CLEAN DEVELOPMENT MECHANISM

**CDM-EB94-AA-A08**

# Concept note

# Cost-effective and context-appropriate approaches for monitoring, reporting and verification (jointly by the MP, SSC WG, and secretariat)

Version 02.0

**United Nations**
Framework Convention on
Climate Change

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# 1. Procedural background

1. The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) in its decision 6 CMP.11, paragraph 15, requested the Executive Board of the clean development mechanism (CDM) (hereinafter referred to as the Board) to develop more cost-effective and context-appropriate approaches for monitoring, reporting and verification (MRV), with a focus on project activities involving households and communities, addressing, inter alia:

   (a) Procedures to manage data gaps;

   (b) Regionally appropriate calibration requirements;

   (c) The use of sectoral and nationally collected data where appropriate.

2. The Board at its ninety-second meeting considered a concept note on cost-effective and context-appropriate approaches for MRV and approved the recommendation on regionally appropriate calibration requirements, including the related changes to regulatory documents. For the remaining issues in paragraph 1 (1 (a) and 1 (c)), the Board further requested the secretariat to present a revised concept note to the Board at a future meeting, taking into account the guidance provided by the Board that the Methodologies Panel (MP) and the Small-Scale Working Group (SSC WG) should jointly:

   (a) Propose a more representative title for the “data handling protocol” and, instead of integrating it into the CDM project standard (PS), propose it as a best-practice example in a separate document. In doing so, avoid overlaps with the related requirements in the PS and consider simplifying the requirements for adjustments proposed (e.g. requirements on deducting the standard deviation of the parameter values from the previous monitoring period and/or requirements for justifying the adjustments);

   (b) Exclude the provision that allows delay of surveys up to six months from the date it was due, together with the related discounting of emission reductions, or further clarify and explain the value addition of the provision;

   (c) With regard to surveys covering multiple programmes of activities (PoAs), further assess the potential risks – for example, in the event of an excess issuance that occurred that is traced back to the errors in the survey, determine whether there are safeguards to allocate the respective responsibilities to the PoAs that participate. Also, to assess if there will be a possibility for PoAs to choose whether to undertake a common survey for a group of PoAs or at the level of individual PoAs to maximize the parameter values that positively impact the emission reduction estimates.

3. Further, the CMP, in its decision 3/CMP.12 paragraph 8, encouraged the Board to explore possibilities for reducing the transaction costs of monitoring by expanding the use of tiered approaches offering a choice between conservative default values and direct measurements.

4. This work relates to the CDM management plan 2017 (CDM MAP) activity “Simplification of methodologies” under objective 1(c): “Develop simplified and user-friendly standards

and procedures that increase efficiency and ensure environmental integrity", as referred to in table 4 on page 10 of the CDM MAP 2017 (EB 92 report, annex 1).

# 2. Purpose

5. The purpose of this note is to make recommendations on draft procedures to manage data gaps, further elaborate the draft procedures for surveys covering multiple PoAs, and explore possibilities for reducing transaction costs by expanding the use of tiered approaches for monitoring.

# 3. Key issues and proposed solutions

## 3.1. Procedures to manage data gaps

6. Taking into account the Board's guidance at its ninety-second meeting, it is proposed that guidance be developed based on the best-practice examples for addressing data gaps in relation to monitoring, where required, tailored to specific technologies and methodologies. In so doing, the secretariat will take into account the experience accumulated with regard to monitoring issues encountered during the assessment of project activities and PoAs requesting issuance or registration. The following step-wise approach is considered:

   (a) Include guidance in relevant methodological tools;

   (b) Develop a separate regulatory document (e.g. titled "Guidelines for managing data gaps in monitoring of CDM project activities").

7. The above step (paragraph 6 (a)) would provide practical solutions to the concerned project activity types and would possibly enable project participants (PPs) to use sectoral and nationally collected data where it is demonstrated to be conservative and appropriate. Examples included in the tools will be at a project developer's immediate disposal as such a measure would broaden the options in the methodologies citing the tool. For example, the recent revision of the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" simplified and standardized the monitoring of electricity produced and/or consumed in many methodologies that cited the tool. As a next step, the guidance included in the tools will be used to develop a separate regulatory document (paragraph 6 (b)) that would build on the work in the previous step and serve as a broadly applicable data gap management guideline.

8. It is proposed that the secretariat would periodically revise the tools to include guidance in consultation with the MP and the SSC WG for the Board's subsequent approval.

9. The guidance based on the best-practice examples provided in table 1 will only complement the related requirements in the CDM PS.

**Table 1. Correspondence of the proposed guidance to project standard requirements**

| Project standard requirements | Guidance |
|---|---|
| PPs or the coordinating/ managing entity (CME) shall develop and describe the monitoring plan for the proposed CDM project activity or component project activity (CPA), in accordance with the selected methodology(ies), where applicable, the selected standardized baseline(s) and all other applicable CDM rules and requirements.<br><br>The monitoring plan shall include all data, parameters and related information required by the selected methodology(ies) and, where applicable, the selected standardized baseline(s). | Monitoring parameters will be in accordance with methodologies. Where PPs had pitfalls (as evidenced by the project assessment experience), additional guidance on parameters will be included in the examples as to how to effectively meet the PS requirement. |
| The monitoring plan shall include uncertainty levels, methods and the associated accuracy level of measuring instruments to be used for various parameters and variables. | Procedures, options, flow-charts, and justification of the alternative method to be used in case of data gaps will be included in the examples. |

10. Further taking into account the Board's guidance at its ninety-second meeting, it is proposed to:

(a) Develop guidance within the Guideline "Sampling and surveys for CDM project activities and programmes of activities" aimed primarily at project activities involving households and communities. Recognizing high transaction costs associated with the surveys for many of these project activities, the revision of the guidelines would include example survey forms for some selected categories of project activities, to be identified based on usage of the methodologies, monitoring reports submitted and post-registration change (PRC) requests made for monitoring plan;

(b) Explore further possibilities, including the process to apply sectoral and nationally collected data and default factors in approved CDM methodologies and tools to cover data gaps. For example, a PP can use a methodology clarification request to clarify whether a conservative default factor from the credible source (e.g. nationally collected data) would apply as a substitute for the missing data. The MP or SSC WG would check the credibility of the source and quality of data and provide recommendation, which would be included by the PP in the request for PRC. This could significantly reduce transaction costs, as the project proponent could have certainty on applying the alternative value and include the request for PRC in the issuance track.

## 3.2. Surveys to cover multiple programmes of activities

11. As proposed in previous concept notes (annex 19 of the MP 70 report and annex 13 of MP 71 report),[1] enabling the implementation of sampling surveys undertaken for the group of the project activities or PoAs applying the stratified sampling approach could considerably reduce the cost of monitoring surveys without compromising the environmental integrity of emission reduction estimates. The approved standard "Sampling and surveys for CDM project activities and programmes of activities" and Guideline "Sampling and surveys for CDM project activities and programmes of activities" include guidance for carrying out common sampling surveys, even when the included activities are not uniform, to achieve the required confidence and precision of survey results. When the stratified sampling method is used, although a commmon survey has been undertaken, the results will be differentiated per strata, so that each PoA will represent one strata; therefore, PoA-specific results of the survey will be available. Such a grouping of different project activities for a given stage of the CDM project cycle has already been piloted under the CDM. For example, the decisions of the CMP and the Board have made it possible to bundle project actitivities for a specific stage of the project cycle, or for the entire project cycle. For bundling of small-scale project activities, there are requirements in place to complete and submit a bundling form for approval by the Board. There are also procedures that govern removal of activities from a bundle that require prior approval by the Board to alter the composition of the bundle.

12. To add assurance against "pick and choose" between a common sampling survey for a group of PoAs or undertaking surveys at the level of individual PoAs, it is proposed that a common sampling survey form of all the PoAs involved be completed by the CMEs (a draft is attached in Appendix 2). It is also proposed that to remove a PoA included for a common sampling survey, prior approval by the Board is required, applying the PRC process. This means that the survey at the level of the PoA included for a common sampling survey is not allowed unless approved by the Board. Furthermore, it is recommended that a 95/10 precision be applied for common sampling surveys across PoAs.

13. Table 2 outlines common sampling survey steps, identifies potential errors that may occur, and describes whether the deficiencies could be assigned to respective PoAs for corrective action.

[1] https://cdm.unfccc.int/Panels/meth/index.html

**Table 2. Assessment of safeguards to ensure credibility of common surveys**

| Steps to prepare, implement and review the common sampling plan | Procedural safeguards |
|---|---|
| PPs/CMEs prepare a common sampling plan:<br>(a) Select stratified sampling;<br>(b) Calculate the sample size for each stratum to achieve the required reliability;<br>(c) Ensure random selection of samples. | DOEs will validate the proposed common sampling plan. The validation includes determining:<br>(a) Whether the proposed sample size and sampling method are adequate to achieve the confidence/precision requirements (e.g. is a stratified sampling selected? Is the sample size calculated for each stratum to achieve the required reliability?); and<br>(b) Whether the proposed common sampling plan will ensure that samples are randomly selected and are representative of the population in all the project activities/PoAs.<br>Any errors related to sample size or random selection of samples identified by DOEs during validation will be applicable to the entire group of PoAs included, and corrective actions need have to be taken as per existing procedures. No regulatory gaps are identified. |
| PPs/CMEs conduct a common sampling and check whether actual samples achieve the required reliability. | After the survey, PPs/CMEs will check whether actual samples achieve the required reliability for all the project activities/PoAs. Failure to do so will affect all of the project activities/PoAs. Therefore, PPs/CMEs shall address non-conformity through the measures recommended in the sampling standard and guidelines (e.g. additional data collection, selection of the lower or upper bound, use of a conservative default value included in applied methodologies).<br>Any deficiency related to achieving the required level of precision will trigger an action spanning across all those PoAs involved (e.g. if additional samples need to be chosen and visited, then such samples will have to be randomly selected from all PoAs involved). Actions will have to be taken as per existing procedures covering all PoAs involved. No regulatory gaps are identified. |
| DOEs verify the common sampling survey conducted by PPs/CMEs. | DOEs will verify whether PPs/CMEs have implemented the common sampling plan according to the registered plan. The verification includes determining whether the:<br>(a) Required confidence/precision has been met; and<br>(b) Selected sample was representative of the PAs/PoAs.<br>The DOE may apply acceptance sampling, as per the sampling standard, and take a random sample check of PP/CME sample records. In case of any shortcomings detected in the validation/verification work (including the potential for excess issuance due to survey errors), corrective action will need to be taken by the DOE covering the entire group of PoAs. Existing procedures will address the issue and no regulatory gaps are identified. |

14. Proposed changes to the standard “Sampling and surveys for CDM project activities and programmes of activities” and a draft common sampling survey form are provided in Appendix 1 and Appendix 2.

## 3.3. Expanding the use of tiered approaches

15. With a view to reducing transaction costs of monitoring, some methodologies and tools under the CDM have piloted tiered approaches, offering a choice between conservative default values and direct measurements. It would be important to consider the experience gained with those methodologies and tools to explore expanding the approach. Appendix 3 provides a list of such methodologies and tools. This list includes methodologies of relevance to project activities involving households and communities, and indicates which methodologies and tools would allow these project types to pilot the tiered approach.

16. Appendix 3 contains certain methodologies applicable to project activities that are highly vulnerable to the cost of the monitoring, such as those based on distributed appliances. These methodologies have recently been updated to include simplified and cost-effective alternatives based on the accumulated experience of project registration and issuance. For example, “AMS-II.C: Demand-side energy-efficiency activities for specific technologies” has included specific guidance on utilization hours of equipment for project activities installing lighting equipment, while also introducing conservative estimates for lamp failure, building on the experience gained with the methodology “AMS-II.J: Demand-side activities for efficient lighting technologies”.

17. Analysis of provisions contained in the CDM’s existing CDM standards shows that:

    (a) Differentiation based on size and technology type has been taken into account in some cases; for example, simplified monitoring for project activities with capacity of less than 45 kilowatts thermal has been specified in “AMS-I.C: Thermal energy production with or without electricity”.

    (b) Tiered approaches for additionality demonstration, including a positive list of automatically additional technologies, have been introduced under the small-scale and microscale additionality guidelines and some large-scale methodologies, e.g. “ACM0002: Grid-connected electricity generation from renewable sources”.

    (c) Project location, specifically where sampling is resource-intensive and may impose high transaction costs but with only a small contribution to accuracy improvement, has been used in some cases to include simplifications (e.g. simplified procedures for Least Developed Countries/Small Island Developing States (LDCs/SIDS) in the “Tool to calculate the emission factor for an electricity system”).

    (d) Relative share of project or leakage source of emissions, that is, where the amount of emissions is too low to require a very high accuracy level (e.g. emissions associated with the production of makeup water in “AM0117: Introduction of a new district cooling system”), has been used as a criterion some cases to provide simplification.

18. Furthermore, some of the ongoing work of the MP and SSC WG is aiming to include tiered approaches to monitoring requirements, among others. These include:

    (a) Revision of the “Tool to calculate the emission factor for an electricity system”;

(b) Development of the methodological framework for standardized baselines for energy-efficient appliances and energy efficiency in buildings;

(c) Methodology for two- to three-wheeled personal transportation.

19. Additionally, it is noted that some emission trading systems, the European Union Emission Trading Scheme (EU ETS) for example, provide a tiered approach for monitoring, which takes the size of the installation into account when defining accuracy levels and sampling sizes (see table 3). The EU ETS provides detailed descriptions of the acceptable uncertainty levels for measurement equipment based on the technical feasibility of gathering the data. It is argued in related literature that this concept could be applied not only depending on project size, but also – or alternatively – depending on project location/national development level.

**Table 3. European Union Emission Trading Scheme (EU ETS) description of acceptable uncertainty levels**

| Activity/source type | Parameter to which the uncertainty is applied | Tier 1 | Tier 2 | Tier 3 | Tier 4 |
|---|---|---|---|---|---|
| Commercial standard fuels | Amount of fuel [t] or [nm3] | ±7.5% | ±5% | ±2.5% | ±1.5% |
| Other gaseous and liquid fuels | Amount of fuel [t] or [nm3] | ±7.5% | ±5% | ±2.5% | ±1.5% |
| Solid fuels | Amount of fuel [t] | ±7.5% | ±5% | ±2.5% | ±1.5% |
| Flaring | Amount of flare gas [$nm_3$] | ±17.5% | ±12.5% | ±7.5% | |
| Category A | | < 50,000 t/CO2 | | At least tier 1 | |
| Category B | | 50,000 – 500,000 t/CO2 | | Tier 4 / at least Tier 2 if Tier 4 technically not feasible | |

20. For the purposes of the CDM, it may be difficult to include generic guidance specifying a level of acceptable uncertainty in methodologies and projects related to monitoring results. For example, it may not be very conducive for common interpretation among PPs, validators, etc. with regard to precision of monitoring requirements. Instead, if those principles are taken into account while specifying monitoring requirements in individual methodologies, the measure could facilitate project implementation. Thus, CDM methodologies and tools could further benefit from including the tiered approaches customized with respect to:

(a) Scale of the technology/project (e.g. pico-scale, micro-scale, small-scale technologies and project size);

(b) Specific technology types that are proven to have fewer accuracy fluctuations in terms of their performance (e.g. lighting equipment, motors).

21. The methodology-specific work proposed above may be prioritized to some high-potential sectors. The ongoing methodological work for the CDM in the urban context (mandated in EB 90 report, paragraph 52) is based on the analysis of the cities' climate action plans and investment programmes that being planned or implemented. City-based climate action plans aim to holistically address key areas of mitigation such as transport, waste and water management besides energy supply. This information could be used to identify reasonable levels of uncertainty for different scales and types of technology when revising relevant methodologies or developing new ones. Tiered approaches could be implemented in methodologies covering a broad range of activities, such as transport, waste management, and residential energy efficiency in an urban context.

22. It is proposed that the following aspects be taken into account when introducing new or revising existing tiered approaches:

    (a) Monitored data from the registered project activities and PoAs;

    (b) Implementation aspects and effectiveness of the tiered approaches – whether PPs use the default factors or undertake direct measurements;

    (c) The impact of the tiered approaches – cost- benefit analysis of simplified monitoring using tiered approaches versus rigorous monitoring based on the direct measurement of projects activity parameters;

    (d) Feasibility of using sectoral and nationally collected data where appropriate.

# 4. Impacts

23. The cost-effective and context-appropriate approaches for MRV will reduce transaction costs associated with monitoring, improve the attractiveness of the CDM, and facilitate project development.

24. The proposed work does not foresee any cost implications for third parties/stakeholders.

# 5. Proposed work and timelines

25. The proposed work plan is as follows:

    (a) Board guidance on concept note: EB 94;

    (b) Draft revised regulatory documents (i.e. revised sampling standard) for the consideration of the Board: EB 96;

    (c) Subject to the Board providing the mandate, the work on other areas (e.g. best practice examples, tiered approaches) can commence in 2017, however majority of the work can only be undertaken in 2018. For the latter, i.e. the work to be done in 2018; it would be reflected in the draft MAP 2018 for the Board's approval at a future meeting.

# 6. Recommendations to the Board

26. The MP, SSC WG and secretariat recommend that the Board:

(a) Provide the mandate to develop guidance based on the context-specific best-practice examples for inclusion in methodological tools that cover monitoring aspects, sampling guidelines and a new guideline for managing data gaps;

(b) Provide the mandate to assess the possibilities to apply either sectoral and nationally collected data or existing approved default factors in CDM methodologies and tools to cover data gaps;

(c) Adopt the proposed revised text included in Appendix 1 and Appendix 2;

(d) Take note of the use of tiered approaches for monitoring in the concluded and ongoing work, and provide a mandate to explore introducing tiered approaches in CDM methodologies relevant to the urban context.

# Appendix 1. Proposed revision to the Standard "Sampling and Surveys for CDM Project Activities and Programme of Activities"

1. Paragraph 5: The following definitions are applied in this document:

   (a) A sample is a subset of a population. The population could be, for example, all households included in a CDM project activity or PoA or in a group of project activities or group of PoAs; the sample is a subset of these households. A characteristic of the population, such as average number of hours of operating a biogas stove, or proportion of installed refrigerator units still in operation, will be referred to as a parameter. The population parameter is unknown unless the whole population is studied, which is often not feasible or possible. A population parameter can, however, be estimated using data collected from a sample. It is therefore important that the sample is representative of the population. The correct choice of sample design can help to achieve this;

2. Paragraph 14: Subject to the two requirements of unbiased estimates and achieving reliability levels for the specific parameter determination, project participants have broad discretion in the sampling approach they propose to use to obtain the estimates. The choice depends on several considerations, including the known characteristics of the population, the cost of information-gathering, the number of project activities/PoAs covered by the survey (e.g. a single project activity/PoA or a group of project activities/PoAs), and other conditions surrounding the project in question. Some of the most commonly used sampling methods are summarized in the "Guidelines for sampling and surveys for CDM project activities and programmes of activities", along with typical circumstances where each may be most appropriate to apply. In case a survey covers a group of project activities or PoAs, stratified random sampling method shall be applied or if other methods of sampling are applied justification is provided for the choice that demonstrates the conservativeness and accuracy of the alternative procedure to be at least at the same level of the random sampling.

3. Paragraph 20: This section covers specific sampling requirements for PoAs or a group of project activities/PoAs for application by CME(s) to estimate parameter values through sampling.

4. Paragraph 21: Parameter values shall be estimated by sampling in accordance with the requirements in the applied methodology separately and independently for each of the CPAs included in a PoA except when a single sampling plan covering a group of CPAs included in one PoA or in a group of PoAs is undertaken applying 95/10 confidence/precision[1] for the sample-size calculation. In the latter case, the populations of all CPAs in the group are combined, the sample size is determined, and a single survey is undertaken to collect data; for example if the parameter of interest is the daily usage ~~hours~~ of ~~light bulbs~~ cook-stoves, it may be feasible to undertake a single sampling and

1 This is consistent with the approach in many approved methodologies to aim at higher confidence/precision when the sampling/survey effort is undertaken less frequently (e.g. methodologies AMS-I.E, AMS-II.G or AMS-I.J).

survey effort spread across geographic regions of several CPAs included in one PoA or in a group of PoAs when either homogeneity of included CPAs relative to the ~~light usage hours~~ cooking habits can be demonstrated or the differences among the included CPAs is taken into account in the sample-size calculation. Several groups of CPAs may be formed and sample sizes may be calculated for the groups. Furthermore, a single sampling plan may also be undertaken for a group of project activities/PoAs applying 95/10 confidence/precision. Currently PoAs applying large-scale CDM methodologies are not ~~included~~ allowed to bundle for applying a single sampling plan covering a group of CPAs pending further analysis.

# Appendix 2. CDM Common Sampling Form

| CDM COMMON SAMPLING FORM (F-CDM-###-###)<br>VERSION 1.0 |
|---|

If data/parameters are determined by a sampling approach jointly by a group of project activities and/or programme of activities (PoAs), provide a description of the sampling efforts in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities".

## SECTION A: Description of common sampling plan

### A.1. General description of project activities and/or PoAs participating in common sampling plan

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| Project activity and/or PoA (including reference number) | Project participants and/or CMEs | Methodology(ies) | Technology(ies) / Measure(s) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

### A.2. Location of project activities and/or PoAs participating in common sampling plan

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| Project activity and/or PoA (including reference number) | Host Party(ies) | Region/State/ Province | City/Town/ Community |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

### A.3. Description of common sampling plan

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# Appendix 3. Tiered approach in the CDM standards

| CDM standard | Parameter | Tier 1 approach | Tier 2 approach |
|---|---|---|---|
| Methodological tool: Emissions from solid waste disposal sites | The model correction factor to account for model uncertainties | A default value | The factor is determined based on specific situation of the project activity |
| | the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS | The IPCC default value | An alternative to using the default factor is to estimate DOCf,y or DOCf,m using equations (9), (10) and (11) of the tool |
| Methodological tool: Project emissions from flaring | The flare efficiency | A default value | Measure the flare efficiency |
| Methodological tool: Tool to calculate the emission factor for an electricity system | Emission factor for electricity import | A default value of zero | The actual operating margin EF of the connected grid |
| Methodological tool: Tool to calculate the emission factor for an electricity system | CO2 emission factor and the default value of the electricity generated by the off-grid power plants | The default CO2 emission factor and the default value of the electricity generated available to Pas located in LDCs, SIDS and states underrepresenting in CDM | Sampling procedures related to off-grid power generation |
| Methodological tool: Tool to determine the mass flow of a greenhouse gas in a gaseous stream | The absolute humidity of the gaseous stream | Simplified calculation without measurement of the moisture content | Calculation using measurement of the moisture content |

| CDM standard | Parameter | Tier 1 approach | Tier 2 approach |
|---|---|---|---|
| Methodological tool: Determining the baseline efficiency of thermal or electric energy generation systems | Efficiency of the energy generation system as a constant value | Default efficiency for thermal applications<br>Default efficiency for grid connected power plants | The manufacturer's efficiency values<br>The efficiency based on measurements and use a conservative value |
| Methodological Tool: Tool to determine the remaining lifetime of equipment | Remaining lifetime of the baseline or project equipment | The default values for the technical lifetime | Manufacturer's information on the technical lifetime of equipment and compare to the date of first commissioning<br>An expert evaluation |
| Methodological tool: Project and leakage emissions from transportation of freight | Fuel consumption | Conservative default emission factors to estimate project or leakage emissions from road transportation of freight. | Monitoring the fuel consumption of the vehicles used for the transportation of freight under the project activity |
| Methodological Tool: Project and leakage emissions from composting | Project emissions from fossil fuel consumption | Project emissions from fossil fuel consumption shall be calculated by applying the default emission factor for fossil fuels consumed by the composting activity per tonne of waste | shall be calculated using the latest approved version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" |
| | Project emissions of methane | A default value for EFCH4,y is used | EFCH4,y is determined based on measurements of the methane emissions during a composting cycle |
| | Project emissions of nitrous oxide | A default value for EFN2O,y is used | EFN2O,y is determined based on measurements of the emissions during a composting cycle |

| CDM standard | Parameter | Tier 1 approach | Tier 2 approach |
|---|---|---|---|
| Methodological Tool: Project and leakage emissions from anaerobic digesters | The quantity of methane produced in the digester | A default value | Procedure using monitored data |
| | project emissions from electricity consumption | A default value | Tool to calculate baseline, project and/or leakage emissions from electricity consumption |
| Methodological tool: Upstream leakage emissions associated with fossil fuel use | Emission factors for upstream emissions for different types of fossil fuels | Default emission factors for upstream emissions for different types of fossil fuels | Detailed approach based on the upstream emissions stages |
| Methodological tool: Baseline emissions for modal shift measures in inter-urban cargo transport | The average specific emission factor per TKM for cargo type | Default factors for rail transport depending on the type of fuel used by trains transporting cargo of different density<br>Default factors for domestic water transport depending on the type of cargo transported | the average specific emission factor per TKM per cargo type is estimated based on data on fuel/electricity consumption per cargo type transported by trains or by domestic ships |
| Methodological tool: Baseline emissions for modal shift measures in urban passenger transport | Mass or volume units of fuel/km | Globally applicable default values | (a) Measurement of fuel consumption data using total data<br>(b) Use of fixed values based on national or international literature<br>(c) latest IPCC default values reported matching the respective vehicle category, age, vehicle origin and technology<br>(d) Design data for relevant vehicle categories |

| CDM standard | Parameter | Tier 1 approach | Tier 2 approach |
|---|---|---|---|
| | Specific electricity consumption of vehicle category | Globally applicable default values | Local measured data (studies, e.g. performed by universities, other institutions or ordered by project proponent);<br>National or international data from studies;<br>IPCC default values for the respective vehicle categories (latest IPCC report)<br>Design data for relevant vehicle categories |
| AMS-II.C: Demand-side energy efficiency activities for specific technologies' has included specific guidance on monitoring requirements for project activities installing a lighting equipment | Operating hours of group of i project devices | default daily operating hours of 3.5 (hours/day) | Recording the "power" of the project equipment installed (e.g. lamp or refrigerator) using nameplate data or bench tests of a sample of the units installed and metering a sample of the units installed for their operating hours using run time meters |
| 'AMS-II.J: Demand-side activities for efficient lighting technologies' | Lamp Failure Rate | Use of data monitored every three years | Use of annually monitored data on lamp failures |
| AM0113: Distribution of compact fluorescent lamps (CFL) and light-emitting diode (LED) lamps to households | Daily operation hours of project lamp type | A default value of 3.5 hours per 24 hours period | An average measured value determined from measurements |

| CDM standard | Parameter | Tier 1 approach | Tier 2 approach |
|---|---|---|---|
| AMS-I.E: Switch from non-renewable biomass for thermal applications by the user | Average annual consumption of woody biomass per person before the start of the project activity | (a) A default value of 0.5 tonnes/person per year<br>(b) Country or region specific values approved through the "procedure for development, revision, clarification and update of standardized baselines", which are available on the CDM website | Historical data or a sample survey conducted as per the latest version of the standard for "sampling and surveys for CDM project activities and programme of activities". |
| AMS-I.L: Electrification of rural communities using renewable energy | Net amount of renewable electricity delivered to each consumer connected to the project renewable electricity generation system(s). | Calculate the net amount of renewable electricity delivered to all the consumers connected to the project renewable electricity generation system(s) as the installed capacity of the project renewable electricity generation systems times annual average value for availability. For solar photovoltaic electricity systems, the annual average value for availability can be determined using a conservative default value of twelve per cent (12 per cent) or calculated value using "RETScreen" or the values from the project feasibility report. | Measure the net amount of renewable electricity delivered to each consumer connected to the project renewable electricity generation system(s). |
| AMS-II.G: Energy efficiency measures in thermal applications of non-renewable biomass | Annual quantity of woody biomass that would have been used per person in the household | A default value of 0.5 tonnes/capita per year for annual per-capita baseline woody biomass consumption | A value from a standardised baseline may be used as an alternative to the default value provided |

| CDM standard | Parameter | Tier 1 approach | Tier 2 approach |
|---|---|---|---|
| | The value of the fraction of non-renewable biomass (fNRB) | Use default national values approved by the Board | Conduct local studies to determine the local fNRB value (sub national values) |
| | Leakage | A net to gross adjustment factor of 0.95 for leakage | Ex post surveys of users |
| AMS-II.K: Installation of co-generation or tri-generation systems supplying energy to commercial building | Quantity of refrigerant used in year y to replace refrigerant that has leaked | A default value of 35% of the initial refrigerant charge | Use the higher of the two quantities below:<br>(a) The monitored quantity of refrigerant used for top up to compensate for the leaked quantity during the year *y*; or<br>(b) The typical refrigerant leakage rate for the type of cooling equipment as determined from the Emission Factors provided in the IPCC 2006 Guidelines. |
| AMS-II.M: Demand-side energy efficiency activities for installation of low-flow hot water savings devices | Temperature of cold water | A scientifically validated study in residential systems in the project activity location. | Measurement of temperature of cold water |
| AMS-III.R: Methane recovery in agricultural activities at household/small farm level | Baseline emissions | IPCC Tier 1 approach 'Emissions from Livestock and Manure Management') | IPCC Tier 2 approach |
| AMS-III.AR: Substituting fossil fuel based lighting with LED/CFL lighting systems | Baseline emissions | Default values | Actual data based on research/monitoring and documentation provided by the project proponent |

| CDM standard | Parameter | Tier 1 approach | Tier 2 approach |
|---|---|---|---|
| AMS-III.BB: Electrification of communities through grid extension or construction of new mini-grids | Net amount of renewable electricity delivered to all the consumers | The installed capacity of the project renewable electricity generation systems times annual average value for availability. For solar photovoltaic electricity systems, the annual average value for availability can be determined using a conservative default value of twelve per cent (12 per cent) or calculated value using "RETScreen" or the values from the project feasibility report. | Measure the net amount of renewable electricity delivered to each consumer connected to the project renewable electricity generation system(s) |
| AMS-III.D: Methane recovery in animal manure management systems | Baseline emissions | Baseline is determined using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the IPCC Tier 2 approach. For this calculation, information about the characteristics of the manure and of the management systems in the baseline is required | Baseline emission is alternatively calculated using the amount of manure that would decay anaerobically in the absence of the project activity based on direct measurement of the quantity of manure treated together with its specific volatile solids content. |

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## Document information

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|---|---|---|
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