially, for trip tracking to directly monitor baseline and project emissions, thus avoiding surveys);

(d) Modelling approaches may be explored for all of the options above;

(e) Quantitative approaches should be further explored for additionality.

4. Impacts

30. The simplification and broadening of transport sector CDM methodologies including the development of new methodologies can potentially enhance the uptake of CDM projects in the transport sector, which is currently underrepresented in the CDM project portfolio.

31. The proposed work foresees a decrease of costs of development of CDM projects and PoAs on the long term.

5. Subsequent work and timelines

32. The Board may wish to provide guidance to the secretariat at EB 86 on the proposal contained in this concept note or alternatively task the secretariat, the Meth Panel and the SSC WG to further work on the issue to concretise the proposals and present a

[16] As reported in public comments, surveys and sampling issues are one of the areas in transport CDM that deserve further attention. Any future improvement needs to consider presenting very clear step-wise guidance on how such surveys need to be implemented and what kinds of questions need to be asked, and how the answers need to be processed in order to get the final measure for the baseline/project emissions.

[17] The ratio of actual and expected CERs of transport projects seems to vary widely and generally there is a substantial underperformance based on the PDD figures (according to UNEP/DTU). Therefore standardization may necessitate a conservative baseline while balancing the need to be pragmatic. If the effort to determine a certain parameter is excessively complicated, a choice between measurement and a conservative parameter may be an option.

revised concept note to the Board at a future meeting. For the former case, specific proposals will be included in the 2016 work plan of the Meth Panel and the SSC WG besides CDM MAP projects that Board will undertake in 2016, for the consideration of the Board at a future meeting of the Board.

6. Recommendations to the Board

33. The secretariat recommends that the Board agree to the work proposed and provide guidance as required.

Appendix. Definitions of some terms used in the concept note

1. A **transit-oriented development (TOD)** is defined as a compact, mixed-use (residential and commercial) development within walking distance of a transit station area designed to maximize access to public transport, and incorporates features to encourage transit ridership. A TOD would typically have a centre with a transit station or stop (train station, metro station, tram stop, or bus stop), surrounded by relatively high-density development with high pedestrian orientation providing more mobility choices and would simultaneously reduce the dependence on driving and energy consumption. Studies reveal that this type of arrangement can reduce driving by up to 85 per cent and reduce traffic congestion and air pollution by up to 25 to 50 per cent compared to typical suburban development.

2. **Non-motorized transport (NMT) in urban area**: A broad definition of NMT would be any kind of a transport system that does not run on a motor but rather on human-powered means and represents the least polluting source of transportation. Walking is the most familiar form of NMT and others include cycling, rickshaws and pedicabs. The use of NMT in cities reduces energy consumption, greenhouse gas emissions and pollution (air, water and noise) and has social, economic and environmental benefits.

3. **Land use or urban planning:** Urban planning is a technical and political process concerned with the use of land, protection, use of the environment, public welfare, the design of the urban environment, including air, water, and the infrastructure such as transportation, communications, and distribution networks. Urban planning guides and ensures the orderly development of settlements and satellite communities which commute into and out of urban areas or share resources with it. The pattern of land use has a strong influence on the travel demand. While compact cities have lower travel demand, especially for motorized travel, sprawling cities allow larger holdings and bigger homes. Integrating land use and transport planning can help optimize between the demand for motorized modes of travel and the size of one’s holding.

4. **Expressway:** Expressway, motorway or freeway is a type of highway which has been designed for high-speed vehicular traffic, with all traffic flow and ingress/egress regulated. It provides an unhindered flow of traffic, with no traffic signals, intersections or property access. Elimination of the sources of potential conflicts with other directions of travellers dramatically improves safety, fuel consumption, and travel times.

5. **Car-pooling:** Car-pooling is an arrangement among a group of automobile owners whereby owners take turns to drive the others to and from a designated place, or is otherwise the sharing of car journeys so that more than one person travels in a car. This has positive effects both on the individual’s travel cost as well as being a sustainable way to travel.

6. **Driverless car:** A driverless car is an autonomous vehicle capable of fulfilling the main transportation capabilities of a traditional car, and is capable of sensing its environment and navigating without human input. Robotic cars exist mainly as prototypes and demonstration systems.

7. **Smart traffic signals:** A smart traffic signal (known as intelligent traffic lights or advanced traffic lights) is a new system that combines existing technology with artificial intelligence to create lights that “think for themselves”. They are, in essence, signals that utilize a buried induction coil to sense the presence of signals that adapt to information that is received from a central computer about the position, speed and direction of vehicles. The signals communicate with each other and adapt to changing traffic conditions to reduce the amount of time that cars spend idling. Using fibre-optic video receivers similar to those already employed in dynamic control systems, the new technology monitors vehicle numbers and makes changes in real time to avoid congestion wherever possible.

8. **Components of urban goods transport:** There are three main components of city logistics:

   (a) The modes that carry the freight;

   (b) The infrastructures supporting freight flows;

   (c) The operations related to their organization and management.

9. Each component has subcomponents with their own characteristics and constraints. For instance, transport terminals, roads and distribution centres are infrastructure subcomponents of city logistics. The same applies to scheduling, routing, parking and loading/unloading, which are operational subcomponents. While trucks remain the dominant mode supporting city logistics, they face constraints mainly related to congestion and environmental externalities. A major challenge for city logistics is therefore a rebalancing where alternative modes (such as electric vehicles) and infrastructure (such as local freight stations), improved by novel forms of operations, would play a more prominent role.

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