Eligibility of civil aviation projects under the Clean Development Mechanism (CDM)

This report is intended to address the ICAO Assembly request to study the possible application of CDM of the Kyoto Protocol to international aviation (per Resolution A37-19 paragraph 24 (m)). This is a document prepared exclusively for the internal deliberations of ICAO and should be used for no other purpose.

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1. Introduction

The 37th ICAO Assembly adopted Resolution A37-19: *Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change*, which, among other issues, addresses further work of ICAO on the clean development mechanism (CDM). Specifically, in its preamble, the Resolution states: "the Kyoto Protocol provides for different flexible instruments (such as the Clean Development Mechanism — CDM) which would benefit projects involving developing States". In its operative part, the Assembly:

- "Recognizes that in the short term voluntary carbon offsetting schemes constitute a practical way to offset CO_2 emissions, and invites States to encourage their operators wishing to take early actions to use carbon offsetting, particularly through the use of credits generated from internationally recognized schemes such as the CDM"; (paragraph 19) and
- "Requests the Council to undertake a study on the possible application of CDM of the Kyoto Protocol to international aviation" (sub-paragraph 24 (m)).

The CDM is one of the three Kyoto mechanisms (the other two being emissions trading and joint implementation) and has a dual role contributing to sustainable development of developing countries (non-Annex I Parties) while assisting developed countries (Annex I Parties) to partially fulfill their obligations under the Kyoto Protocol. CDM projects can be implemented bilaterally (a donor country providing the means for the materialization of a project, and another country being the host of the CDM project) or unilaterally (the same country being both the donor and the host of a CDM project).

Since the start of the CDM, almost 10 years ago, more than 4,000 projects have been registered that are expected to result in a combined reduction of about 2.14 billion tonnes of CO_2 eq by the end of 2012.[1] This is slightly higher than the total anthropogenic GHG emissions of the Russian Federation in 2009 (2.13 billion tonnes of CO_2 eq).[2] Despite the success of CDM, in terms of emissions reductions, and the desire of a lot of developing countries to attract CDM projects, the future of the mechanism is not secured as it is closely linked to the future of the Kyoto Protocol. Under the UNFCCC process, governments are currently working towards an agreement for a second commitment period under the Protocol that will hopefully provide reassurances to CDM project developers regarding the future implementation of projects.

For projects relating to bunker fuels,[3] the CDM Executive Board (EB)[4] has "agreed to confirm that the project activities/parts of project activities resulting in emission reductions from reduced consumption of bunker fuels (e.g. fuel saving on account of shortening of the shipping route on international waters) are

[1] Information from the UNFCCC website (http://cdm.unfccc.int/Statistics/index.html) extracted on 30/05/2012.

[2] Table 5 of FCCC/SBI/2011/9 (http://unfccc.int/resource/docs/2011/sbi/eng/09.pdf).

[3] The term "bunker fuels" is often used within the UNFCCC process and refers to fuel used for both international aviation and maritime transport.

[4] The CDM EB supervises the CDM, under the authority and guidance of the Parties to the Kyoto Protocol. It is comprised of 10 individuals (and alternates) elected by the Conference of the Parties serving as the Meeting of the Parties (CMP) to the Kyoto Protocol.

not eligible under the CDM."[5] In essence, this excludes international aviation from the CDM and, therefore, there are no relevant approved methodologies for any potential CDM projects. It should be noted that there are no restrictions for domestic aviation CDM projects.

Letting aside the political negotiations and the current exclusion of international aviation from CDM, this document discusses potential future methodological work relating to CDM projects for aviation. For this report, the following assumptions have been made:

- The CDM will continue in the future either in its present form or as a derivative of the present form;
- There will be demand for aviation CDM projects that could help ICAO States in their efforts to address the growth of international aviation and the minimization of its impacts on the global environment.

Taking into account the above, the objectives of this document are:

- To provide information on the CDM, including a brief description of its current procedures and institutions;
- To consider mitigation measures for aviation in the context of the present rules and procedures of the CDM;
- To assess aviation mitigation measures in terms of their potential to be considered as CDM projects;
- To review existing CDM methodologies that could be applicable to aviation mitigation measures.

This report does not prejudge decisions that may be taken by ICAO and the UNFCCC in relation to the implementation of market measures to address GHG emissions from international aviation or any other relevant sector.

[5] Paragraph 58 of the report of the 25th meeting of the EB <http://cdm.unfccc.int/EB/025/eb25rep.pdf>.

2. Clean Development Mechanism (CDM)

2.1 Background

The Clean Development Mechanism (CDM) is one of the three mechanisms introduced by the Kyoto Protocol; the other two being emissions trading and joint implementation (JI). The CDM is a project-based mechanism, defined in Article 12 of the Kyoto Protocol, which allows an industrialized country with an emission reduction or emission limitation commitment under the Kyoto Protocol (Annex B Party) to implement emissions reduction projects in developing countries while contributing to the sustainable development of these countries. Through the implementation of such projects certified emission reduction (CER) credits, each equivalent to one tonne of CO_2, are created and can be counted towards meeting Kyoto targets of Annex B Parties.

The CDM is the first global, environmental investment and credit scheme of its kind, providing a standardized emissions offset instrument, CER. The mechanism provides a link between sustainable development and emission reductions in developing countries, while giving industrialized countries some flexibility in how they can meet their emission reduction or limitation targets.

2.2 Definition and classification of CDM projects

CDM projects must lead to reductions in emissions of greenhouse gases compared to a business as usual (or baseline) scenario. The implementation could be undertaken by a developing country, by a developed country or through a joint venture between the two.

The CDM requires application of a baseline and monitoring methodology in order to determine the amount of CERs generated by a mitigation project in a host country.

Methodologies are allocated to generic mitigation activity types. Sectoral scopes 1 to 3 (energy sectors – generation, supply and consumption) are first distinguished according to:

- Electricity generation and supply;
- Energy for industries;
- Energy (fuel) for transport;
- Energy for households and buildings.

They are then categorized in terms of type of mitigation activity, such as:

- Displacement of a more-GHG-intensive output (e.g., renewable energy, low carbon electricity);
- Energy efficiency;
- Fuel and feedstock switch.

Sectoral scopes 4 to 15 (other sectors) are categorized according to the following mitigation activities:

- Displacement of a more-GHG-intensive output;
- Renewable energy;
- Energy efficiency;
- GHG destruction;
- GHG emission avoidance;
- Fuel switch; and
- GHG removal by sinks.

For more information on CDM procedures, refer to Appendix A.

2.3 Aviation and CDM

Under the UNFCCC process and procedures (including both the Convention and the Kyoto Protocol) domestic and international aviation are treated differently. According to the current accounting rules, all Parties are to distinguish emissions from domestic aviation from those resulting from international aviation. The former are to be included as part of the national total GHG emissions, while the latter are to be excluded from national totals and reported separately in Parties' GHG inventories.

This differentiation between domestic and international operations has created an exclusion of potential projects in international aviation from the CDM. This means that although projects could be implemented they would not result in CERs that would be part of the carbon market established under the Kyoto Protocol. In essence this situation creates a disincentive for the implementation of such projects.

The current rules are not expected to change and will continue to apply during the remainder of the first commitment period of the Kyoto Protocol (2008-2012). It is anticipated that the CDM (in some form) will continue to provide opportunities for countries to reduce their GHG emissions while enhancing their sustainable development efforts. Any changes to the CDM rules will apply to future regimes and commitment periods agreed under the UNFCCC process.

3. Eligibility of measures to limit or reduce emissions from international aviation under CDM

3.1 The basket of measures

The High-level Meeting on International Aviation and Climate Change in October 2009 (HLM-ENV/09) endorsed the Programme of Action on International Aviation and Climate Change which included global aspirational goals in the form of fuel efficiency, a basket of measures and the means to measure progress. The basket of measures was used to test the potential eligibility of aviation projects under the CDM. The basket of measures was classified according to the following categories:

1) Aircraft-related Technology Development
2) Improved Air Traffic Management and Infrastructure Use
3) More efficient operations
4) Economic / market-based measures
5) Regulatory measures / Other

The detailed list of measures is provided in Appendix B. These measures can be classified under energy consumption and can, in general, be categorized in the following broad areas:

- Displacement of a more-GHG-intensive output:
  - Renewable energy
  - Low carbon electricity
- Energy efficiency;
- Fuel and feedstock switch.

3.2 Assessment of potential eligibility under the CDM

It should be recalled that CDM has a dual objective: reducing GHG emissions and contributing to sustainable development. This implies that measures whose contribution to sustainable development cannot be proven will not be eligible. Also a CDM project has to take place in a developing country. Therefore measures which cannot be implemented in a developing country should be excluded. Measures for which it is not possible to prove “additionality” should also be excluded.

The review of the measures provided in Appendix B for eligibility under the CDM identified the following potentially eligible measures:

- Purchase of new aircraft (difficult to prove additionality)
- Retrofitting and upgrade improvements on existing aircraft (difficult to prove additionality)
- Avionics (difficult to prove additionality)
- Alternative fuels (not necessarily civil aviation related)
- More efficient ATM planning, ground operations, terminal operations (departure and arrivals), enroute operations, airspace design and usage, aircraft air navigation capabilities (difficult to prove additionality).
- More efficient use and planning of airport capacities (difficult to prove additionality).
- Conversion of airport infrastructure and ground support equipment to cleaner fuels
- Construction of additional runways to reduce congestion (difficult to prove additionality)
- Enhanced terminal support facilities (difficult to prove additionality)
- Improved public transport access (not necessarily civil aviation related)
- Enhancing weather forecasting services (difficult to prove additionality)

4. Methodologies for CDM transport projects

4.1 General

The implementation of CDM projects requires the existence of approved baseline and monitoring methodologies to determine the amount of certified emission reductions (CERs)[6] generated by these projects. In general, each methodology contains the following elements:

- Definitions used in the application of the methodology;
- Description of the applicability of the methodology;
- Description of the project boundary;
- Procedure to identify the baseline scenario;
- Procedure to demonstrate and assess additionality;
- Procedure to calculate emission reductions;
- Description of the monitoring procedure.

The methodologies that have been developed and approved by the CDM EB apply to 13 sectoral scopes (see Box 1). In addition, the CDM EB has developed tools, including guidance, guidelines and procedures, to further explain specific issues and assist CDM project developers. All methodologies and related tools are available on the UNFCCC website (http://cdm.unfccc.int/methodologies/index.html).

[6] A certified emission reduction or CER is a unit that represents a reduction of GHG emissions equal to one metric tonne of CO_2 equivalent from a CDM project.

Box 1: Sectoral scopes of the CDM

1. Energy industries (renewable and non renewable sources)
2. Energy distribution
3. Energy demand
4. Manufacturing industries
5. Chemical industries
6. Construction
7. Transport
8. Mining/mineral production
9. Metal production
10. Fugitive emissions from fuel (solid, oil and gas)
11. Fugitive emissions from production and consumption of halocarbons and SF_6
12. Solvent use
13. Waste handling and disposal

CDM methodologies are classified into four categories:

- Methodologies for large scale CDM project activities;
- Methodologies for small scale CDM project activities;
- Methodologies for large scale afforestation and reforestation (A/R) CDM project activities;
- Methodologies for small scale A/R CDM project activities.

Methodologies for large scale projects can be used for projects of any size. Simplified small-scale methodologies can only be applied if the activity is within certain limits and are grouped into three different types, as follows:

Type I: Renewable energy projects with a maximum output capacity equivalent to up to 15 MW (or an appropriate equivalent);

Type II: Energy efficiency improvement projects that reduce energy consumption, on the supply and/or demand side, by up to the equivalent of 60 GWh per year;

Type III: Other projects that both reduce anthropogenic emissions by sources and directly emit less than 60 kilotonnes of CO_2 eq annually.

In relation to transport CDM projects, the approved methodologies, and the specific activities that they cover, are shown in Table 1. Brief descriptions of these methodologies are provided in Appendix 1.

Table 1. CDM methodologies for transport projects

Large scale methodologies	
AM0031	Bus rapid transit projects - Version 4.0.0
AM0090	Modal shift in transportation of cargo from road transportation to water or rail transportation - Version 1.1.0
AM0101	High speed passenger rail systems - Version 1.0.0
Consolidated methodologies	
ACM0016	Mass Rapid Transit Projects - Version 3.0.0
Small scale methodologies	
AMS-III.C.	Emission reductions by electric and hybrid vehicles - Version 13.0
AMS-III.S.	Introduction of low-emission vehicles/technologies to commercial vehicle fleets - Version 3.0
AMS-III.T.	Plant oil production and use for transport applications - Version 2.0
AMS-III.U.	Cable Cars for Mass Rapid Transit System (MRTS) - Version 1.0
AMS-III.AA.	Transportation Energy Efficiency Activities using Retrofit Technologies -Version 1.0
AMS-III.AK.	Biodiesel production and use for transport applications - Version 1.0
AMS-III.AP.	Transport energy efficiency activities using post - fit Idling Stop device - Version 2.0
AMS-III.AQ.	Introduction of Bio-CNG in transportation applications - Version 1.0
AMS-III.AT.	Transportation energy efficiency activities installing digital tachograph systems to commercial freight transport fleets - Version 2.0
AMS-III.AY.	Introduction of LNG buses to existing and new bus routes - Version 1.0

4.2 Revision, clarification and deviation

CDM methodologies can be modified through the following three procedures:

Revision: Applies to new projects that are "broadly similar" to projects for which an approved methodology already exists. The revisions should not lead to exclusion, restriction, narrowing of the applicability conditions. If the revision would add new procedures or scenarios to more than half of the sections of an approved methodology, a new methodology must be proposed. The EB, project developers or the Meth Panel, and the COP/MOP can propose a revision. Revisions do not affect registered projects and projects submitted for registration.

Clarification: Could be requested if a methodology is unclear or ambiguous. Only validators are allowed to submit requests for clarification of methodologies.

Deviation: Suitable for situations where a change in the procedures for the estimation of emissions or monitoring procedures is required due to a change in the conditions, circumstances or nature of a registered project. Deviations are project specific.

5. Potential methodologies for aviation-related measures

The CDM methodologies are based, to a great extent, on the methodologies that are included in the IPCC guidelines for national GHG inventories (Revised 1996[7] and 2006[8] editions) and the IPCC good practice guidance[9]. For aviation, the IPCC prescribes the estimation of emissions separately for domestic and international operations and provides different methods depending on the information available in a country. The simplest (tier 1) method involves the total amount of fuel consumed (separately for domestic and international flights) and the use of default emission factors. The tier 2 method requires additional information on LTOs by aircraft type. Tier 3A and 3B methods are based on flight movement data instead of fuel use and are more suitable for use in models (e.g., SAGE, AERO2K etc.).

According to the IPCC guidelines, emissions are estimated for the LTO and cruise stages, separately. Jet fuel consumption is assumed to be the total amount of fuel loaded on aircrafts. The emissions during LTOs are accounted either as domestic or international depending on the designation of a specific flight despite that, irrespective of the final destination, LTO-related emissions are released in the vicinity of an airport and, technically, could be designated as domestic emissions. The way the IPCC guidelines are implemented, the LTO covers not only the approach, taxi/idle, take off, and climb (based on the ICAO definition) but also all activities that involve use of jet fuel while an airplane is at an airport gate.

Although there is no restriction for domestic aviation CDM projects, no relevant methodologies have been approved by the EB. The reason for this is the cost of developing CDM methodologies combined with potentially limited application given that for the majority of developing countries international flights constitute the vast majority of the GHG emissions from aviation activities. Only in very few countries (such as the largest developing countries: Brazil, China and India) emissions from domestic aviation could be significant. For such countries, it should be possible to devise methodologies and projects that could lead to CERs within the existing CDM framework.

Of the measures identified by the High-level Meeting on International Aviation and Climate Change in October 2009 (HLM-ENV/09) that could be eligible under a future CDM, Table 2 indicates whether there are methodologies that would apply to specific measures or if there is need for the development of new methodologies.

[7] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html).

[8] 2006 IPCC Guidelines for National Greenhouse Gas Inventories (http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html).

[9] Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (http://www.ipcc-nggip.iges.or.jp/public/gp/english/index.html) and Good Practice Guidance for Land Use, Land-Use Change and Forestry (http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html).

Table 2. Potentially eligible measures for CDM international aviation projects

Measure	Related existing CDM methodology	Comments
Purchase of new aircraft	AMS-III.S. Introduction of low-emission vehicles/technologies to commercial vehicle fleets	The existing methodology could be revised to address emissions from aviation.
Retrofitting and upgrade improvements on existing aircraft	AMS-III.AA. Transportation energy efficiency activities using retrofit technologies	The existing methodology applies to car fleets. It would require a revision to address emissions from aviation.
Avionics	AMS-III.S. Introduction of low-emission vehicles/technologies to commercial vehicle fleets	Specific methodology needs to be developed
Alternative fuels	ACM0017 Production of biodiesel for use as fuel AMS-III.AK. Biodiesel production and use for transport applications AMS-III.T. Plant oil production and use for transport applications	The case where air carriers are the producers of alternative fuels is not covered by existing methodologies.
More efficient ATM planning, ground operations, terminal operations (departure and arrivals), enroute operations, airspace design and usage, aircraft air navigation capabilities	No methodology	A specific methodology needs to be developed
More efficient use and planning of airport capacities	No methodology	This is purely domestic as it relates to the airport capacities. Could develop methodologies and have projects within the existing CDM framework
Conversion of airport	ACM0017 Production of biodiesel for use as fuel	This is purely domestic as it relates to the airport capacities. Could develop methodologies and have

infrastructure and ground support equipment to cleaner fuels	AMS-III.AK. Biodiesel production and use for transport applications AMS-III.T. Plant oil production and use for transport applications	projects within the existing CDM framework
Construction of additional runways to reduce congestion	No methodology	A methodology for this measure could be complicated to develop and monitoring emissions reductions could also be difficult.
Enhanced terminal support facilities	No methodology	This is purely domestic as it relates to the airport capacities. Could develop methodologies and have projects within the existing CDM framework
Improved public transport access	AM0031 Baseline methodology for bus rapid transit projects AMS-III.U. Cable Cars for Mass Rapid Transit System (MRTS) AMS-III.C. Emission reductions by electric and hybrid vehicles	Although this is not necessarily an aviation related project, it could apply to specific airport locations. This is purely domestic as it relates to the airport capacities. Could develop methodologies and have projects within the existing CDM framework
Enhancing weather forecasting services	No methodology	A methodology for this measure could be complicated to develop and monitoring emissions reductions could also be difficult..

The following sections provide examples of how some of the existing methodologies could be modified to apply to aviation CDM projects.

5.1 Methodology AM0090

Applicability

Methodology AM0090 -"Modal shift in transportation of cargo from road transportation to water or rail transportation"[10] is applicable to project activities that result in modal shift in transportation of a specific cargo (excluding passengers) from road transportation using trucks to water transportation using barges or ships or rail transportation. Specifically, it is applicable under the following conditions:

- The owner of the cargo is one of the project participants. If the entity investing in the CDM project activity is not the owner of the cargo, it should also be a project participant;
- The project participants should have made at least one of the below listed new investments:
    - Direct investment in new infrastructure, including facilities (new ports, handling areas) and/or equipments[11] (ships, barges, etc.) for water transportation;
    - Direct investment in new infrastructure, including facilities (new ports, handling areas, railway track)[12] and/or equipments[9] (trains, wagons, etc) for rail transportation;
    - Refurbishment/replacement of existing water and rail transportation infrastructure or equipments, with transport capacity expansion;
- The transport infrastructure/equipment in which these new investments are made is at least 50% used by the cargo transported under the project activity, i.e. the cargo transported under the project activity constitutes at least 50% of the cargo transported annually by/with this infrastructure/equipment;
- With respect to fuels, the following conditions[13] apply:
    - In the case of gaseous fossil fuels, the methodology is applicable if it can be demonstrated that equal or more gaseous fossil fuels are used in the baseline scenario than in the project activity. The methodology is not applicable in its current

[10] The methodology is available on the UNFCCC website; see http://cdm.unfccc.int/methodologies/DB/4DOIK2WYP8P3AGAVJKT0CHY1NXJ4QP.

[11] Investment on intermodal containers is not considered as investment in this case.

[12] Not necessarily the whole railway track, but a part of the track can be built (for example, from the industrial facility to a nearest connecting point).

[13] No provisions to calculate upstream emissions from the production of the fuels are provided in order to keep the methodology simple. Therefore, in order to ensure that the calculated emission reductions are conservative, this applicability condition aims to limit the use of the methodology to cases where the upstream emissions under the project activity are likely to be equal or lower than in the baseline scenario. Note that other methodologies involving fuel switch situations usually require the consideration of upstream emissions. Note also that as this methodology is about a switch from road transportation using trucks to water transportation using barges or ships or rail transportation, most project activities can comply with these requirements. If required, project participant may submit a request for revision to this methodology.

form if more gaseous fossil fuels are used in the project activity compared to the baseline scenario;[14]

- In the case of biofuels, the methodology is applicable if it can be demonstrated that equal or more biofuels are used in the baseline scenario than in the project activity. The methodology is not applicable in its current form if more biofuels are used in the project activity compared to the baseline scenario.

- The project transportation mode is defined in the CDM-PDD at the validation of the project activity and no change of transportation mode is allowed thereafter;
- The cargo is transported from the same origin (point A) to the same destination (point B) throughout the whole crediting period. These two points and transportation routes are defined in the CDM-PDD at the validation of the project activity and are fixed along the crediting period;
- Under the project activity, the route from origin to destination may combine the different transportation modes: Trucks, ships, barges and/or rail but a part of the route must consist of either ships, barges or rail;
- Both in the baseline and project activity, only one type of cargo, owned by the project participants, is transported and no mix of cargo is permitted (this condition does not apply to the return trip cargo). The cargo type of the project activity is defined in the CDM-PDD at the validation of the project activity and is fixed along the crediting period;
- The railway infrastructure or waterway has enough capacity to accommodate new transportation demand under the project activity and will not displace other existing transportation demand due to limited capacity of infrastructure.

This methodology is only applicable if the most plausible baseline scenario, as identified per the section "Selection of the baseline scenario and demonstration of additionality" hereunder, is M1 (Road transportation).

Specific considerations

When identifying alternative scenarios for cargo transportation project developers should include all realistic and credible alternatives to the project activity that are consistent with current laws and regulations of the host country.

The following likely scenarios of transportation modes shall be assessed, *inter alia*:

M1: Road transportation;

M2: Rail transportation;

M3: Water transportation;

M4: Other transportation modes (e.g. air transportation, pipelines, electric conveyors, ropeway, if relevant).

[14] Project participants wishing to consider a higher consumption of gaseous fuels in the project activity than in the baseline may propose a revision of this methodology by adding the relevant upstream emission terms that a fuel switch towards gaseous fuels entails, taken e.g. from ACM0009.

All considered scenarios should provide the same service, i.e. they should be able to transport the same amount of cargo as transported under the project activity from the same origin to the same destination.

If the demand for the transportation of cargo is new,[15] it has to be demonstrated that road transportation is a realistic option from a technical point of view and that appropriate road infrastructure is available in the project activity region. It shall also be proved that road transportation is a common practice for the transportation of the project cargo type in the host country or other relevant region as defined in the common practice analysis of the tool.

Undertaking an investment analysis is mandatory and the following guidance should be followed:

- The investment analysis shall be carried out from the perspective of the project participants, including the owner of the cargo and the investing entity (if different from the owner).
- In the case that the cargo is not transported by the owner of the cargo and the transport service provider is not a project participant, the transport tariffs of this third party transport service provider shall be used in the investment analysis and verified by the DOE.
- In case the project activity infrastructure/equipment is only partially used for the cargo transported under the project activity and the same infrastructure/equipment is also used to transport cargo of third parties and/or the cargo owned by the project participants which are the not included under the project activity, then the investment analysis shall consider all revenues generated by the use of this infrastructure for the transport of cargo other than the project cargo, including non CDM transportation activities (including any non CDM return cargo). The cargo transported under the project activity must constitute at least 50% of the total amount of cargo transported.
- If the project activity provides a different quality of service than other alternative scenarios, such as faster or more reliable transportation, these benefits may be monetized and be taken into account in the investment analysis. Any monetization of time or quality of service shall be supported by "revealed/stated preference" type studies to be verified by the DOE. The typical transport time for the cargo from origin to the destination for both the project activity and baseline scenario shall be estimated and documented in the CDM-PDD.

For aviation projects, a project developer would need to providing justification that air transport would lead to lower GHG emissions as compared to road transportation and other feasible alternatives (e.g., rail, maritime transport).

5.2 Methodology AMS-III.S

Applicability

Methodology AMS-III.S[16] is for project activities introducing low-greenhouse gas emitting vehicles for commercial passenger (including public transportation), material and freight transport, operating on

[15] For the purpose of this methodology, a new demand for transportation means that there is no history of transportation of the same cargo type that is being transported in the project activity between the same points prior to the start of the project activity. For example, transportation of cargo from/to a greenfield industrial facility

[16] The methodology is available on the UNFCCC website; see http://cdm.unfccc.int/methodologies/DB/5OY2ID7LHPXX69YJOT2PCJ5ONSXB4B.

routes with comparable conditions.[17] 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.

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

- Compressed natural gas (CNG) vehicles;
- Electric vehicles;
- Liquid petroleum gas (LPG) vehicles;
- Hybrid vehicles with electrical and internal combustion motive systems.

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

- Buses, jeepneys, commuter vans and tricycles for public transport;
- Trucks for freight transport, waste collection or other services with regular routes.

Project participants must demonstrate that:

- The project activity is unlikely to change the level of service[18] provided on comparable routes before the project activity;[19]
- 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.

Project participants shall identify the following parameters:

- The routes along which the vehicles operate;
- The level of service on each route, for example the average/total number of passengers or tonnage transported and the average distance the passengers or freight was transported on that route on an annual basis.

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

The project boundary includes the following:

- Fleet to which low emission vehicles are introduced;
- The geographical area covering the physical routes along which these vehicles operate;
- Auxiliary facilities such as fuelling stations, workshops and service stations that are visited by the vehicles in the feet.

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[17] Comparable routes are routes with similar traffic conditions and terrain in the same city or region (e.g. traffic density of the route and average speed of vehicles).

[18] 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.

[19] 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.

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

Example relating to the submission of a request for a clarification[20]

A clarification could be submitted to the EB on the applicability of AMS-III.S for introduction of low-emission airplanes/technologies to commercial air fleets.

An airline company that provides transportation services (passenger and goods) intending to introduce new low greenhouse gas emitting aircraft could request the following:

- Clarification on the applicability of the methodology AMS-III.S for such a project activity and whether the methodology can be used for aircraft instead of land vehicles mentioned in paragraph 3 assuming that the project activity can fulfill the other eligibilities as per methodology.
- Clarification on whether the methodology can apply to national boundary, regional boundary or international boundary.
- Clarification on whether this type of project can use the PoA[21] approach that includes all the project activities that are applicable with the AMS-III.S methodology.

[20] The example is modeled along the clarification proposal for the applicability of the methodology for maritime transport.

[21] A Programme of activities (PoA) is a voluntary coordinated action by a private or public entity which coordinates and implements any policy/measure or stated goal (i.e., incentive schemes and voluntary programmes), which leas to anthropogenic GHG emissions reductions or net anthropogenic GHG removals by sinks that are additional to any that would occur in the absence of the PoA, via an unlimited number of crediting periods.

Box 2: Applicability of AMS-III.S fro maritime projects

The small-scale working group (SSC WG) agreed to clarify that the AMS-III.S may be applied for a project activity involving the introduction of low greenhouse gas emitting marine vessels and retrofitting of water borne vehicles to switch from high to low greenhouse gas intensive fossil fuel (e.g. diesel to natural gas) used solely for domestic water borne transport as defined by IPCC 2006, vol.2, chapter 3, provided that the other requirement of the methodology are also met.

Domestic water borne transport, restricted to national boundaries only, can be considered eligible as stipulated under other transportation methodologies (see for example footnotes 3 and 2 of AMS-III.AK and AMS-III.T, respectively) which complies with paragraph 58 of the EB 25 report that states that "the project activities/parts of project activities resulting in emission reductions from reduced consumption of bunker fuels (e.g. fuel savings on account of shortening of shipping route on international waters) are not eligible under the CDM".

The SSC WG points out that in the specific context of domestic water borne transportation the "comparability of routes" should be demonstrated showing that maritime vessels are operated under similar conditions that are specific for maritime transportation, for example ocean/river currents and others.

With reference to the requirement of AMS-III.S that conditions which govern the operation of the fleet (e.g. tariffs, regulations) should be homogeneous within the project boundary, the SSC WG agreed to clarify that the same fuel subsidies/taxes and regulations/restrictions on shipping are applicable to all vessels included in the project boundary.

This methodology is applicable to PoAs and the additional requirements for PoAs stipulated in the methodology should be followed for example consideration of leakage emissions in the case of fossil fuel switch project as per paragraph 21 of AMS-III.S.

5.3 Methodology AMS.II.D

Applicability

Methodology AMS.II.D applies to any energy efficiency and fuel switching measures implemented at a single or several industrial or mining and mineral production facility(ies). It covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B.[22] Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial or mining and mineral production processes (such as steel furnaces, paper drying, tobacco curing, etc.). Specifically it covers:

- Measures that may replace, modify or retrofit existing facilities or be installed in a new facility;
- Project activities where it is possible to directly measure and record the energy use within the project boundary (e.g., electricity and/or fossil fuel consumption);

[22] Thus, fuel switching measures that are part of a package of energy efficiency measures at a single location may be part of a project activity included in this project category.

- Project activities where the impact of the measures implemented (improvements in energy efficiency) by the project activity can be clearly distinguished from changes in energy use due to other variables not influenced by the project activity (signal to noise ratio);

- Projects for which the aggregate energy savings (inclusive of a single facility or several facilities) may not exceed the equivalent of 60 GWh_e per year. A total saving of 60 GWh_e per year is equivalent to a maximal saving of 180 GWh_{th} per year in fuel input.

The project boundary is the physical, geographical site of the industrial or mining and mineral production facility(ies), processes or equipment that are affected by the project activity.

Example relating to replacing APU

The following proposal was submitted to the EB for its consideration. Because the proposed methodology resulted in the reduction of emissions through the replacement of bunker fuel, the EB rejected it in its present form. The rationale for the rejection and the suggestions of the Meth Panel are provided below.

Proposal

"All the aircrafts are fitted with an Auxiliary Power Unit (APU) that provide power to the aircraft when it is landed at the airport and the engine are shut down, to run the accessories. One of the major functions is to operate the air conditioning units to maintain comfortable temperature in the cabin while the passengers are boarding before the aircraft's engines are started. Present ground cooling systems, if any, are inadequate in hot and humid climate (in the Middle East region) and therefore it becomes mandatory to use Auxiliary Power Unit (APU) to operate the aircraft on board cooling system (Air packs) for several hours before the aircraft is ready for boarding.

Every plane has a built-in cooling unit powered by APU which takes air from the outside and compresses and cools it. The cooled air is then forced into the aircraft through small holes on the inner surface of the cabin. This kind of cooling uses an open system (air from the atmosphere) and is highly energy inefficient and environmental unfriendly since they are powered by the bleed air from the APU. To summarize, the APU based cooling system is inefficient due to:

- The air from the atmosphere may have varying humidity levels. Humid air is not cooled as easily.

- Most of the cooled air will be rejected back out into the atmosphere as a result of forcing the air through small holes

The APU runs on Jet Fuel and lead to substantial fuel consumption resulting in release of a large amount of CO_2 emissions during the period aircraft is parked at the airport.

The project activity involves installation of a new electrically powered pre-conditioned Compressed Air Expansion (CAE) ground based cooling system. The new ground cooling units are operating according to the air cycle principle and are mainly powered by dry compressed air generated in a centralized compressor room.

The new ground cooling system is unique in the respect that it is capable of continuously supplying pre-conditioned air at subfreezing temperatures according to the IATA standard.

The new subfreezing ground cooling system is capable of running more efficient compared to the Air packs, because of the efficient system of drying the compressed air before the subfreezing pre-conditioned air is generated. This allows the system to run continuously without frequent need for

defrosting. The drying of the compressed air is done by adsorption dryer technology capable of removing 99.5% of the humidity from the ambient air.

Since the new system is electrically powered (from the grid) which has a significant lower emissions compared to the burning of Jet fuel due to lower carbon intensity. The reduction of greenhouse gases (GHG) is estimated to be up to 67% and anticipated on two fronts:

1) High efficiency of the external cooling system compared to the in-build air conditioning units

2) Switch from high carbon intensity energy (ie. Jet fuel) to low carbon intensity energy (Grid electricity)

The GHG emission reductions are expected to be within the prescribed limit of 180 GWhth per year. It is noteworthy that the project activity is primarily an energy efficiency measure, though involves fuel switch from Jet fuel to electricity, and therefore meets the requirement Methodology AMS.II.D ver 12.

As per the title and para 1 of methodology AMS.II.D ver 12 "Energy Efficiency and Fuel Switching measures for industrial facilities", it comprises any energy efficiency and fuel switching measures implemented at a single or several industrial or mining and mineral production facility(ies); aimed primarily at energy efficiency.

As per the above, the methodology is applicable to Industrial Facilities (including mining and mineral production facilities) only. The project activity may and may not fall under the specified category as it may be considered as commercial facility. In prima facia though, other methodology conditions seems to be applicable to the project activity."

Response

In response to the query whether the underlying project activity is applicable under AMS-II.D, the SSC WG agreed to clarify that per a clarification provided by the CDM EB (EB 25 report, para 58), project activities/parts of project activities resulting in emission reductions from reduced consumption of bunker fuels are not eligible under the CDM. Thus, displacement of jet/aviation fuel is not an eligible CDM activity, as proposed in the description provided by the author of the query.

However, if the project proponent were to indicate and justify a baseline scenario of a ground-based, electric cooling system that is less efficient than the proposed project activity, that could possibly be an eligible CDM activity. Further, even if the baseline scenario is an electric cooling system, the following issues shall be noted:

- Example projects applicable for use of AMS-II.D include energy efficiency measures (such as efficient motors), and efficiency measures for specific industrial or mining and mineral production processes (such as steel furnaces, paper drying, tobacco curing, etc.). AMS-II.D does not provide necessary procedures to estimate emissions reduction in the specific case of this chiller replacement project with variable performance. For example, AMS-II.D does not provide procedures or provisions to:

- Calculate baseline/project/leakage emission due to the use of refrigerants in chillers;

- Determine baseline scenario for project activity that supplies cooling energy;

- Conservatively determine a baseline specific energy consumption taking into consideration the variable performance efficiencies of baseline chilling/cooling units (taking into consideration auxiliary loads such as cooling towers and chilled water circulating pumps);

- Select baseline parameters such as COP and efficiency in the case of thermal energy;
- Ensure level of service in the project as compared to its baseline. For example how to ensure that additional cooling is not done in the project case because the cooling is easier/less expensive; and
- Monitor thermal energy (e.g. cooling output).

The SSC WG is of the opinion that the project proponents need to explain transparently in the PDD addressing the issues mentioned above. Alternatively, the project proponents wish to submit a request for revision of AMS-II.D or submit a new methodology taking into account the issues above.

Also, please note that the SSC WG is in the process of revising AMS-II.C or developing a new methodology to cover project activities involving technologies with variable input/output characteristics such as chillers. (See SSC WG response to SSC_540 “Clarification on calculation of baseline emissions for chiller programme under AMS-II.C”).

In response to the query whether the project activity can be considered as a industrial facility, the SSC WG clarified that an airport can be considered to be an industrial facility intended under AMS-II.D.

Appendix A

CDM Procedures

1. CDM Project stakeholders

The CDM projects must undergo a rigorous and public registration and issuance process. At least four stakeholders are involved in a CDM Project throughout its cycle: the project participant, the UNFCCC's CDM Executive Board (CDM EB), the Designated National Authority (DNA) and the Designated Operational Entity (DOE).

Project Participants

A Party or a private and/or public entity authorized by a Party to participate in a CDM project activity. The Party remains responsible for the fulfilment of its obligations under the Protocol and shall ensure that such participation is consistent with the modalities and procedures for CDM.

CDM Executive Board

The CDM is overseen by the CDM Executive Board, which ultimately reports to the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol that comprises countries that have ratified the Kyoto Protocol.

The Executive Board has 10 elected members from Parties to the Kyoto Protocol. Its role is to:

- Develop procedures for the CDM;
- Approve new methodologies;
- Accredit Designated Operations Entities (DOEs);
- Register projects (in accordance with specific procedures);
- Issue Certified Emission Reduction (CER) credits earned through CDM projects in accordance with specific procedures;
- Make publicly available information on proposed CDM projects in need of funding and investors seeking opportunities;
- Maintain a public database of CDM project activities containing information on registered project design documents, comments received, verification reports, CDM Executive Board decisions and information on all CERs issued;
- Develop and maintain the CDM registry.

Designated National Authority

Parties participating in the CDM are required to designate a national authority for the CDM. This could be a Ministry of Environment or an Agency or any other government authority.

Designated Operational Entity

Emission reductions resulting from each project activity shall be certified by operational entities on the basis of:

a) Voluntary participation approved by each Party involved;
b) Real, measurable, and long-term benefits related to the mitigation of climate change; and
c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

Designated Operational Entities (DOE) are third party certifiers designated by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol based on a recommendation from the CDM EB who is responsible for their accreditation.

The main functions of a designated operational entity are:

(a) Validating proposed CDM project activities;
(b) Verifying and certifying reductions in anthropogenic emissions by sources of greenhouse gases;

The DOE must demonstrate that it, and its subcontractors, have no real or potential conflict of interest with the participants in the CDM project activities for which it has been selected to carry out validation or verification and certification functions. It must perform one of the following functions relating to a given CDM project activity: validation or verification and certification. Upon request, the Executive Board may, however, allow a single designated operational entity to perform all these functions within a single CDM project activity.

2. CDM Project Cycle

In order to generate Certified Emission Reductions, the CDM Project must be registered with the UNFCCC and its emission reduction must be monitored and verified. The CDM project cycle starts with an idea and involves the project design, the national approval, the validation, the registration, the monitoring, the verification leading to the issuance of CERs.

Even though it is not a requirement, in practice, the project participant starts with the preparation of a "project idea note" or a "project information note" (PIN). The PIN should contain a clear description of activities and technologies, the identification of project participants and arrangements for project implementation, determination of baseline scenario and demonstration of additionality, benefits as well as risks. The PIN is submitted to the DNA to receive a letter/statement of non objection.

Project design

The project participant prepares the project design document (PDD), making use of an approved emissions baseline and monitoring methodology.

The critical elements of a PDD are the following:

1. Selection of applicable approved methodologies;
2. Assessment and demonstration of additionality;
3. Articulation of sustainable development benefits and documentation of stakeholder consultations.

If no approved baseline and/or monitoring methodology is available for the project, the DOE may submit a new methodology to the CDM EB for review and approval. This has to be done prior to the validation and submission for registration of the project.

The structure of a PDD, as specified in the CDM EB guidelines, is as follows:

A. General description of project activity

B. Application of a baseline methodology including the assessment and demonstration of additionality and the estimation of emission reductions
C. Duration of the project activity / Crediting period
D. Application of a monitoring methodology and plan
E. Estimation of GHG emissions by sources
F. Environmental impacts
G. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline Information

Annex 4: Monitoring plan

National approval

The project participant should receive a letter of approval from the DNA of a Party involved in a proposed CDM project. The letter should indicate that the Party has ratified the Kyoto Protocol and that participation is voluntary. It should also include a statement, from host Parties, indicating that the proposed CDM project/contributes to sustainable development.

Validation

The project design document is reviewed and approved by an accredited designated operational entity which acts as a third party certifier.

Validation is the independent assessment of the project's compliance with all CDM rules by a Designated Operational Entity, on the basis of the project design document.

Registration

After validating the PDD, the DOE submits a request for registration to the CDM EB.

Registration is the formal acceptance by the EB of a validated project as a CDM project activity. Registration is the prerequisite for the verification, certification and issuance of CERs related to that project activity.

Monitoring

The project participant monitors actual emissions according to the approved methodology (specified in the PDD).

Verification

The DOE verifies that emission reductions took place, in the amount claimed, according to approved monitoring plan (specified in the PDD).

Verification is the periodic independent review and ex-post determination by a designated operational entity of the monitored emission reductions that have occurred as a result of a registered CDM project activity during the verification period. There is no prescribed length of the verification period. It shall, however, not be longer than the crediting period.

Reductions in emissions must be adjusted for leakage in accordance with the monitoring and verification provisions.

Certification is the written assurance by the designated operational entity that, during the specified period, the project activity achieved the emission reductions as verified.

Issuance of CERs

The DOE submits verification report with request for issuance to CDM Executive Board.

Issuance of CERs refers to the instruction by the Executive Board to the CDM registry administrator to issue a specified quantity of CERs for a project activity

3. Additionality

A project activity complies with the additionality requirement of CDM, if it achieves more emission reductions than business as usual (or compared to a baseline). This requirement was set to avoid issuing CERs to projects that would have happened anyway. The concept of "baseline" is defined as "scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity".

In practice, a project activity is deemed additional if realistic and more economically attractive alternative scenarios to the project exist or if the project activity faces barriers to its implementation that CDM helps it overcome.

The CDM EB has developed a tool for the demonstration and assessment of additionality. The use of this tool is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool. Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.

The tool provides for a step-wise approach to demonstrate and assess additionality. These Steps include:

- Identification of alternatives to the project activity;
- Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible;
- Barriers analysis; and
- Common practice analysis.

The CDM EB has also developed a combined tool to identify the baseline scenario and demonstrate additionality.

This tool provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality. Project participants proposing new baseline methodologies may incorporate this combined tool in their proposal. Project participants may also propose other tools for the identification of the baseline scenario and demonstrate additionality to the Executive Board for its consideration.

4. Leakage

Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the project boundary, and which is measurable and attributable to the CDM project activity.

The project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the CDM project activity.

5. Methodologies

Methodologies are required to establish a project's emissions baseline, or expected emissions without the project, and to monitor the actual ongoing emissions once a project is implemented.

The CDM requires application of these methodologies in order to determine the amount of Certified Emission Reductions (CERs) generated by the project.

Methodologies are classified into four categories:

- Methodologies for large scale CDM project activities;
- Methodologies for small scale CDM project activities;
- Methodologies for large scale afforestation and reforestation (A/R) CDM project activities;
- Methodologies for small scale A/R CDM project activities.

The CDM EB has developed guidelines for the proposal of new methodologies. The following is a summary of those guidelines.

Baseline methodology

A methodology is an application of an approach as defined in paragraph 48 of the CDM modalities and procedures, to an individual project activity, reflecting aspects such as sector and region. No methodology is excluded a priori so that project participants have the opportunity to propose any methodology. In considering paragraph 48, the Executive Board agreed that, in the two cases below, the following applies:

a) Case of a new methodology: In developing a baseline methodology, the first step is to identify the most appropriate approach for the project activity and then an applicable methodology;
b) Case of an approved methodology: In opting for an approved methodology, project participants have implicitly chosen an approach.

Baseline approach

A baseline approach is the basis for a baseline methodology. The Executive Board agreed that the three approaches identified in sub-paragraphs 48 a) to c) of the CDM modalities and procedures be the only ones applicable to CDM project activities. They are:

a) Existing actual or historical emissions, as applicable; or
b) Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment; or
c) The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category.

In choosing a baseline methodology for a project activity, project participants shall select from the approaches above the one deemed most appropriate for the project activity, taking into account any guidance by the Executive Board, and justify the appropriateness of their choice.

Project participants may propose a new baseline methodology established in a transparent and conservative manner. In developing a new baseline methodology, the first step is to identify the most appropriate approach for the project activity and then an applicable methodology.

The content of a new baseline methodology is as follows:

A. Methodology title and summary description
B. Applicability/ project activity
C. Project boundary
D. Baseline scenario

E. Additionality
F. Baseline emissions
G. Project activity emissions
H. Leakage
I. Emission reductions
J. Optional: Changes required for methodology implementation in 2nd and 3rd crediting periods (if relevant)
K. Selected baseline approach from paragraph 48 of the CDM modalities and procedures
L. Other information

Monitoring methodology

A monitoring methodology refers to the method used by project participants for the collection and archiving of all relevant data necessary for the implementation of the monitoring plan.

Project participants may propose a new monitoring methodology. In developing a monitoring methodology, the first step is to identify the most appropriate methodology bearing in mind good monitoring practice in relevant sectors.

The content of a new monitoring methodology is as follows:

A. Identification of methodology
B. Proposed new monitoring methodology

Appendix B

Basket of measures adopted by ICAO to limit or reduce emissions from international civil aviation

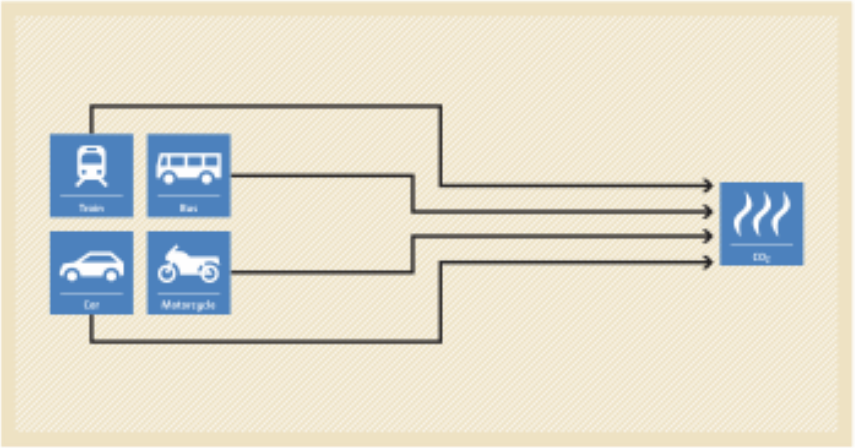
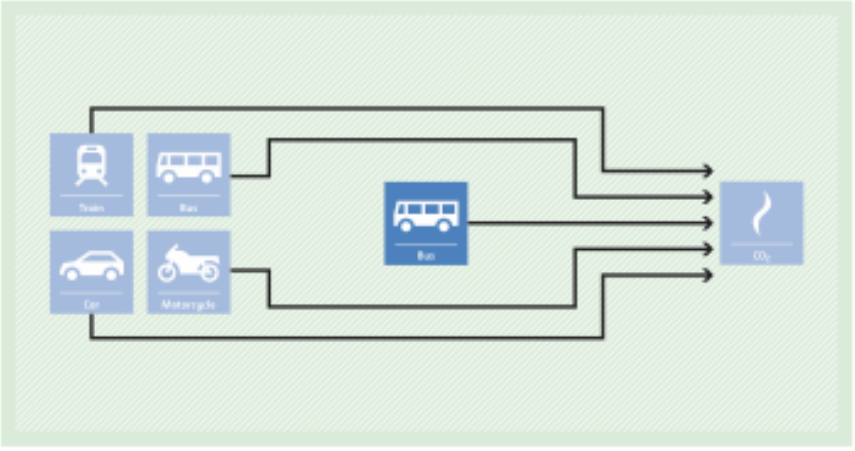
1) Aircraft-related Technology Development
   a. Aircraft minimum fuel efficiency standards
   b. Aggressive aircraft fuel efficiency standards, setting standards for the future
   c. Purchase of new aircraft
   d. Retrofitting and upgrade improvements on existing aircraft
   e. Optimising improvements in aircraft produced in the near to mid-term
   f. Avionics
   g. Adoption of revolutionary new designs in aircraft/engines
   h. Alternative Fuels
2) Improved Air Traffic Management and Infrastructure Use
   a. More efficient ATM planning, ground operations, terminal operations (departure and arrivals), enroute operations, airspace design and usage, aircraft air navigation capabilities.
   b. More efficient use and planning of airport capacities
   c. Conversion of airport infrastructure and ground support equipment to cleaner fuels
   d. Construction of additional runways
   e. Enhanced terminal support facilities
   f. Improved public transport access
   g. Collaborative research endeavours
3) More efficient operations
   a. Best practices in operations
   b. Optimised aircraft maintenance (including jet engine cleaning/washing)
   c. Selecting aircraft best suited to mission
4) Economic / market-based measures
   a. Voluntary inclusion of aviation sector in emissions trading scheme
   b. Incorporation of emissions from international aviation into regional or national emissions trading schemes, in accordance with relevant international instruments
   c. Establishment of a multilateral emissions trading scheme for aviation which allows trading permits with other sectors, in accordance with relevant international instruments
   d. Establishment of a framework for linking existing emissions trading schemes and providing for their extension to international aviation, in accordance with relevant international instruments
   e. Emissions charges or modulation of LTO charges, in accordance with relevant international instruments
   f. Positive economic stimulation by regulator: research programs, special consideration and government programs/legislation and accelerated depreciation of aircraft
   g. Accredited offset schemes
   h. Explore extension of CDM
   i. Taxation of aviation fuel
5) Regulatory measures / Other
   a. Airport movement caps/slot management
   b. Enhancing weather forecasting services
   c. Requiring transparent carbon reporting
   d. Conferences workshops

APPENDIX C

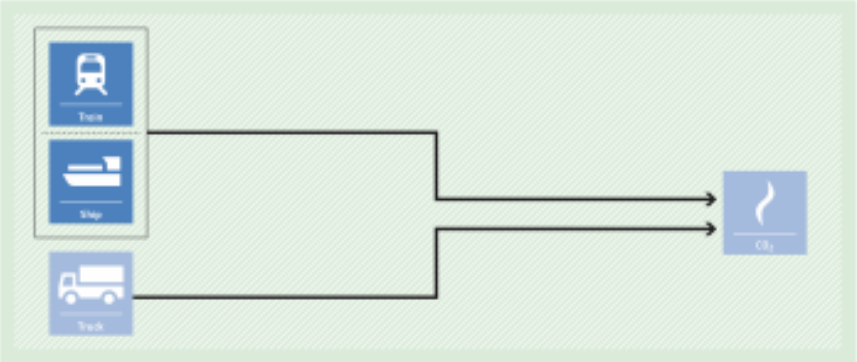
BRIEF DESCRIPTIONS OF CDM METHODOLOGIES FOR TRANSPORT

Source: CDM Methodology Booklet (information including EB 66), May 2012 (http://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf)

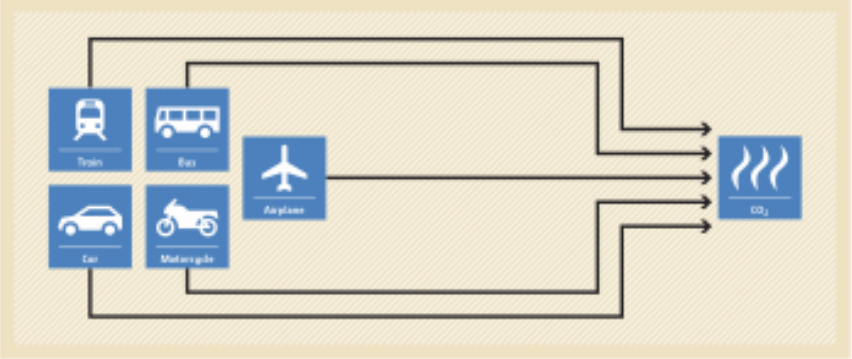
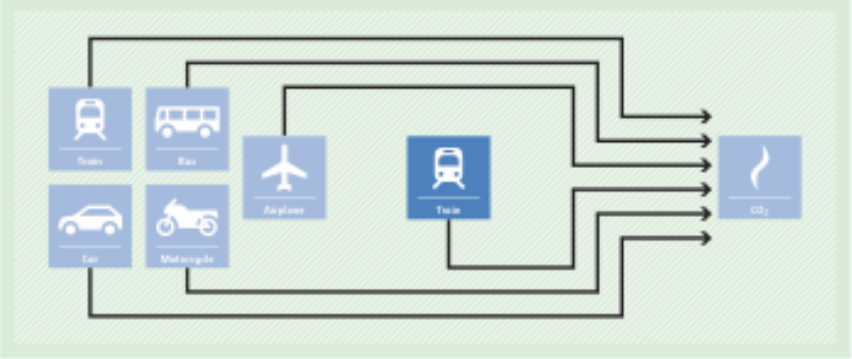
AM0031 Baseline methodology for bus rapid transit projects

Typical project(s)	Construction and operation of a new bus rapid transit system (BRT) for urban transport of passengers. Replacement, extensions or expansions of existing bus rapid transit systems (adding new routes and lines) are also allowed.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of more-GHG-intensive transportation modes by less-GHG-intensive ones.
Important conditions under which the methodology is applicable	• If biofuels are used, project buses must use the same biofuel blend (same percentage of biofuel) as commonly used by conventional comparable urban buses in the country.
Important parameters	At validation: • Baseline distance and transport mode, which are obtained through a comprehensive survey involving the users of the project transport system; • Specific fuel consumption, occupancy rates and travelled distances of different transport modes (including the project); • Policies affecting the baseline (i.e. modal split of passengers, fuel usage of vehicles, maximum vehicle age).
	Monitored: • Number of passengers transported in the project; • Total consumption of fuel/electricity in the project.
BASELINE SCENARIO Passengers are transported using a diverse transport system involving buses, trains, cars, non-motorized transport modes, etc. operating under mixed traffic conditions.	
PROJECT SCENARIO Passengers are transported using the newly developed bus rapid transit system that partially displaces the existing transport system operating under mixed traffic conditions.	

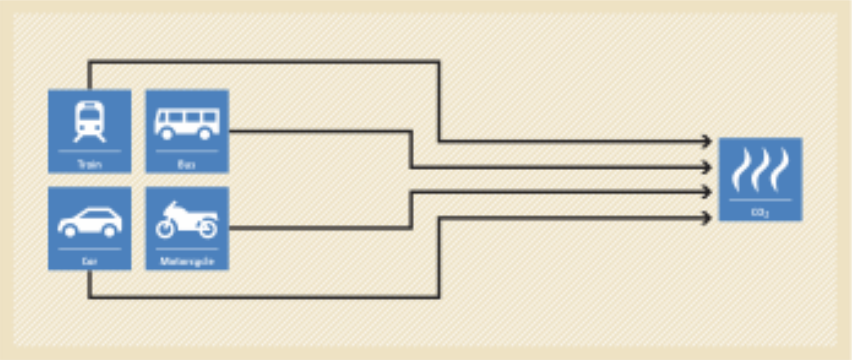
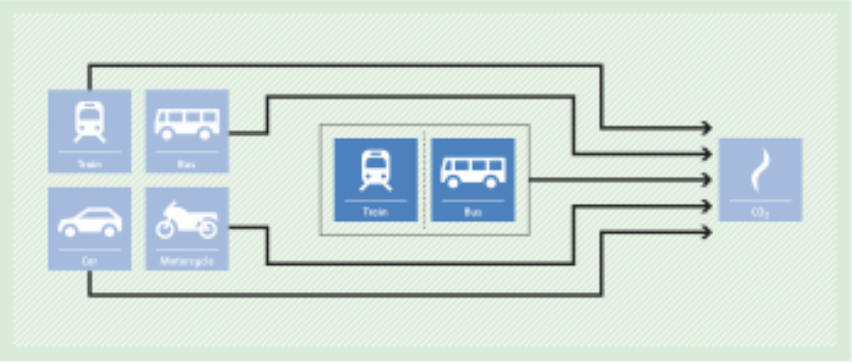
AM0090 Modal shift in transportation of cargo from road transportation to water or rail transportation

Typical project(s)	Transportation of cargo using barges, ships or trains.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of a more-carbon-intensive transportation mode.
Important conditions under which the methodology is applicable	• The owner of the cargo is one of the project participants. If the entity investing in the project is not the owner of the cargo, it should also be a project participant; • The project should have made at least one of the following new investments: direct investment in new infrastructure for water transportation or for rail transportation, or refurbishment/replacement of existing water and rail transportation infrastructure or equipments, with transport capacity expansion; • The cargo type, transportation mode, and transportation routes of the project are defined at the validation of the project and no change is allowed thereafter; • Both in the baseline and project, only one type of cargo is transported and no mix of cargo is permitted.
Important parameters	At validation: • Distance of the baseline trip route (both forward and return trips).
	Monitored: • Fuel and/or electricity consumption by the project transportation mode; • Amount of cargo transported by the project transportation mode (both forward and return trips).
BASELINE SCENARIO The cargo is transported using trucks.	
PROJECT SCENARIO The cargo is transported using barges, ships or trains.	

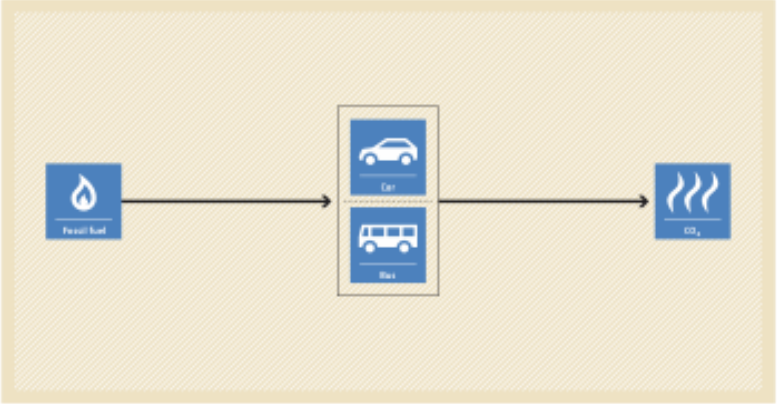
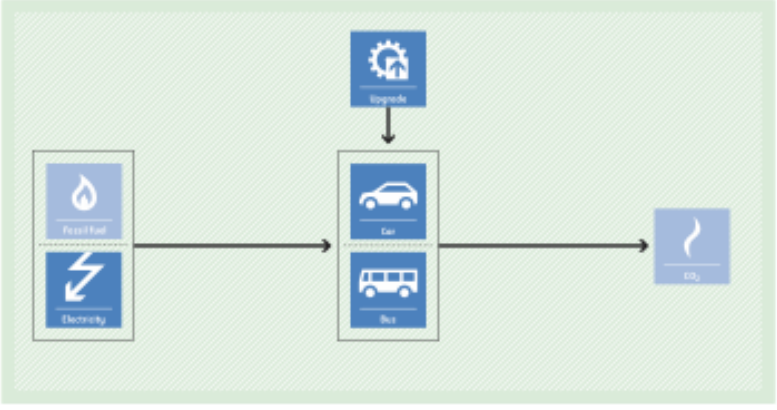
AM0101 High speed passenger rail system

Typical project(s)	Establishment and operation of a new high speed rail system. Extension of an existing high speed rail system. Replacement or upgrading of a conventional rail system to the high speed rail system.
Type of GHG emissions mitigation action	• Energy efficiency Displacement of more GHG-intensive transport modes (airplanes, buses, conventional rail, motorcycles and personal cars) by less-GHG intensive one (high speed rail).
Important conditions under which the methodology is applicable	• The project establishes a new rail-based infrastructure for high speed rail. The new rail infrastructure can be the extension of an existing high speed rail system. It can also be the replacement or upgrading of an existing conventional rail system to high speed rail system; • The methodology is applicable to inter-urban passenger transport only; • The entire high speed rail system must be located in the same host country; The average distance between all stations served by the project high speed rail system is at least 20 km.
Important parameters	At validation: • Data on parameters necessary to determine the baseline emission factors per passenger-kilometre of the relevant modes of transport and total trip distance travelled by passengers per baseline mode of transport.
	Monitored: • Total number of passengers travelled by the project high speed rail system; • Share of the project passengers or the number of passengers who would have travelled by the relevant modes of transport in absence of the project activity; • Passenger trip distances.
BASELINE SCENARIO Passengers transported between cities using a conventional transport system including buses, trains, cars, motorcycles and airplanes.	
PROJECT SCENARIO Passengers are transported between cities by the high-speed passenger rail-based system that partially displaces the existing modes of inter-urban transport.	

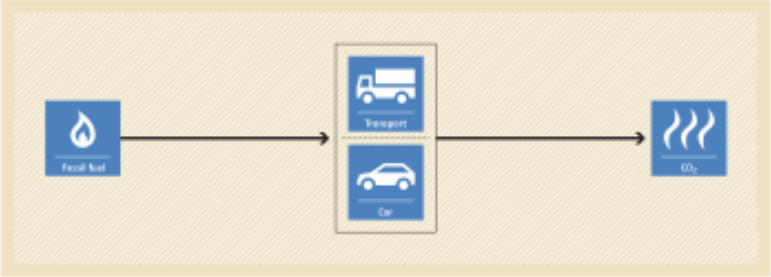
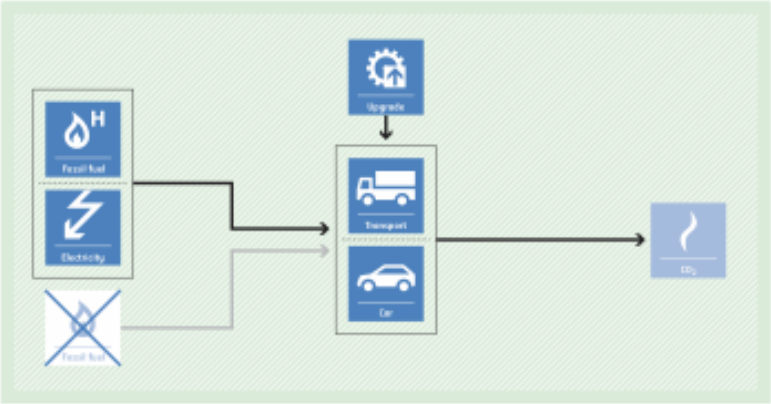
ACM0016 Baseline methodology for mass rapid transit projects

Typical project(s)	Establishment and operation of rail-based or bus-based mass rapid transit systems in urban or suburban regions for passenger transport by replacing a traditional urban bus-driven public transport system.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of more-GHG and, if gaseous fuels are used, CH_4-intensive transport modes (existing fleet of buses operating under mixed traffic conditions) by less-GHG-intensive ones (newly developed rail-based systems or segregated bus lanes).
Important conditions under which the methodology is applicable	• The project either installs new railways or segregated bus lanes in order to replace existing bus routes (e.g. by scrapping buses, closing or rescheduling bus routes). For bus rapid transit systems with feeder plus trunk routes, methodology AM0031 is recommended; • The methodology is applicable for urban or suburban trips. It is not applicable for inter-urban transport; • The methodology is not applicable for operational improvements (e.g. new or larger buses) of an already existing and operating bus lane or rail-based system.
Important parameters	At validation: • An extensive survey with the passengers using the project is required in order to determine the baseline scenario (i.e. the distance and mode of transport that the passengers using the project would have used in the baseline). Monitored: • The number of passengers transported in the project; • Specific fuel consumption, occupancy rates and travelled distances of different transport modes as well as the speed of vehicles on affected roads.
BASELINE SCENARIO Passengers are transported using a diverse transport system involving buses, trains, cars, non-motorized transport modes, etc. operating under mixed traffic conditions.	
PROJECT SCENARIO Passengers are transported using newly developed rail-based systems or segregated bus lanes that partially displace the existing bus-driven transport system operated under mixed traffic conditions.	

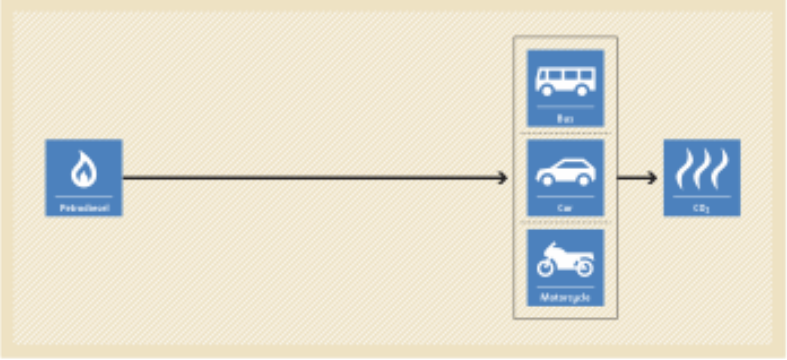
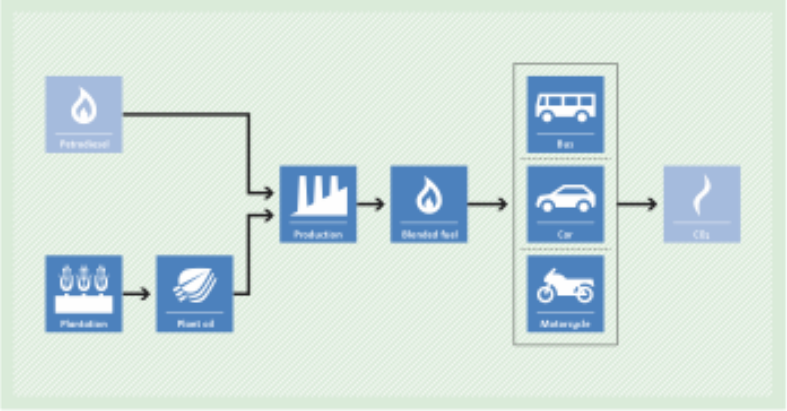
AMS-III.C. Emission reductions by electric and hybrid vehicles

Typical project(s)	Operation of electric and hybrid vehicles for providing transportation services.
Type of GHG emissions mitigation action	• Fuel switch. Displacement of more-GHG-intensive vehicles.
Important conditions under which the methodology is applicable	• Project and baseline vehicles should belong to the same vehicle category. Vehicles under a category have comparable passenger/load capacity and power rating with variation of no more than +/-20 %; • The prevailing regulations pertaining to battery use and disposal shall be complied with.
Important parameters	At validation: • If applicable: grid emission factor (can also be monitored ex post). Monitored: • Number of electric/hybrid vehicles operated under the project; • Quantity of fossil fuel used e.g. for hybrid vehicles and electricity consumption for all electric and hybrid vehicles to determine specific electricity/fossil fuel consumption per km; • Annual average distance driven by project vehicles.
BASELINE SCENARIO Operation of more-GHG-emitting vehicles for providing transportation services.	
PROJECT SCENARIO Operation of less-GHG-emitting vehicles with electric/hybrid engines for providing transportation services.	

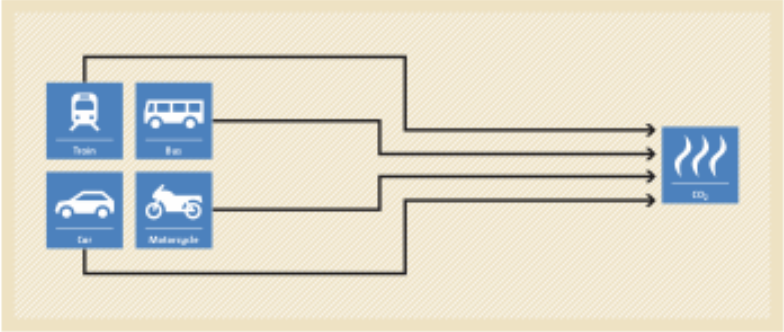
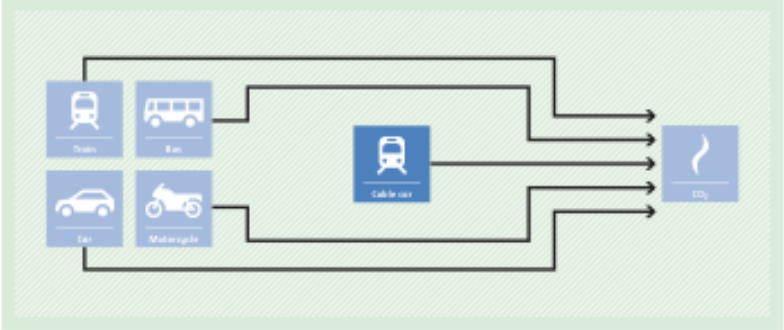
AMS-III.S. Introduction of low-emission vehicles/technologies to commercial vehicle fleets

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	• Fuel switch. Displacement of more-GHG-intensive vehicles.
Important conditions under which the methodology is applicable	• The overall level of service provided on comparable routes before project implementation shall remain the same and a modal shift in transport is not eligible; • There is no significant change in tariff discernible from their natural trend, which could lead to change in patterns of vehicle use; • The frequency of operation of the vehicles is not decreased; • The characteristics of the travel route – distance, start and end points and the route itself and/or the capacity introduced by the project is sufficient to service the level of passenger/freight transportation previously provided.
Important parameters	At validation: • Efficiency of baseline vehicles (can also be monitored ex post). Monitored: • Total annual distance travelled and passengers or goods transported by project and baseline vehicles on fixed route; • Annual average distance of transportation per person or tonne of freight per baseline and project vehicle; • Service level in terms of total passengers or volume of goods transported on fixed route before and after project implementation.
BASELINE SCENARIO Passengers and freight are transported using more-GHG-intensive transportation modes.	
PROJECT SCENARIO Passengers and freight are transported using new less-greenhouse-gas-emitting vehicles or retrofitted existing vehicles on fixed routes.	

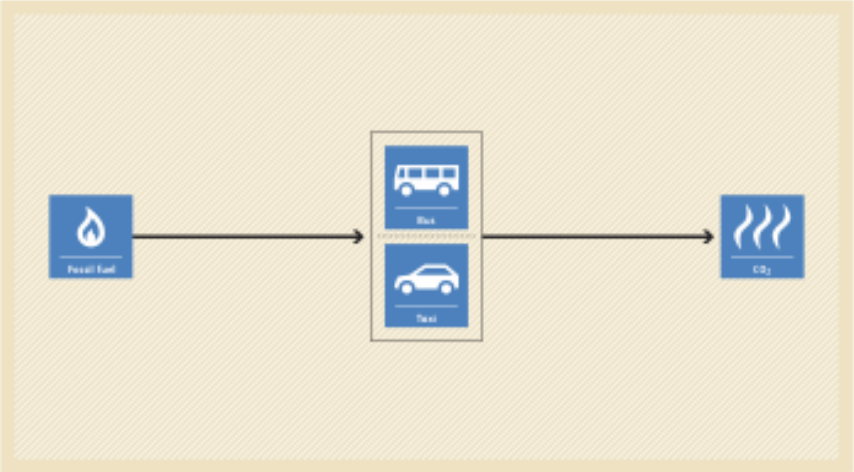
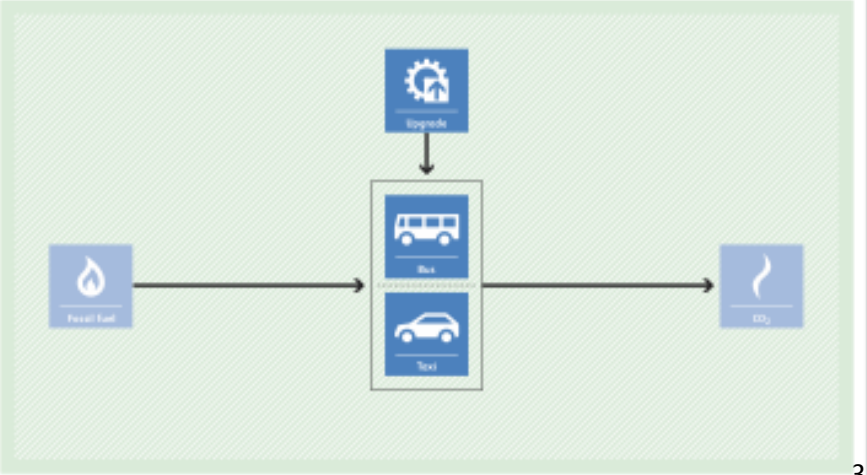
AMS-III.T. Plant oil production and use for transport applications

Typical project(s)	Plant oil production that is used for transportation applications, where the plant oil is produced from pressed and filtered oilseeds from plants that are cultivated on dedicated plantations.
Type of GHG emissions mitigation action	• Fuel switch. Displacement of more-GHG-intensive petrodiesel for transport.
Important conditions under which the methodology is applicable	• Oil crops are cultivated on area that is not a forest and has not been deforested during the last 10 years prior to the implementation of the project; • The establishment of dedicated plantations on peatlands is not allowed; • The plant oil is used in blends with pure petrodiesel of up to 10% by volume only or use of pure plant oil in converted vehicles; • Baseline vehicles use petrodiesel only; • No export of produced plant oil to Annex 1 countries allowed.
Important parameters	Monitored: • Crop harvest and oil content of the oilseeds as well as net calorific value and amount of plant oil produced by the project per crop source; • Energy use (electricity and fossil fuel) for the production of plant oil; • Use default values or alternatively monitor amount of fertilizer applied for the cultivation of plant oil per crop source; • Leakage emissions due to a shift of pre-project activities and the competing uses of biomass; • In case of use of pure plant oil it shall be monitored and verified by random sampling that the vehicles have carried out engine conversions.
BASELINE SCENARIO Petrodiesel would be used in the transportation applications.	
PROJECT SCENARIO Oil crops are cultivated, plant oil is produced and used in the transportation applications displacing petrodiesel.	

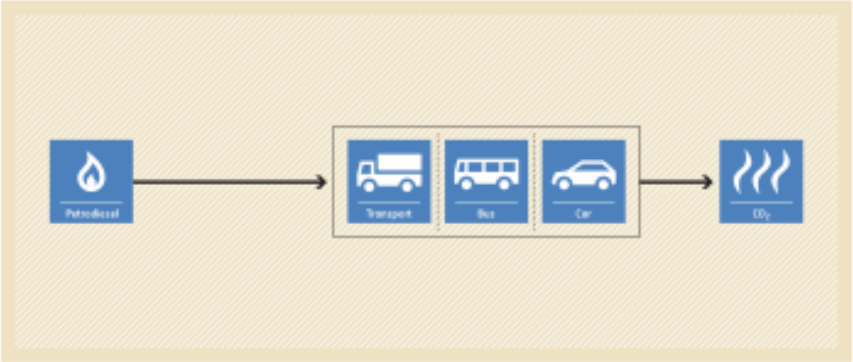
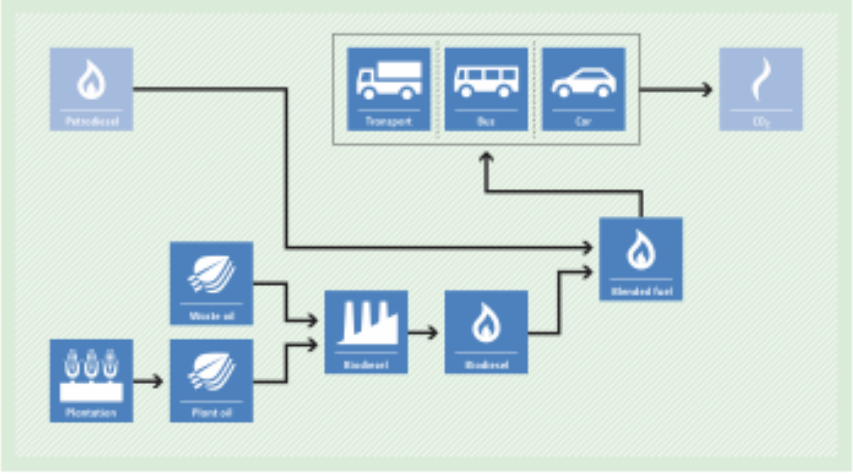
AMS-III.U. Cable Cars for Mass Rapid Transit System (MRTS)

Typical project(s)	Construction and operation of cable cars for urban transport of passengers substituting traditional road-based transport trips. Extensions of existing cable cars are not allowed.
Type of GHG emissions mitigation action	• Energy efficiency; • Fuel switch. Displacement of more-GHG-intensive vehicles.
Important conditions under which the methodology is applicable	• The origin and final destination of the cable cars are accessible by road; • Fuels used in the baseline and/or the project are electricity, gaseous or liquid fossil fuels. If biofuels are used, the baseline and the project emissions should be adjusted accordingly; • The analysis of possible baseline scenario alternatives shall demonstrate that a continuation of the current public transport system is the most plausible baseline scenario.
Important parameters	At validation: • Occupancy rate of vehicles category; • If applicable: grid emission factor (can also be monitored ex post).
	Monitored: • Total passengers transported by the project; • By survey: trip distance of passengers using the baseline mode and the trip distance of passengers using the project mode from their trip origin to the project entry station and from project exit station to their final destination; • By survey: share of the passengers that would have used the baseline mode; • Share of the passengers using the project mode from trip origin to the project entry station and from project exit station to their final destination; • Quantity of electricity consumed by the cable car for traction.
BASELINE SCENARIO Passengers are transported under mixed traffic conditions using a diverse transport system involving buses, trains, cars, non-motorized transport modes, etc.	
PROJECT SCENARIO Passengers are transported using cable cars, thus reducing fossil fuel consumption and GHG emissions	

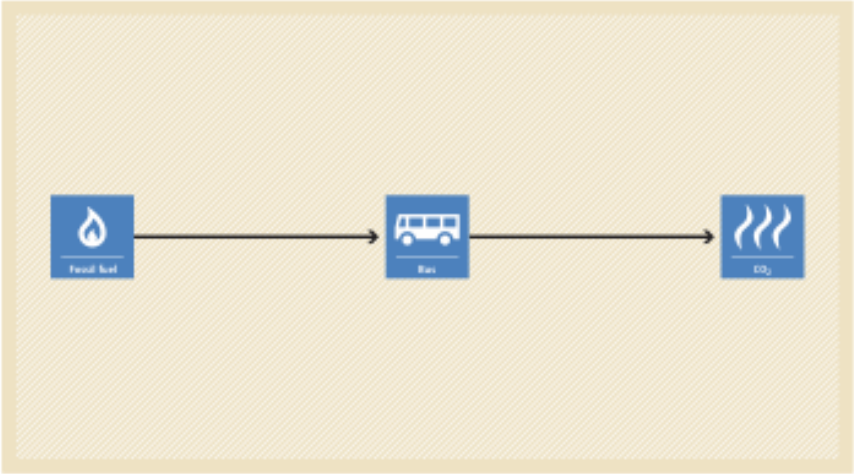
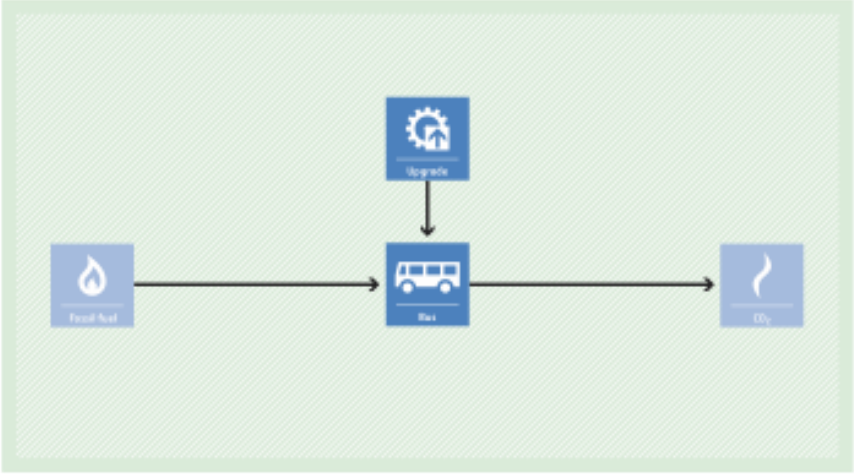
AMS-III.AA. Transportation energy efficiency activities using retrofit technologies

Typical project(s)	Retrofit of the engine of existing/used vehicles for commercial passengers transport (e.g. buses, motorized rickshaws, taxis) which results in increased fuel efficiency of the vehicles.
Type of GHG emissions mitigation action	• Energy efficiency. Energy efficiency measures in transportation reduce GHG emissions due to decreased fuel consumption.
Important conditions under which the methodology is applicable	• The vehicles for passenger transportation are of the same type, use the same fuel and single type of retrofit technology; • The methodology is not applicable to brand new vehicles/technologies (e.g. CNG, LPG, electric or hybrid vehicles); • The vehicles shall operate during the baseline and project on comparable routes with similar traffic situations.
Important parameters	At validation: • Determination of the remaining technical lifetime of the retrofitted vehicles.
	Monitored: • Fuel efficiency of the baseline and project vehicle; • Annual average distance travelled by project vehicles; • Number of theoretically operating project vehicles; • Share of project vehicles in operation.
BASELINE SCENARIO Passengers are transported using less-fuel-efficient vehicles.	
PROJECT SCENARIO Passengers are transported using retrofitted more-fuel-efficient vehicles	

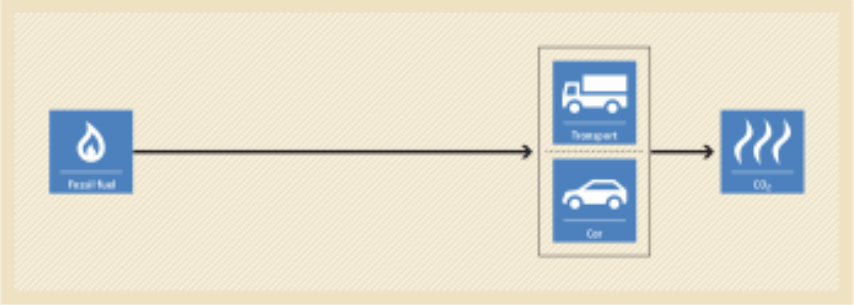
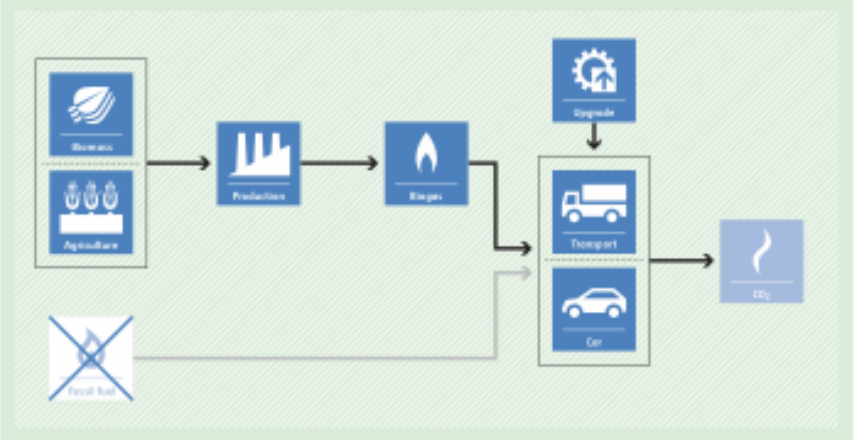
AMS-III.AK. Biodiesel production and use for transport applications

Typical project(s)	Biodiesel production that is used for transportation applications, where the biodiesel is produced from oilseed cultivated on dedicated plantations and from waste oil/fat.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-carbon-intensive fossil fuel for combustion in vehicles/ transportation applications by use of renewable biomass.
Important conditions under which the methodology is applicable	• Oil crops are cultivated on area which is classified as degraded or degrading as per the "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities" or on area included in the project boundary of one or several registered A/R CDM project activities. Plantations established on peatlands are not eligible; • Export of produced biodiesel is not allowed; • The biodiesel is used in blends with diesel of up to 20 % by volume; • The biodiesel and its blends are end-used in a captive fleet of vehicles; • The alcohol used for esterification is methanol of fossil fuel origin.
Important parameters	Monitored: • Quantity of biodiesel produced in the project plant and consumption of biodiesel and its blends by the captive users; • Quantity of fossil fuel and electricity consumption for processing the oilseeds and the waste fat/oil to produce biodiesel; • Parameters to estimate project emissions from the cultivation of oil crops if the default values for jatropha and palm oil are not applied.
BASELINE SCENARIO Petrodiesel would be used in the transportation applications.	
PROJECT SCENARIO Oil crops are cultivated, blended biodiesel is produced and used in the transportation applications.	

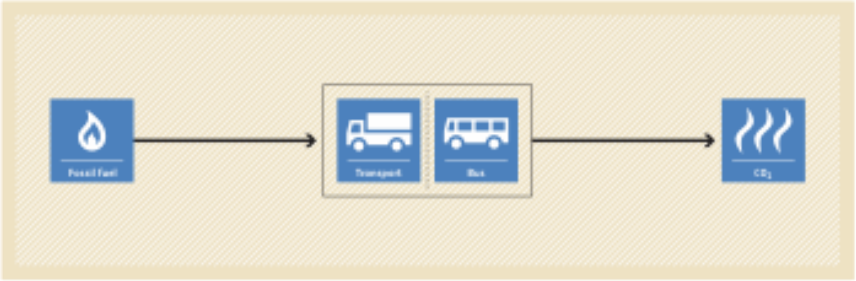
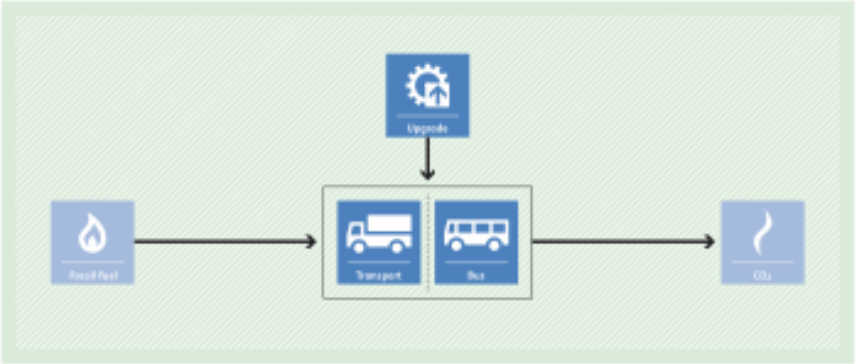
AMS-III.AP. Transport energy efficiency activities using post – fit Idling Stop device

Typical project(s)	Demand side activities associated with the installation of post-fit type Idling Stop devices in passenger vehicles used for public transport (e.g. buses).
Type of GHG emissions mitigation action	• Energy Efficiency. Reduction of fossil fuel use and corresponding emissions through energy efficiency improvements.
Important conditions under which the methodology is applicable	• Vehicles used for public transportation; • Vehicles using gasoline or petrodiesel as fuel; • Vehicles in which it is possible to install post-fit Idling Stop device.
Important parameters	Monitored: • Cumulative Idling Period of all vehicles of type i in year y; • Total number of times of Idling Stop of vehicle i in the year y.
BASELINE SCENARIO Vehicles used for public transportation continue idling.	
PROJECT SCENARIO Vehicles used for public transportation using a post-fit type Idling Stop device that will turn off the vehicle engine and prevent idling.	

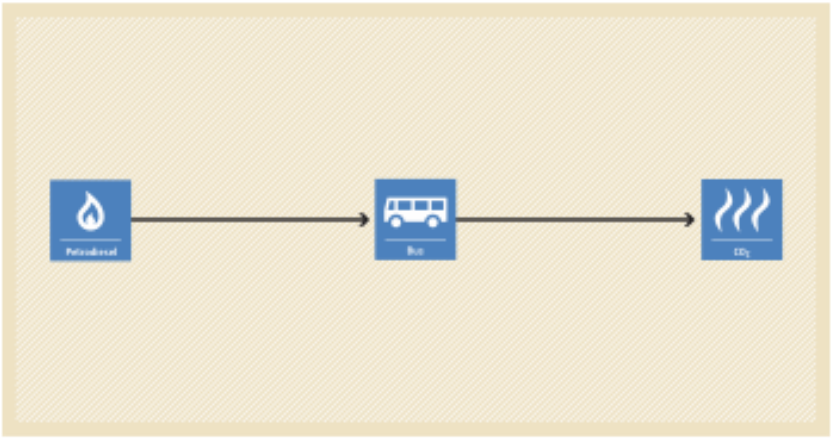
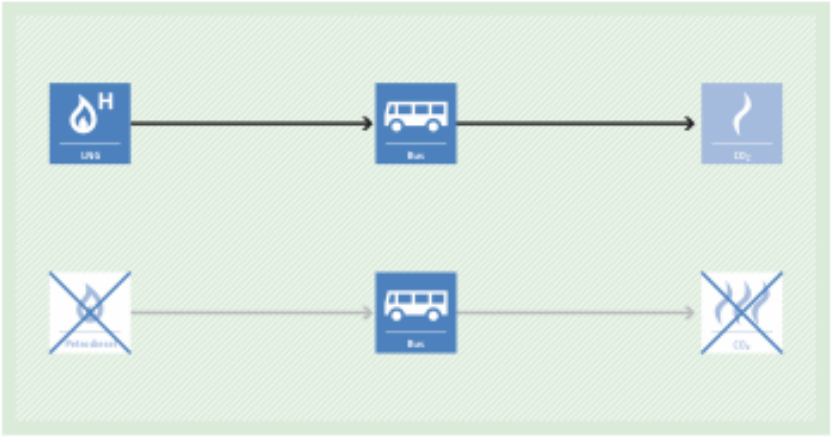
AMS-III.AQ. Introduction of Bio-CNG in transportation applications

Typical project(s)	Production of Biogenic Compressed Natural Gas (Bio-CNG) from renewable biomass and use in transportation applications. The Bio-CNG is derived from various sources such as biomass from dedicated plantations; waste water treatment; manure management; biomass residues.
Type of GHG emissions mitigation action	• Renewable Energy. Displacement of more-GHG-intensive fossil fuel for combustion in vehicles.
Important conditions under which the methodology is applicable	• Bio-CNG is used in Compressed Natural Gas (CNG) vehicles, modified gasoline vehicles. Diesel vehicles are not included; • Methane content of the Bio-CNG meets relevant national regulations or a minimum of 96% (by volume); • Conditions apply if the feedstock for production of the Bio-CNG is derived from dedicated plantation; • Export of Bio-CNG is not allowed; • Only the producer of the Bio-CNG can claim emission reductions.
Important parameters	At validation: • Determine fraction of gasoline (on mass basis) in the blend where national regulations require mandatory blending of the fuels with biofuels; • Amount of gasoline consumption in the baseline vehicles ex ante.
	Monitored: • Amount of Bio-CNG produced/distributed/sold/consumed directly to retailers, filling stations; • Parameters for calculating methane emissions from physical leakage of methane; • Parameters for determining project emissions from renewable biomass cultivation.
BASELINE SCENARIO Gasoline or CNG are used in the baseline vehicles.	
PROJECT SCENARIO Only Bio-CNG are used in the project vehicles.	

AMS-III.AT. Transportation energy efficiency activities installing digital tachograph systems or similar devices to transport fleets

Typical project(s)	Project activities that install digital tachograph systems or another device that monitors vehicle and driver performance and provides real-time feedback to drivers in freight vehicles and/or commercial passenger vehicles.
Type of GHG emissions mitigation action	• Energy Efficiency. Reduction of fossil fuel use and corresponding emissions through energy efficiency improvements.
Important conditions under which the methodology is applicable	• This methodology applies to freight vehicle fleets and/or passenger vehicle fleets that are centrally controlled and managed by a single entity; • The project activity is unlikely to change the level of service of the vehicle fleet provided before the project activity; • The project activity does not involve a fuel switch in existing vehicles; • This methodology is not applicable to project activities in locations where the installation of the device is mandatory by law; • For freight vehicle fleets, project participants shall identify the traceable routes along which the vehicles operate, the characteristics of those routes, the level of service on each route, the vehicles that are in use on each traceable route before and after project implementation.
Important parameters	Monitored: • Total distance travelled by each vehicle; • The vehicles are identified based on the age, characteristics and load capacity and availability of historical data; • Annual average distance of transportation per tonne of freight by each project vehicle; • Consumption of fuel by vehicle; • Total annual goods transported by each project vehicle; • Annual monitoring to check if devices have become a mandatory practice, or that highly-enforced anti-idling policies or legislation have been put into place; • Monitoring to ensure that all device and feedback systems including fuel flow sensors (meters) are operating correctly and have not been disabled.
BASELINE SCENARIO Fossil fuel consumption due to inefficient driving.	
PROJECT SCENARIO A digital tachograph system or similar device reduces fossil fuel consumption in vehicles by providing to the driver feedback against inefficient driving, and thus encouraging efficient driver behaviour which results in improved vehicle fuel efficiency.	

AMS-III.AY. Introduction of LNG buses to existing and new bus routes

Typical project(s)	Introduction and operation of new LNG buses for passengers transportation to existing and new routes.
Type of GHG emissions mitigation action	• Fuel switch. Displacement of more-GHG-intensive vehicles.
Important conditions under which the methodology is applicable	• The existing and new routes are fixed; • On each route only one type of bus and fuel are used; • For the new routes it should be demonstrated that these new routes have been planed prior to the start date of the project activity and serviced by fossil fuel busses; • The project and baseline frequency of operation of the buses should be the same; • The project and baseline buses should be with comparable passengers capacity and power rating.
Important parameters	At validation: • Baseline fuel data (NCV and emission factor).
	Monitored: • Specificfuel consumption of baseline buses; • Total annual distance travelled by baseline buses; • Fuel consumption of the project buses.
BASELINE SCENARIO Buses use diesel or comparable fossil fuel.	
PROJECT SCENARIO Buses use LNG only.	

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