CLEAN DEVELOPMENT MECHANISM

CDM-EB67-A25-GUID

Guideline

Guidelines for completing the proposed new carbon capture and storage baseline and monitoring methodology form

Version 01.1

United Nations
Framework Convention on
Climate Change

TABLE OF CONTENTS **Page**

PART I

General information on completing the proposed new carbon capture and storage baseline and monitoring methodology form

1. These guidelines seek to assist project participants in completing the Proposed new carbon capture and storage (CCS) baseline and monitoring methodology form (CDM-CCS-NM-FORM).

2. If project participants wish to propose new CCS baseline and monitoring methodologies they shall complete and submit the CDM-CCS-NM-FORM and a draft CDM-CCS-PDD with only sections A-C filled along with completed "New baseline and monitoring methodology proposal form" (hereafter referred to as CDM-PNM-FORM) in accordance with "Procedure: Development, revision and clarification of baseline and monitoring methodologies and methodological tools".

3. The CDM-CCS-NM-FORM may be obtained electronically from the UNFCCC CDM website.

4. Terms, which are underlined with a broken line in the CDM-CCS-NM-FORM, are explained in the "Glossary of CDM terms" available on the CDM UNFCCC website. It is strongly recommended that before or during the completion of the forms that project participants consult the most recent version of the "Glossary of CDM terms".

5. Project participants should also consult the section "Guidance – clarifications" of the UNFCCC CDM website <http://unfccc.int/cdm>.

6. The Executive Board may revise the CDM-CCS-NM-FORM.

7. Revisions to the CDM-CCS-NM-FORM do not affect proposed new CCS baseline and monitoring methodologies:

   (a) Submitted to the secretariat prior to the adoption of the revised CDM-CCS-NM-FORM;

   (b) Submitted to the secretariat within a month following the adoption of the revised CDM-CCS-NM-FORM;

   (c) The Executive Board will not accept documentation using a previous version of the CDM-CCS-NM-FORM three months after the adoption of the new version.

8. In accordance with the CDM modalities and procedures, the working language of the Board is English. The CDM-CCS-NM-FORM shall therefore be completed and submitted in English language to the Executive Board.

9. The CDM-CCS-NM-FORM templates shall not be altered, that is, shall be completed using the same font without modifying its format, font, headings or logo.

10. Tables and their columns shall not be modified or deleted. Rows may be added, as needed.

11. The CDM-CCS-NM-FORM shall include in section A.1 the version number and the date of the document.

12. If sections of the CDM-CCS-NM-FORM are not applicable, it shall be explicitly stated that the section is left blank on purpose.

13. The CDM-CCS-NM-FORM is not applicable to afforestation and reforestation CDM project activities. The documentation for afforestation and reforestation project activities is available on the UNFCCC CDM website.

14. The presentation of values in the CDM-CCS-NM-FORM, including those used for the calculation of emission reductions, should be in international standard format e.g 1,000 representing one thousand and 1.0 representing one. The units used for weights/currency (Lakh/crore etc) should be accompanied by their equivalent S.I. units/norms (thousand/million) as part of the requirement to ensure transparency and clarity.

PART II

Technical guidelines for the development of proposed new carbon capture and storage baseline and monitoring methodologies

CONTENTS

Note**:** The document is prepared with the aim to facilitate the development of new methodologies and as such is a guidance document. The decisions/guidance provided by either by the Board or COP are legally valid and this document does not replace such decisions or guidance provided. The document is a living document and shall be revised, as and when required, to accommodate EB and/or CMP decisions.

Please note this document is not mandatory and as such is for guidance

General guidance on proposed new carbon capture and storage baseline and monitoring methodologies

(1) Analysis of the existing approved methodologies

Before considering the proposal of a new CCS baseline and monitoring methodology, the list of approved methodologies should be checked by the project proponents to verify whether an approved baseline and monitoring methodology could be used, or used with modifications, for the proposed project activity. In case modifications are required, please, refer to the guidance provided by the Executive Board on criteria for the consolidation and revision of approved methodologies (EB 27, Annex 10) and when to request a revision, clarification or deviation to an approved methodology (EB 31, Annex 12). This guidance is available at <http://cdm.unfccc.int/EB/index.html>.

(2) Forms to be used for submitting new methodologies

(a) The new CCS baseline and monitoring methodologies shall be proposed and approved together. "Proposed new carbon capture and storage baseline and monitoring methodology form" (CDM-CCS-NM-FORM) is to be used to propose a new CCS baseline and monitoring methodology. This form shall fully and completely describe the methodology. The form should be accompanied by a draft project design document (CDM-PDD) with sections A-C completed, including relevant annexes, in order to demonstrate the application of the proposed new methodologies to a proposed project activity. Each proposed new CCS baseline and monitoring methodology should use a CDM-CCS-NM-FORM. The CDM-CCS-NM-FORM for several new methodologies may be submitted together with the same CDM-CCS-PDD for several components of a proposed project;

(b) The forms shall be submitted to the Executive Board in accordance with "Procedures for submission and consideration of a proposed new methodology". The most recent versions of these forms and procedures may be obtained from the UNFCCC CDM website <http://unfccc.int/cdm>;

(c) The CDM-CCS-NM-FORM and the CDM-CCS-PDD shall include in sections B and A respectively the version number and the date of the document. Tables and their columns shall not be modified or deleted. Rows may be added, as needed;

(d) Project participants shall refrain from providing glossaries or using key terminology not used in the documents of the Conference of the Parties (COP), the CMP, the "Glossary of CDM terms", or the "Definitions relevant to CDM baseline and monitoring methodologies" (Annex 2 of this document), and they shall refrain from rewriting these instructions.

(3) General guidance for completing the proposed new carbon capture and storage baseline and monitoring methodology form (CDM-CCS-NM-FORM)

(a) The "Proposed new CCS baseline and monitoring methodology " sections shall:

(i) Be completed in a fashion that can be readily used as an approved methodology. This requires use of appropriate format, tone, and level of specificity. Text shall be clear and succinct, well-written, and logically sequenced. It shall describe the procedures in a manner that is sufficiently

explicit to enable the methodology to carried out by a methodology user, applied to projects unambiguously, and reproduced by a third party.
It shall be possible for projects following the methodology to be subjected to a validation and/or verification study. Methodology developers should review and be familiar with methodologies approved by the CDM Executive Board (please refer to the section on methodologies in the UNFCCC CDM website <http://cdm.unfccc.int/methodologies/PAmethodologies>);

(ii) Be generally appropriate for the entire group of project activities that satisfy the specified applicability conditions. A new methodology should, therefore, stand independently from the specific project activity proposed in the draft CDM-CCS-PDD with which the new methodology is being submitted. The methodology should not make direct reference to, or depend on characteristics of, the specific project activity being proposed in the draft CDM-CCS-PDD. It should not refer to specific project activities or locations, project-specific conditions or project-specific parameters. This project-specific information should be described in the draft CDM-CCS-PDD, however, it can be referred to in the explanation/justification section to help describe the methodology;

(iii) Present methodology steps as one might present a recipe. It should include all algorithms, formulae, and step-by-step procedures needed to apply the methodology and validate the project activity, i.e. calculating baseline, project, and leakage emissions. The completed form shall provide stand-alone replicable methodologies, and avoid reference to any secondary documents other than EB-approved tools and methodologies;

(iv) Indicate precisely what information the project proponent must report in the draft CDM-CCS-PDD and/or in monitoring reports;

(v) Support important procedures and concepts with equations and diagrams. Non-essential information should be avoided;

(vi) Provide instructions for making any logical or quantitative assumptions that are not provided in the methodology and must be made by the methodology user;

(vii) Include instructions to assist in implementing the methodology in a conservative manner where logical or quantitative assumptions have to be made by the methodology user, particularly in cases of uncertainty.

(4) Use of variables in equations

(a) Use the nomenclature of variables contained in Annex 1 to these guidelines. Variables not contained in the standard nomenclature should be named with two or three upper case letters that are first letters of each key word describing variable (e.g. stack height = SH);

(b) All variables that are reported or estimated annually should have a *y* subscript for year (e.g. BE_y);

(c) Variables should use the *i* subscript to denote multiple pieces of equipment, fuel types, processes, sites or measuring locations (e.g. F_i = flow rate at different

measuring points *i*). If two summations are required (e.g. fuel type and equipment piece), the subscripts *i* and *j* should be used;

(d) No name should be used more than once for different variables in the same methodology;

(e) Where necessary, the subscripts BL and PJ should be used to distinguish between the project and the baseline (e.g. EG_{BL}, EG_{PJ});

(f) Where a variable refers to a gases, the formula of the gas should be indicated as a subscript (e.g. $BE_{CO2,y}$).

SECTION A: Recommendation by the CCS Working Group (to be completed by the CCS Working Group)

(1) Recommendation

This section is to state the outcome of the assessment of the proposed new methodology:

(a) Approve;

(b) Reject;

(c) Preliminary recommendation.

(2) Major changes

(3) Major changes

SECTION B: Summary and applicability of the baseline and monitoring methodologies

(1) Methodology Title

Provide an unambiguous title for the proposed methodology. The title should reflect the project types to which the methodology is applicable. Do not use project-specific titles. Please indicate the following:

(a) The title of the proposed methodology;
(b) The version number of the document;
(c) The date of the document.

(2) If this methodology is based on a previous submission or an approved methodology, please state the reference numbers

State whether the proposed methodology is based on a previous submission or an approved methodology and, if so, explain briefly the main deviation(s) and their rationale. Where the methodology references other approved methodologies, the following guidance should be followed:

(a) The new methodology should clarify whether a section of an approved methodology is used verbatim, or rather as the basis for the proposal;
(b) If the section is used verbatim, then no additional text is needed in the methodology proposal other than a reference to the sections and paragraphs of the approved methodology (including version number);
(c) If the original text is modified in the proposal, then the entire text should be repeated.

Provide the reference number and version number to approved methodologies and tools if they are used – in whole or in part – in the proposed new methodology. Relevant sections can be cited specifically, but should not be repeated. Any proposed modifications and/or additions to approved tools and methodologies need to be clearly highlighted.

(3) Summary description of the methodology

For the baseline and monitoring methodology, summarize the key elements of the proposed new methodology, including brief statements on how the proposed methodology:

(a) Chooses the baseline scenario;
(b) Demonstrates additionality;
(c) Characterizes and selects the geological storage site;
(d) Calculates baseline emissions,
(e) Calculates project emissions;
(f) Calculates leakage;
(g) Identifies and collects monitoring data;
(h) Calculates emission reductions.

In doing so, if relevant, describe how this methodology builds on, complements, and/or provides an alternative to approved methodologies. Please do not exceed one page. The detailed explanation of the proposed new methodology is to be provided in Sections I, II and III of the CDM-CCS-NM-FORM.

SECTION C: Proposed new carbon capture and storage baseline and monitoring methodology

I. SOURCE, DEFINITIONS AND APPLICABILITY

(1) Sources

(a) Proponent of the new methodology should provide a list of existing approved methodologies and tools used in this new submission.

(2) Selected baseline approach from paragraph 48 of the CDM modalities and procedures

(a) Developers of a new CCS baseline methodology shall select the approach from paragraph 48 of the CDM modalities and procedures that is most consistent with the context of applicable project types, and most consistent with the underlying algorithms and data sources used in the proposed baseline methodology, and justify the choice on this basis. (EB 10, Annex 1, Para B3);

(b) Proponents of methodologies have indicated some apparent overlap between approaches (a), (b), and (c) of paragraph 48 of the CDM modalities and procedures. Since paragraph 48 stipulates that only one approach should be chosen, developers are advised to select the one that most closely reflects the process used for calculating baseline emissions or baseline emission rates. The tool used in order to demonstrate additionality does not need to be linked to one of the three approaches of paragraph 48 of the CDM modalities and procedures. (EB 10, Annex 1, Para B4);

(c) Project participants wishing to select approach 48 (c) of the CDM modalities and procedures shall elaborate in their submission of a proposed new CCS baseline methodology, *inter alia*, on:

  (i) How they determine “similar social, economic, environmental and technological circumstances”; and

  (ii) How they assess the “performance among the top 20 per cent of their category” defined as greenhouse gas emissions performance (in terms of CO_2e emissions per unit of output). (EB 08, Annex 1, Para B)

(3) Definitions

(a) Provide definitions of key terms that are used in the proposed new methodology;

(b) Where relevant, use the same definitions used in the *Modalities and procedures for carbon dioxide capture and storage in geological formations as clean development mechanism project activities* (CCS modalities and procedures) (decision 10/CMP.7).

(c) If possible, use definitions from other approved methodologies (e.g. electricity grid, tail gas).

(4) Applicability conditions

(a) List the category(ies) of project activities to which the methodology may apply. Use the list of categories of project activities and of registered CDM project activities by category available on the UNFCCC CDM website. If no suitable category(ies) of project activities can be identified, please suggest a new category(ies) descriptor and its definition, being guided by relevant information on the UNFCCC CDM website;
(b) List any conditions which a proposed CDM project activity must satisfy in order for the methodology to be applicable, related to, inter alia, identification and characterization of the geographic storage site, behaviour of the injected carbon dioxide, seepage, history matching, use of the geographic storage site and other aspects (e.g. project technology, sectoral circumstances, region). Applicability conditions must pertain to the type of proposed project activity and sector in which it takes place. Conditions should not substitute for steps that are necessary parts of the baseline methodology, such as defining the baseline. In this regard, they should not be conditions on a presumed baseline scenario (e.g., it is not appropriate for an applicability condition to be "The plant would continue to use the same fuel at the same efficiency without the project activity" as this is not a condition on the project activity, but a result of baseline assessment);
(c) In some cases, compliance with an applicability condition, such as "the project activity is a CCS facility", is obvious, easily validated, and unlikely to change. In other cases however, compliance with an applicability condition may need to be monitored during the crediting period, and the consequences of non-compliance would need to be indicated in the methodology;
(d) Explain in the Section D "explanations/justifications" the choice of the project category and applicability conditions. Indicate if an approved methodology exists for the same conditions of application.

II. BASELINE METHODOLOGY PROCEDURE

(1) Project Boundary

The spatial extent of the project boundary encompasses

(a) Describe and justify the physical delineation of the project boundary (the phrase is taken from guidance provided in CDM-CCS-NM-FORM section of guidelines to complete CDM-PDD, CDM-CCS-NM-FORM) and the gases and sources included, bearing in mind that it 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 project activity:
  (i) Explain the physical delineation. Use a figure or flowchart if it would be helpful;
  (ii) Explicitly state all sources and gases included. Explain whether any sources related to the baseline or the project activity have been excluded, and if so, justify their exclusion. If possible use the table provided in the CDM-CCS-NM-FORM;

(b) When defining which emission sources should be considered in the project boundary, in the baseline scenario and in the calculation of leakage emissions, project participants should make conservative assumptions, for example the magnitude of emission sources omitted in the calculation of project emissions and leakage effects (if positive) should be equal to or less than the magnitude of emission sources omitted in the calculation of baseline emissions (EB 22, Annex 2);
(c) For CCS CDM projects, the project boundary shall encompass the vertical and lateral limits of the carbon dioxide geological storage site that are expected when the carbon dioxide plume stabilizes over the long term during the closure phase and the post-closure phase. It also encompasses all above-ground components, including, where

applicable, the following:
(i) The installation where the carbon dioxide is captured;
(ii) Any treatment facilities;
(iii) Transportation equipment, including pipelines and booster stations along a pipeline, or offloading facilities in the case of transportation by ship, rail or road tanker;
(iv) Any reception facilities or holding tanks at the injection site;
(v) The injection facility;
(vi) Subsurface components, including the geological storage site and all potential sources of seepage (as determined during the characterization and selection of the geological storage site).

The greenhouse gases included in or excluded from the project boundary are shown in Table 1.

Table 1: Emissions sources included in or excluded from the project boundary

Source		Gas	Included?	Justification / Explanation
Baseline	Source 1	CO_2		
		CH_4		
		N_2O		
	Source 2	CO_2		
		CH_4		
		N_2O		
	Source 3	CO_2		
		CH_4		
		N_2O		
Project Activity	Source 1	CO_2		
		CH_4		
		N_2O		
	Source 2	CO_2		
		CH_4		
		N_2O		
	Source 3	CO_2		
		CH_4		
		N_2O		

(2) Identification and characterization of the geological storage site

2.1. General Issues

(a) Provide a systematic, step-by-step procedure for characterizing the geological storage site, in accordance with appendix B to the CCS modalities and procedures (decision 10/CMP.7);

(b) Geological storage sites shall only be used to store carbon dioxide as CDM project activities if, under the proposed conditions of use, there is no significant risk of seepage, no significant environmental or health risks exist, and the geological storage site will comply with all laws and regulations of the host Party;

(c) Characterization of the geological storage site is also necessary for developing the procedures and identifying the monitoring requirements for quantifying the storage of carbon dioxide in the geological storage site and detecting and measuring seepage.

(3) Identification of the most plausible scenario

3.1. General Issues

(a) The baseline is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity. Different scenarios may be elaborated as potential evolutions of the situation existing before the proposed CDM project activity. The continuation of a current activity could be one of them; implementing the proposed project activity without registration as CDM project activity may be another; and many others could be envisaged;

(b) Provide a systematic, step-by-step procedure for determining the most likely baseline scenario. Explain in the "explanations/justification" section why the proposed procedure for determining the baseline scenario is appropriate for the project type and applicability conditions;

(c) This procedure should describe a process for identifying the options to be considered as plausible candidate baseline scenarios. Justify that the range of options to be considered as plausible baseline scenarios is sufficiently comprehensive. The options to be considered should not exclude plausible options that, if included, might result in the determination of a different baseline scenario. Baseline methodologies shall require a narrative description of all reasonable baseline scenarios;

(d) Highlight the key logical assumptions and quantitative factors underlying the procedure for determining the baseline scenario. Clearly explain the logical and analytical steps that must be followed in ascertaining the most likely baseline scenario from among the candidate baseline scenarios. State clearly which assumptions and factors have significant uncertainty associated with them, and how such uncertainty is to be addressed;

(e) Ensure consistency between baseline scenario derived by this procedure and the procedure and formulae used to calculate the baseline emissions (below). The baseline scenario determination procedure should indicate for which baseline scenarios the overall methodology is applicable. This situation would occur when baseline emissions section (below) does not include algorithms and/or parameters relevant to the baseline scenario identified by the procedure.

3.2. Consideration of national and/or sectoral policies and circumstances in baseline scenarios (EB 16, Annex 3 and EB 22, Annex 3)

(a) A baseline scenario shall be established taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector;

(b) As a general principle, national and/or sectoral policies and circumstances are to be taken into account on the establishment of a baseline scenario, without creating perverse incentives that may impact Host Parties' contributions to the ultimate objective of the Convention;

(c) The following two types of national and/or sectoral policies are to be taken into account when establishing baseline scenarios:

  (i) National and/or sectoral policies or regulations that give comparative advantages to more emissions-intensive technologies or fuels over less emissions-intensive technologies or fuels;[1]

  (ii) National and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs).[2]

(d) These two types of policies shall be addressed as follows:

  (i) Only national and/or sectoral policies or regulations under paragraph (c) (i) above that have been implemented before adoption of the Kyoto Protocol by the COP (decision 1/CP.3, 11 December 1997) shall be taken into account when developing a baseline scenario. If such national and/or sectoral policies were implemented since the adoption of the Kyoto Protocol, the baseline scenario should refer to a hypothetical situation without the national and/or sectoral policies or regulations being in place;

  (ii) National and/or sectoral policies or regulations under paragraph c) ii) above that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) need not be taken into account in developing a baseline scenario (i.e. the baseline scenario could refer to a hypothetical situation without the national and/or sectoral policies or regulations being in place.

[1] So called type E+, policy that increase GHG emissions.
[2] So called type E-, policy that decrease GHG emissions.

(4) Additionality

4.1. General issues

(a) Provide a systematic step-by-step procedure for determining whether or not the project activity is, or is part of, the baseline scenario, and thereby determining whether the project activity is additional. The methodology should clearly state what the methodology user must do and what information must be presented in the resulting CDM-CCS-PDD in order to make a logical and well-substantiated case for the project's additionality;

(b) Examples of tools that may be used to demonstrate that a project activity is additional and therefore not the baseline scenario include, among others: (EB 10, Annex 1, Para 2&3);
   (i) A flow-chart or series of questions that lead to a narrowing of potential baseline options; and/or
   (ii) A qualitative or quantitative assessment of different potential options and an indication of why the non-project option is more likely; and/or
   (iii) A qualitative or quantitative assessment of one or more barriers facing the proposed project activity (such as those laid out for small-scale CDM projects); and/or
   (iv) An indication that the project type is not common practice (e.g. occurs in less than [<x%] of similar cases) in the proposed area of implementation, and not required by a Party's legislation/regulations.

(c) Present the procedures in each step in as much detail as needed, but avoid repetition that is not needed for reasons of clarity;

(d) Justify in the section D "explanations/justification" why the proposed procedure is an appropriate procedure for establishing the project's additionality. Highlight the key logical assumptions and quantitative factors underlying the procedure for demonstrating the project activity is additional. State clearly which assumptions and factors have significant uncertainty associated with them, and how such uncertainty is to be addressed. If relevant, explain how national and/or sectoral policies and circumstances are taken into account by the methodology.

4.2. Use of the "Tool for the demonstration and assessment of additionality"

(a) The use of the "Tool for the demonstration and assessment of additionality" is intended to facilitate the process of submitting methodologies, and that the use of the tool is not mandatory for preparing methodologies (Para 9 decision 12 CP.10, Para 28 Decision 7/CMP.1, EB 18, Para 20).

Project participants are encouraged to suggest further details on how to implement this tool to specific project types covered by the proposed methodology. If project participants suggest such further details, in the proposed methodology, they should refer to the tool and reproduce only the section(s) of the additionality tool, they propose to modify, clearly highlighting the proposed changes and/or additions to the tool. (EB 18, Para 20).

4.3. Relationship between the demonstration of additionality and the selection of the baseline scenario (EB 17, Para 16)

(a) The use of the "tool to assess and determine additionality" does not replace the need for the baseline methodology to provide for a stepwise approach justifying the selection and determination of the most plausible baseline scenario alternatives;

(b) Project participants proposing new CCS baseline methodologies shall ensure consistency between the determination of additionality of a project activity and the determination of a baseline scenario.

4.4. Use of the "Combined tool to identify the baseline scenario and demonstrate additionality"

(a) Project participants may choose, if applicable, to use the "Combined tool to identify the baseline scenario and demonstrate additionality", which is also intended to facilitate the process of submitting new methodologies. The combined tool provides a general framework for identifying the baseline scenario as well as demonstrating additionality, in one single stepwise procedure;
(b) In some cases, adjustments or additional explanations to the tool are required for specific project activities. This may include, *inter alia,* a listing of relevant alternative scenarios that should be considered in step 1, any relevant types of barriers other than those presented in the tool and guidance on how common practice should be established. In this case, project participants should refer to the tool and reproduce only the section(s) of it, which they propose to modify, clearly highlighting the proposed changes and/or additions;
(c) Please refer to the tool for applicability conditions and further details.

(5) Baseline emissions, Project emissions and leakage effects

5.1. General guidance

(a) Elaborate all algorithms and formulae used to estimate, measure or calculate the project emissions, baseline emissions and leakage effects, including seepage. Be specific and complete, so that the procedure can be carried out in an unambiguous way, replicated, and subjected to a validation and/or verification study:
    (i) Explain the underlying rationale for algorithm/formulae (e.g. marginal vs. average, etc.);
    (ii) Use consistent variables, equation formats, subscripts, etc.;
    (iii) Number all equations;
    (iv) Define all variables, with units indicated;
    (v) Justify the conservativeness of the algorithms/procedures; to the extent possible, include methods to quantitatively account for uncertainty in key parameters.
(b) Elaborate all parameters, coefficients, and variables used in the calculation of baseline emissions, project emissions and leakage effects:
    (i) For those values that are provided in the methodology:
        - Clearly indicate the precise references from these values are taken (e.g. official statistics, IPCC Guidelines, commercial and scientific literature, numerical modelling);
        - Justify the conservativeness of the values provided, including information on the sensitivity analysis of assumptions made in any numerical modelling.
    (ii) For those values that are to be provided by the project participant, clearly indicate how the values are to be selected and justified, for example, by explaining:
        - What types of sources are suitable (official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, numerical modelling.);
        - The vintage of data that is suitable (relative to the project crediting period);
        - What spatial level of data is suitable (local, regional, national, international);
        - How conservativeness of the values is to be ensured, including information

on the sensitivity analysis of assumptions made in any numerical modelling.

(c) For all data sources, specify the procedures to be followed if expected data are unavailable. For instance, the methodology could point to a preferred data source (e.g. national statistics for the past 5 years), and indicate a priority order for use of additional data (e.g. using longer time series) and/or fall back data sources to preferred sources (e.g. private, international statistics, etc.). (EB 09, Annex 3, Para 6);

(d) Use International System Units (SI units – refer to http://www.bipm.fr/enus/3_SI/si.html). (EB 09, Annex 3, Para 6);

(e) Note any parameters, coefficients, variables, etc. that are used to calculate baseline emissions but are obtained through monitoring. Ensure consistency between the baseline and monitoring methodologies. State if the data or parameter is monitored during and/or beyond the crediting period(s) of the proposed project activity;

(f) If the calculation of the baseline emissions is to be performed ex post, include an illustrative ex ante emissions calculation;

(g) Ensure consistency between the elaboration of the baseline scenario (Section 2) and the procedure for calculating the emissions of the baseline;

(h) With the intention to facilitate the submission of proposed new methodologies and standardize the calculation of certain classes of emissions sources that are common for different types of project activities, the Executive Board has approved several tools to calculate project and baseline emissions. Please refer to the CDM website: <http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>;

(i) The tools should be used whenever their applicability conditions allow. They should be used as stand-alone procedures, without changes, and need not to be copied in the proposed methodology. The proposed new methodology only needs to refer to the tool at the point in which the emissions from a source are calculated, making sure that the applicability conditions of the tool are met by the proposed project activity, the emission source referred to in the proposed methodology corresponds to that in the tool, and that units are consistent. Apart from using the existing approved tools, project proponents are also encouraged to propose new ones in areas where no tool exists or approved tools are not appropriate;

(j) Explain in section D “explanations/justifications” any parts of the algorithm or formulae that are not self-evident. Justify that the procedure is consistent with standard technical procedures in the relevant sector. Provide references as necessary. Explain implicit and explicit key assumptions in a transparent manner. State clearly which assumptions and procedures that have significant uncertainty associated with them, and how such uncertainty is to be addressed. Describe the uncertainty of key parameters and, where possible, provide an uncertainty range at 95% confidence level for key parameters for the calculation of emission reductions. Methodology developers are also encouraged to refer to chapter 6 of the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories for more Guidance on analysis of uncertainty.

5.2. Transparency and conservativeness

According to paragraph 45 (b) of the modalities and procedures, a baseline shall be established in a “transparent and conservative manner”. This means that assumptions are explicitly explained and choices are substantiated. In case of uncertainty regarding values of variables and parameters, the establishment of a baseline is considered conservative if the resulting projection of the baseline does not lead to an overestimation of emission reductions attributable to the CDM project activity (that is, in the case of doubt, values that generate a lower baseline projection shall be used). (EB 05, Annex 3).

5.3. Output-linked baseline values (EB 08, Annex 1, Para D8)

An output- or product-linked definition of baseline values (i.e. CO2e per unit of output) shall be applied, unless the project participants can demonstrate why this is not applicable and provide an appropriate alternative.

5.4. Use of and/or reference to lifecycle analysis (EB 22, Annex 2)

When referring to and/or making use of lifecycle analysis (LCAs) and/or LCA tools, project participants shall in a transparent manner provide all equations, parameterizations and assumptions used in the LCA and/or LCA tools to calculate baseline and monitoring methodologies. For example, this could be accomplished by highlighting the relevant sections in an attached copy of the referenced LCA and/or tool.

5.5. Ex post calculation of baseline emission rates (EB 09, Annex 3, Para 8)

The ex post calculation of baseline emission rates may only be used if proper justification is provided. Notwithstanding, the baseline emission rates shall also be calculated ex ante and reported in the draft CDM-PDD in order to satisfy the requirements for identification of the elements of a baseline methodology agreed by the Executive Board at its eighth meeting.

5.6. Treatment of the output and lifetime of plants and equipment (EB 08 and EB 22, Annex 2)

(a) If a proposed CDM project activity seeks to retrofit or otherwise modify an existing facility, the baseline may refer to the characteristics (i.e. emissions) of the existing facility only to the extent that the project activity does not increase the output or lifetime of the existing facility. For any increase of output or lifetime of the facility which is due to the project activity, a different baseline shall apply (EB 08);

(b) Where a project activity involves the replacement or retrofit of existing equipment or facilities, project participants should take into account that the existing equipment could have been replaced, retrofitted or modified in the absence of the project during the crediting periods. In this case, a baseline methodology should provide a methodological approach to assess whether the existing equipment would in the absence of the CDM be replaced and, if this is the case, to reflect this in the calculation of emission reductions the replacement, retrofit or modification of the equipment in the absence of the CDM;

(c) For a number of project types, it is reasonable to assume that after replacement or retrofit of the existing equipment in the absence of the project activity, the emission level would be similar to that of that of the project activity;

(d) In this case, emission reductions resulting from a specific equipment replacement shall only be accounted from the date of replacement until the point in time when the existing equipment would have been replaced in the absence of the project activity or the end of crediting period, whatever is earlier;

(e) In order to estimate the point in time when the existing equipment would need to be replaced in the absence of the CDM, a new methodology may consider the following approaches:

  (i) A sector and/or activity specific method or criteria to determine when the equipment would be replaced or retrofitted in the absence of the CDM;

  (ii) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.;

(iii) The practices of the responsible entity regarding replacement schedules may be evaluated and documented, e.g. based on historical replacement records for similar equipment.

(f) The point in time when the existing equipment would need to be replaced in the absence of the project activity should be chosen in conservative manner;

(g) In case of project activities that involve several replacements or retrofits, project participants may consider, inter alia, the following generic approaches:

(i) Determination of the technical lifetime on a case-by-case basis, for each equipment or equipment type that is being replaced. This approach may be appropriate if different types of existing equipment are involved; or

(ii) Assuming a conservative default technical lifetime for all equipment involved.

For projects involving a large number of individual equipment installations, methodologies may use a baseline that reflects the expected improvements in emission characteristics (for the equipment type within the sector or industry in question) as a result of replacements or retrofits of equipment in the absence of the project activity.

5.7. Use of regression analysis (EB 21, Annex 7)

(a) Where methodologies propose using multiple regression analysis to estimate baseline emissions or project emissions, safeguards should be used in order to ensure conservativeness and rigor of the fitted regression model. General guidance to achieve such objectives are:

(i) In the process of fitting the regression, assumptions and requirements for regression models should be considered e.g. testing for multi-collinearity;

(ii) Independent variables that are likely to influence the dependent variable in question should be accounted for. Technical background information that may support the selection of such variables should be provided with the methodology for the review of the panel;

(iii) Testing for statistical significance for all independent variables should be done. Independent variables which are statistically significant at 95% confidence level should be selected in the regression model;

(iv) If the time series data is used to fit the regression, autocorrelation should be tested. In case autocorrelation is found to be statistically significant, time series analysis should be used instead of regression.

5.8. Addressing non-permenance (decision 10/CMP.7) and other situations of negative emission reductions (EB 21, Para 18)

The CCS modalities and procedures (decision 10/CMP.7) set out provisions for the issuance of certified emission reductions and addressing non-permanence. This includes the actions to be taken if a verification report determines that a net reversal of storage occurred during the verification period as a result of seepage from the geological storage site of a CCS project activity.

In some cases and for some methodologies, project activities may temporarily result in “negative emission reductions” in a particular year, for reasons not associated with seepage from the geological storage site, for example due to poor performance or due to leakage effects outweighing emission reductions. In these cases and in accordance with the requirements set out in the report of the twenty-first meeting of the Board, Para 18, proposed new methodologies should stipulate that if a project activity temporarily results in “negative emission reductions”, i.e. baseline emissions minus project emissions minus leakage effects are negative, any further CERs will only be issued when the emissions increase has been compensated by subsequent emission reductions by the project activity.

5.9. Consideration of uncertainties when using sampling (EB 22, Annex 2)

Methodologies employing sampling to derive parameters in estimating emissions reductions shall quantify these parameter uncertainties at the 95% confidence level. In addition, the choice of the upper or lower bounds to be used in estimating emission reductions shall be conducted in a manner that ensures conservativeness.

5.10. Consideration of carbon pools in CDM project activity (EB 20, Annex 8)

The following guidance applies to methodologies where other measures (e.g. afforestation and reforestation) are combined with a CCS project activity.

(a) The following approaches towards changes in carbon pools, as defined in the modalities and procedures for afforestation and reforestation project activities under the CDM contained in the annex to decision 19/CP.9, due to CDM project activities should be taken into account:

  (i) Where a project activity, which does not seek to obtain tCERs or lCERs from afforestation or reforestation project activities, may directly or indirectly results in a net decrease of carbon pools compared to what would occur in the absence of the project activity, such changes should be taken into account in the calculation of emission reductions subtracting the corresponding quantities from emission reductions;

  (ii) Where a project activity, which does not seek to obtain tCERs or lCERs from afforestation or reforestation project activities, may directly or indirectly results in a net increase of carbon pools compared to what would occur in the absence of the project activity, this increase should not be taken into account in the calculation of emission reductions;

  (iii) Where a project activity does seek to obtain tCERs or lCERs from afforestation or reforestation project activities, this activity should be treated as a separate project activity and shall fulfill the modalities and procedures for afforestation and reforestation activities under the CDM.

5.11. Specific guidance on leakage

The following guidance applies to methodologies where other measures are combined with a CCS project activity.

Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases (GHG) emissions occurring outside the project boundary that is measurable and attributable to the implementation of the CDM project activity. Identify the sources of leakage. Explain which sources of leakage are to be calculated, and which can be neglected (EB 20, Annex 2). Even if the calculation of the leakage is to be performed ex post, the procedure should include the calculation of an ex ante estimate. Note that in the context of CCS, the term *physical leakage* may refer to seepage of carbon dioxide from a geographic storage site, and should be distinguished from this definition. Seepage should be accounted for as project emissions in the methodology.

5.12. Guidance on IPCC default values

The most recent IPCC default values should be used only when country or project specific data are not available or difficult to obtain (EB 25, Para 59).

5.13. Guidance on bunker fuels

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 not eligible under the CDM (EB 25, Para 58).

5.14. Guidance on avoiding double counting of emission sources

For a project activity, which has an A/R component, the emissions associated with A/R activity should be accounted for in the A/R CDM project activity. In general all project activities using biomass for energy should account for emissions associated with production of biomass. However, in the case that it can be demonstrated that, for a project activity using biomass for energy which uses biomass originating from a registered A/R project activity (i.e. through contractual agreement for procurement of biomass) it need not account for emissions related to biomass production (EB 25, Para 38).

5.15. Guidance on double-counting in CDM project activities using blended biofuel for energy use (EB 26, Annex 12)

The following guidance serves to avoid double-counting of emission reductions that could occur in project activities if both biofuel production and biofuel use are eligible to generate CERs and where such double-counting could occur at different points in the production chain.

(a) Type of biofuel project activities covered under the guidance:

Methodological proposals for the CDM project activities that seek to claim certified emissions reduction (CERs) from the substitution of fossil fuels by biofuels may be proposed for project activities where:

(i) The consumers (end-users) of biofuels claim CERs from displacing fossil fuel consumption with biofuel;

(ii) The producer of biofuels claim CERs, for biofuel production, provided:

- The consumers, to whom the biofuel is sold, are included in the project boundary and;
- The emissions reduction from use of biofuel are estimated based on monitored consumption by the consumers included within the project activity.

(b) Export of biofuels to Annex I countries:

No biofuel production exported to Annex I countries is eligible to claim CERs under the CDM.

(c) Monitoring:

The methodology shall provide a monitoring scheme/framework with elements (e.g. electronic loggers) that can be used to verify without doubt the actual amount of biofuel consumed by the consumer (end user) for displacement of fossil fuels.

The monitored elements of the consumption by the end-user shall correspond to the production of the biofuel and be used to calculate and claim emission reductions.The methodology for project activities undertaken by consumers of biofuel shall provide an estimate of leakage, which is measurable and attributable to the CDM project activity.

(d) Cultivation, harvesting and preparation of biofuel:

Emissions associated with the production of biomass used to produce the biofuel shall be accounted for when calculating emission reductions achieved by the blended biofuel project activity. However, in the case that it can be demonstrated that the project activity is using biomass originating from a registered A/R project activity (i.e. through contractual agreement for procurement of biomass), emissions related to the production of the biomass need not be accounted for (EB 25, Para 38).

5.16. Guidance on estimating emissions reductions related to fuels savings from project activities that primarily improve combustion efficiency of fuels

The following guidance applies to methodologies where other measures (e.g. energy generation) are combined with a CCS project activity.

Project activities that improve the combustion efficiency of fuels used in energy generation, should clearly distinguish between the saving in fuels, resulting from implementing such project activities, that are due to the improvement in combustion efficiency and those that are due to improvements in energy efficiency. Though improvements in combustion efficiency may result in fuel savings, they may not result in equivalent reduction in GHG emissions, as the fuels saving are due to better oxidation of the fuel, which in absence of the project activity would have remained unburned, thus not resulting in GHG emissions (EB 32, Para 28).

5.17. Guidance on eligibility of activities under the CDM

Creating infrastructure (e.g. testing labs, creation of an enforcement agency) or capacity to enforce the policy or standard, as such, cannot be considered as CDM project activities. The eligibility of project activities that are a result of the creation of infrastructure (e.g. testing labs, creation of an enforcement agency) or capacity to enforce the policy or standard shall be based only on measurable emission reductions which are directly attributable to these project activities. The Board recalled that it had agreed at its twenty-third meeting to treat transfer of know-how and training in the same manner (EB 33, Para 30).

5.18. Guidance on eligibility of project activities that produce products whose consumption leads to emission reductions

(a) The Board in its thirty-fifth meeting (paragraph 22) clarified that project activities that result in emission reductions due to the use/consumption of a product produced in the project activity are only eligible as CDM project activity if: (i) the users/consumers of the product are included in the project boundary; and (ii) monitoring takes place of the actual use/consumption and location of the product used/consumed by consumers;
(b) The Board further clarified that in such situations sampling can be used as a monitoring method for actual use/consumption and location of the product (EB 36, Annex 16).

(6) Emission Reductions

(a) Elaborate the algorithms and formulae used to estimate, measure or calculate the net emission reduction from the CDM project activity. In most cases, this will be simple equation with three terms: the baseline emissions, the project emissions, and the net leakage;
(b) Even if the calculation of the emission reductions is to be performed ex post, the procedure should include the calculation of an ex ante estimate;
(c) Ensure that the description of emission reductions is consistent with the proposed new monitoring methodology.

(7) Changes required for methodology implementation in 2nd and 3rd crediting periods (EB 20, Annex 7)

(a) At the start of the second and third crediting period for a project activity, three issues need to be addressed:
  (i) Assessing the continued validity of the baseline;
  (ii) Updating the baseline; and
  (iii) Recharacterizing the geological storage site.

(b) Provide a methodological procedure on how these three issues should be addressed;

Assessing the continued validity of the baseline

(c) In assessing the continued validity of the baseline, a change in the relevant national and/or sectoral regulations between two crediting periods has to be examined at the start of the new crediting period. If at the start of the project activity, the project activity was not mandated by regulations, but at the start of the second or third crediting period regulations are in place that enforce the practice or norms or technologies that are used by the project activity, the new regulation (formulated after the registration of the project activity) has to be examined to determine if it applies to existing plants or not. If the new regulation applies to existing CDM project activities, the baseline has to be reviewed and, if the regulation is binding, the baseline for the project activity should take this into account. This assessment will be undertaken by the verifying DOE;

Updating the baseline

(d) For updating the baseline at the start of the second and third crediting period, there shall be no change in the methodology for determining the baseline emissions. However, new data available will be used to revise the baseline emissions. For example, if the "average of 3 most recent years data" was used to determine the baseline emissions for the first crediting period, the baseline shall be updated using the average for the 3 most recent years prior to the start of the subsequent crediting period;

(e) In the case of baselines where emission factors are determined ex ante (and not updated during a crediting period), the baseline emissions factor shall be updated for the subsequent crediting period. This shall not be necessary for baselines which are constantly updated. In both cases, the CDM project activities are not included in the revised estimation of the baseline emissions;

(f) Project participants shall assess and incorporate the impact of new regulations on baseline emissions;

Recharacterizing the geological storage site

(g) Recharacterizing the geological storage site may, for example, require revision of the project boundary and monitoring plan, and trigger changes to the risk and safety assessment and the environmental and socio-economic impact assessments and alter the calculation of removal of GHG by CCS. Implement the relevant requirements set out in the modalities and procedures (decision 10/CMP.7).

(8) Data and parameters not monitored

The following table provides an example for a simple parameter.

Data / Parameter:	**EG_{3y}**
Data unit:	MWh

Description:	Quantity of electricity generated by the project plant prior to the project implementation during the three most recent historical years
Source of data:	On-site measurements and electricity sales receipts
Measurement procedures (if any):	On-site electricity meter
Any comment:	

III. MONITORING METHODOLOGY

(a) The monitoring methodology needs to provide detailed information on how to establish the monitoring plan related to the collection and archiving of all relevant data needed to:
  (i) Estimate or measure emissions occurring within the project boundary;
  (ii) Determine the baseline emissions;
  (iii) Determine the carbon dioxide storage in the geological storage site;
  (iv) Detect and quantify seepage and increased emissions outside the project boundary;
  (v) Determine whether the applicability conditions for the selection and characterization of the geological storage site are satisfied.

(b) The monitoring methodology should reflect the principles and criteria of international good practice for the monitoring of geological storage sites and consider the range of technologies described in the relevant sections of the Intergovernmental Panel on Climate Change (IPCC) 2006 IPCC Guidelines for National Greenhouse Gas Inventories and other good practice guidance;

(c) Data should be archived electronically and be kept at least for 2 years after the end of monitoring of the geological storage site (i.e. at least 22 years after the end of the last crediting period or after the issuance of CERs has ceased, whichever occurs first).

(1) Data and parameters monitored

(a) The monitoring methodology should provide a complete listing of the data that needs to be collected throughout the application of the methodology. This may include data that is measured or sampled and data that is collected from other sources (e.g. official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.). Data that is calculated with equations provided in the methodology should not be included in the compilation. Data that is determined only once and remains fixed throughout crediting period should be considered under "Data and parameters not monitored";

(b) Use the tables provided in the CDM-CCS-NM-FORM to provide the following information for each data (EB 09, Annex 3, Para 6):
  (i) Under "data/parameter", the variable used in equations in the baseline methodology;
  (ii) The International System Unit (SI units – refer to <http://www.bipm.fr/enus/3_SI/si.html>);
  (iii) A clear and unambiguous description of the parameter;
  (iv) A description which data sources should be used to determine this parameter. Clearly indicate how the values are to be selected and justified, for example, by explaining:
    - What types of sources are suitable (official statitics, expert judgment, proprietary data, IPCC, commercial and scientific literature, numerical modelling etc.);
    - The vintage of data that is suitable (relative to the project crediting period);

- What spatial level of data is suitable (local, regional, national, international);
- How conservativeness of the values is to be ensured;
- The procedures to be followed if expected data are unavailable. For instance, the methodology could point to a preferred data source (e.g. national statistics for the past 5 years), and indicate a priority order for use of additional data (e.g. using longer time series) and/or fall back data sources to preferred sources (e.g. private, international statistics, etc.).

(v) A description of the measurement procedures or reference to appropriate standards;

(vi) A description of the frequency of monitoring (e.g. continuously, annually, etc);

(vii) A description of QA/AC procedures;

(viii) A description of whether the data or parameter is monitored during and/or beyond the crediting period(s) of the proposed project activity.

The following table provides an example for a simple parameter.

Data / Parameter:	**$EG_{PJ,y}$**
Data unit:	MWh
Description:	Quantity of electricity generated by the project plant during the year *y*
Source of data:	On-site measurements and electricity sales receipts
Measurement procedures (if any):	On-site electricity meter
Monitoring frequency:	Continuously
QA/QC procedures:	Meter should be calibrated regularly according to standard ISO*****. Measurement results should be cross-checked with the quantity of invoices from the grid operator.
Any comment:	

(2) Guidance on monitoring procedures

2.1. Guidance related to monitoring requirements

The specific uncertainty levels, methods and associated accuracy level of measurement instruments and calibration procedures to be used for various parameters and variables should be identified in the PDD, along with detailed quality assurance and quality control procedures. In addition standards recommended shall either be national or international standards. The verification of the authenticity of the uncertainty levels and instruments are to be undertaken by the DOE during the verification stage. (EB 23, Para 24).

2.2. Guidance related to calibration (monitoring) requirements

A zero check cannot be considered as a substitute for calibration of the measurement instrument (EB 24, Para 37).

2.3. Guidance related to carbon capture and storage project activities

Monitoring of CDM CCS projects extends beyond the crediting period and is not only required for the calculation of the emission reductions, but also to confirm the isolation of carbon dioxide from the atmosphere in the long term. Implement the relevant requirements for monitoring set out in appendix B to the CCS modalities and procedures (decision 10/CMP.7).

Section D: Explanations/justifications of the proposed new carbon capture and storage baseline and monitoring methodology

The section shall:

(a) Be used to assist the assessment by the Meth Panel and the Executive Board in reviewing the methodology. If the proposed methodology is approved, these section is removed from the final version;

(b) Provide the rationale for the procedures presented;

(c) If the procedure draws from an approved methodology or tool, clearly note any changes to them or elaborations of them. Justify why such changes have been made;

(d) Point out the key logical and quantitative assumptions, i.e., those assumptions that the results of the baseline methodology are particularly sensitive to;

(e) Be clear about sources of uncertainty. Clearly point out which logical or quantitative assumptions have significant uncertainty associated with determining them. If the methodology makes a certain assumption in cases where there is uncertainty, explain why this assumption is appropriate;

(f) Explain how the methodology ensures conservativeness. Explain how the procedures and assumptions on which the procedures rely are conservative. In particular, explain how assumptions in the case of uncertainty are conservative.

Appendix 1. List of standard variables

THIS ANNEX CONTAINS STANDARD VARIABLE NAMES DRAWN FROM APPROVED METHODOLOGIES AND IPCC GUIDELINES THAT SHOULD BE USED FOR ALL NEW CCS BASELINE AND MONITORING METHODOLOGIES. FOR EASE OF EVALUATION AND USE OF METHODOLOGIES, THESE NAMES SHOULD BE USED WHEREVER POSSIBLE, UNLESS THERE ARE SPECIFIC REASONS THAT A DIFFERENT DESIGNATION IS REQUIRED. ISO OR OTHER STANDARDS COULD ALSO BE A REFERENCE, WHERE APPROPRIATE.

Emissions, emission factors and global warming potentials			
Variable	**Symbol**	**Units**	**Comment**
Baseline emissions (total)	BE_y	t CO_2e	
Component of baseline emissions	$BE_{XX,y}$	t CO_2e	XX should be 2–3 letters or a word signifying the source of emissions (e.g. BE_{LW},y = baseline emission from land-filled waste)
Component and specific gas of baseline emissions	$BE_{GHG,XX,y}$	t CO_2e	GHG should be gas name; XX should be 2–3 letters or a word signifying the source of emissions
Project emissions	PE_y	t CO_2e	
Component of project emissions	$PE_{XX,y}$	t CO_2e	XX should be 2–3 letters or a word signifying the source of emissions
Component and specific gas of project emissions	$PE_{GHG,XX,y}$	t CO_2e	GHG should be gas name; XX should be 2–3 letters or a word signifying the source of emissions
Leakage emissions	LE_y	t CO_2e	
Component of leakage emissions	$LE_{XX,y}$	t CO_2e	XX should be 2–3 letters or a word signifying the source of emissions (e.g. $LE_{VH.y}$ = leakage emissions from vehicles)
Component and specific gas of leakage emissions	$LE_{GHG,XX,y}$	t CO_2e	GHG should be gas name; XX should be 2–3 letters or a word signifying the source of emissions
Carbon dioxide emission factor	$EF_{CO2,XX}$	t CO_2/TJ	XX should refer to fuel type, and could be i to signify several possible fuel types (e.g. $EF_{CO2,i}$ or $EF_{CO2,coal}$, $EF_{CO2,NG}$, $EF_{CO2,oil}$)
Methane emission factor	$EF_{CH4,XX}$	t CH_4/TJ	XX should refer to fuel type or process
Nitrous oxide emission factor	$EF_{N2O,XX}$	t N_2O/TJ	XX should refer to fuel type or process
Carbon dioxide equivalent emission factor	$EF_{CO2e,XX}$	t CO_2e/TJ	XX should refer to fuel type or process
CO_2 emission factor for electricity	$EF_{CO2,ELEC,y}$	t CO_2/MWh	
Global warming potential	GWP_{XX}	t CO_2e/t gas	XX should denote the gas (CH_4, N_2O)

Emissions, emission factors and global warming potentials			
Other emission factors	$EF_{XX,YY}$	t GHG/unit of output	XX should specify the gas (where necessary), YY is product output or service (e.g. $EF_{CO2,clinker}$: emissions factor for clinker in t CO_2/t clinker; $EF_{N2O,NA}$: emissions factor for nitric acid in t N_2O/t nitric acid)

Note that standard IPCC emissions factors refer to emissions per unit of *energy*. If the methodology also uses emission per unit of mass, then different variable names should be used for this, or the equation should include the net calorific value to convert to energy units. If the methodology refers to emissions per unit of production or service, this should be indicated as described above under "Other emission factors".

General			
Variable	**Symbol**	**Units**	**Comment**
Production output (project or baseline)	$P_{xx,zz,y}$	tonnes or m^3	XX indicates the product, y is year. ZZ represents baseline and project production of same product, if needed, use subscripts BL and PJ for baseline and project respectively (e.g. $P_{NH3,PJ,y}$ = production of ammonia in the project activity)
Density	ρ_x	t/m^3	E.g. ρ_{CH4} = density of methane
weight fraction or weight concentration	$w_{GHG,XX}$	volume or mass %	GHG is the gas; XX indicates where concentration sample is taken and/or substance measured (e.g. $w_{CH4,PJ}$ = concentration of methane in project gas stream)
Flow rate	$FR_{XX,YY}$	m^3/time	XX should denote the gas, YY the type of flow stream (e.g. $FR_{CH4,flare}$)
Days	d	days	
Hour, year	h, y		

Energy			
Variable	**Symbol**	**Units**	**Comment**
Energy efficiency	η_{XX}	%	useful energy output/total energy input, also used for power plants and all boilers (e.g. η_{BL} = energy efficiency of piece of equipment in the baseline)
Electricity generation	EG_y	MWh	Project and baseline generation should include subscripts (e.g. $EG_{PJ,y}$)
Heat production	HG_y	GJ	Project and baseline generation should include subscripts (e.g. $HG_{BL,y}$)
Electricity consumption	EC_y	MWh	
Heat consumption	HC_y	GJ	
Net calorific value	NCV_{XX}	GJ/t	XX is the fuel or oxidized substance;

			XX could be i if there are many alternatives; standardised to lower heating value (e.g. NCV_{NG} = net calorific value of natural gas)
Fuel quantity combusted	FC_{XX}	t or m^3	XX is the fuel type (e.g. $FC_{Biomass}$ = quantity biomass combusted, FC_{NG} = quantity natural gas combusted)
Oxidation factor for fuel combustion	$OXID_{XX}$	%	XX is the fuel type, e.g. $OXID_{NG}$ = oxidation factor for natural gas
Specific energy consumption	SEC_{XX}	GJ/tonne production	E.g. $SEC_{clinker}$ = energy consumption per tonne of clinker produced
Specific fuel consumption	SFC_{XX}	tonne fuel/tonne production	E.g. SFC_{OPC} = fuel consumption per tonne of ordinary Portland cement production
Specific energy consumption in transport	$SEC_{YY,XX}$	GJ/t-km or passenger-km	YY is transport mode and XX is fuel
Weighting of operating margin	w_{OM}	-	
Weighting of build margin	w_{BM}	-	
Electricity generated by plant i on grid	$EG_{GRID,i,y}$	MWh	i is plant, y is year
Load factor	LF_x	%	x is plant identification
Operating hours	T_x	hours	annual operating hours for plant/equipment x
Enthalpy	h	kJ/kg	used in particular for steam

Financial/economic

Variable	Symbol	Units	Comment
Internal Rate of Return	IRR	%	
Discount rate	dr	%	
Net Present Value	NPV	$ or LCU	

Agriculture, waste and fugitive methane emissions

Variable	Symbol	Units	Comment
Methane gas destroyed in baseline	$GD_{CH4,BL,y}$	t CH_4	
Methane gas destroyed in project scenario	$GD_{CH4,PJ,y}$	t CH_4	
Flare efficiency	$\eta_{flare,t}$	%	This may have a time or period component *t*, if efficiency is measured and varies over time
Fraction of methane destroyed in baseline	$FD_{CH4,BL,y}$	%	Used if the baseline specifies a percentage rather than absolute baseline estimate
Methane Conversion Factor	MCF	%	for landfill site or wastewater treatment plant
Chemical oxygen demand	COD_y	t COD	for effluent stream
Biological oxygen demand	$BOD_{i,y}$	t BOD	i is stage of treatment
Maximum methane	B_0	t CH_4/t input	"input" could be COD, or mass of waste

production capacity			stream (e.g. manure)
Degradable Organic Carbon	DOC_j	fraction	j is part of waste stream (e.g. slow vs fast degrading materials)
Fraction of DOC dissimilated	DOC_F	fraction	
Methane conversion factor for treatment of manure	$MCF_{manure,i}$	%	i is stage of treatment
Volatile solid excretion rate	VS_p	kg dry matter/animal-day	p is the population targeted

Industrial production			
Variable	**Symbol**	**Units**	**Comment**
Weight fraction of CaO or MgO	$w_{CaO,x}/w_{MgO,x}$	fraction	x can indicate clinker or raw material

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