ANNEX ##

TECHNICAL GUIDELINES FOR THE DEVELOPMENT OF NEW AFFORESTATION/REFORESTATION BASELINE AND MONITORING METHODOLOGIES

Version 02

CONTENTS

NOTE: The document is prepared with the aim to facilitate the development of new A/R 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 COP/MOP decisions.

SECTION I. GENERAL GUIDANCE ON PROPOSED NEW BASELINE AND MONITORING METHODOLOGIES

A. Forms to be used for submitting new methodologies

1. A strong link between baseline and monitoring methodologies is to be provided. New baseline and monitoring methodologies shall be proposed and approved together.

2. The form "proposed new baseline and monitoring methodologies for A/R" (CDM-AR-NM) is to be used to propose a new baseline and monitoring methodology. This form shall fully and completely describe the baseline and monitoring methodology. The most recent version of this form may be downloaded from the "forms" section of the UNFCCC CDM web site (http://unfccc.int/cdm) or obtained from the UNFCCC secretariat by e-mail (cdm info@unfccc.int) or in print via fax (+49-228-815-1999).

3. The form "proposed new baseline and monitoring methodologies for A/R" (CDM-AR-NM) shall be accompanied by a "Project Design Document for A/R" (CDM-AR-PDD) with sections A-E completed, in order to demonstrate the application of the proposed new methodology to a proposed A/R CDM project activity.

4. The form "proposed new baseline and monitoring methodologies for A/R" (CDM-AR-NM) shall be submitted to the Executive Board in accordance with "Procedures for submission and consideration of a proposed new A/R methodology". For the most recent version of the procedures, please refer to procedures page of the UNFCCC CDM web site (http://cdm.unfccc.int/Reference/Procedures).

5. Each proposed new baseline and monitoring methodology should use a separate form "proposed new baseline and monitoring methodologies for A/R" (CDM-AR-NM). "Proposed new baseline and monitoring methodologies for A/R" (CDM-AR-NM) forms for several new baseline and monitoring methodologies may be submitted together with the same CDM-AR-PDD for several components of a proposed project activity.

6. For additional guidance on aspects to be covered in the description of a new methodology, please refer to guidance and clarifications by the Executive Board on the "guidance – clarifications" section of the UNFCCC CDM website (http://cdm.unfccc.int/Reference) and the "Glossary of CDM terms"[1] Project participants should use IPCC default values when country or project specific data are not available or difficult to obtain. Information on these values is provided in the Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance (GPG) for Land Use, Land-Use Change and Forestry (LULUCF)[2] and IPCC 2006 Guidelines for National GHG Inventories[3].

7. Project participants shall refrain from providing glossaries or using key terminology not used in the documents of the Conference of the Parties (COP), the COP/MOP, the "Glossary of CDM terms", and they shall refrain from rewriting these instructions.

8. Methodology developers should familiarize themselves with all A/R CDM methodologies already approved by the CDM Executive Board prior to developing their own new methodology, and should to the maximum extent possible use text, equations and explanation/justification from approved

[1] http://cdm.unfccc.int/Reference/Guidclarif

[2] http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm

[3] http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm

methodologies whenever providing equivalent methodology to that provided by existing approved methodologies.

B. General guidelines for completing the proposed new baseline and monitoring methodologies for A/R form (CDM-AR-NM)

1. All sections (except those to be filled in by the A/R WG) of the form CDM-AR-NM shall:

(a) Be completed in a fashion that can be readily used as an approved methodology. This requires use of appropriate format, language, 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.

(b) 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-AR-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-AR-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-AR-PDD, however, it can be referred to in the explanation/justification section to help explain the methodology.

(c) Present methodology steps as one might present a recipe. In doing so, clearly state what the methodology user must do and what information must be presented in the resulting CDM-AR-PDD. 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 net GHG removals by sinks, project emissions and removals, and leakage emissions. The completed form shall provide stand-alone replicable methodologies, and avoid reference to any secondary documents other than EB-approved tools, approved A/R methodologies and IPCC Guidelines.

(d) Indicate precisely what information the project proponent must report in the draft CDM-AR-PDD and/or in monitoring reports.

(e) Support important procedures and concepts with equations and diagrams (if necessary). Non-essential information should be avoided.

(f) Refer by name and reference number to approved methodologies and tools if they are used – in whole or in part – in the proposed methodologies. Any proposed modifications and/or additions to approved tools and methodologies need to be clearly highlighted.

(g) 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.

2. The “explanation and justification” sections shall:

(a) Be used only where methodological procedures are not self explicable.

(b) Be used to assist the assessment by the AR WG and the Executive Board in reviewing the methodology. If the proposed methodology is approved these sections are removed from the final version.

(c) Provide the rationale for the procedures presented.

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

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

(f) 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.

(g) 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.

C. Use of equations, variables and nomenclature

1. The mathematical descriptions, including the numbering of equations and the description of parameters and variables, should comply with the following formal requirements.

2. Variables and nomenclature

(a) Parameters, variables, statistics and particularly indices should be chosen unambiguously and used consistently throughout the document.

(b) The nomenclature of variables contained in Annex 1 of this document to these guidelines should be used wherever possible.

(c) 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. soil depth = SD).

(d) Where a variable refers to emissions from a particular gas, the formula of the gas should be indicated as a subscript (e.g. BE_{N2O}).

(e) Consistency of units should be thoroughly checked for each equation.

(f) Global Warming Potentials and further default parameters (e.g. emission factors, emission ratios, etc.) should be included as parameters in equations, not as values, e.g. "GWP_{N2O}" instead of "310".

(g) Parameters, variables and statistics in the text should be uniformly in italic.

(h) Use International System Units (http://www.bipm.fr/enus/3_SI/si.html). (EB09, Annex 3, Para 6, http://cdm.unfccc.int/EB/009/eb09repa3.pdf).

3. Equations

(a) All equations shall be numbered in order of their appearance.

(b) Brackets in equations should be pair wise and made only where necessary; the first brackets in an equation should be round, further brackets can be square or have other shapes.

(c) Sigma signs should be provided with indices indicating the range of the variables (e.g.

$\sum_{i=1}^{n} X_i$, where *i* varies from 1 to *n*).

(d) A short explanatory description should precede equations.

4. Include description of variables, statistics and parameters names in a table below each equation.

(a) Descriptions of variables, statistics and parameters should be uniform aligned identically throughout the document using the same space between lines, and follow the example of AR AM0001.

(b) All parameters and variables of an equation – including the one on the left-hand side of the equals sign – should be listed in the table and described in the description of parameters, variables, and statistics to allow for easy understanding and a consistency check, including the checking of units.

(c) Parameters, variables and statistics in the equation and in the description of parameters, variables and statistics should be formally identical.

(d) Parameters, variables, and statistics should be listed in the description table in the order of their appearance.

(e) Units in the descriptions of parameters, variables and statistics should be separated uniformly from the descriptive text throughout the document using brackets or semicolon, e.g. tree height (m) or aboveground dry biomass; t (1t = 1 Mg) or t d.m./ha.

(f) Equations should be referred to by their numbers (e.g. Eq. 7).

(g) All gas names should conform to standard scientific practices; check CO_2 and other names of gases (CH_4, N_2O, NO_X etc.) – do not use CO_2, $CO_{2\text{-}e}$, CH_4 etc. If required to express a result for a non-CO_2 gas in CO_2 equivalent units, denote this by using "CO_2-e".

(h) Use a space between d.m. (dry matter) and further units, e.g. d.m. m^{-3} instead of d.m.m^{-3}

(i) Negative exponents should be written uniformly throughout the document, e.g. t CO_2/yr or t CO_2 yr^{-1}).

5. Tables and lists of parameters and variables

(a) The same requirements apply mutatis mutandis as outlined under point 12.

(b) The text in tables should consistently start with a capital letter or a small letter, as appropriate for each column.

6. Parameters and variables in the main text

(a) Parameters and variables in the text should be uniformly in italic.

(b) All gas names should conform to standard scientific practices; check CO_2 and other names of gases (CH_4, N_2O, NO_X) for CO_2, $CO_{2\text{-}e}$. CH_4 etc. If required to express a result for a non-CO_2 gas in CO_2 equivalent units, denote this by using "CO_2-e.".

7. List of default values

(a) A complete list of default values (GHG potentials, emission factors, etc.) including their sources should be included in the "List of variables used in equations" section of the methodology.

(b) The sources for the defaults values must either be publicly accessible (e.g. through a website link or bibliographic reference) or appended to the methodology.

SECTION II. SUMMARY AND APPLICABILITY OF THE BASELINE AND MONITORING METHODOLOGIES

A. Methodology title and history of submission

1. 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 in Section I.1. the following:

(a) The title of the proposed methodology;

(b) The version number of the document;

(c) The date of the document.

2. 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 use language from the CDM-AR-NM form and guidance. Where the methodology references other approved methodologies, the following guidance should be followed:

(a) The new methodology should state when a section is used verbatim.

(b) If the original text is modified in any way, then all modifications should be highlighted.

B. Selected baseline approach from paragraph 22 of the CDM A/R modalities and procedures

1. If the original text is modified in any way, then all modifications should be highlighted Developers of a new baseline methodology shall select the approach from paragraph 22 of the CDM A/R modalities and procedures (page 67 of the document http://cdm.unfccc.int/Reference/COPMOP/08a01.pdf#page=67) that is most consistent with the underlying algorithms and data sources used in the proposed baseline methodology, and justify the choice on this basis.

C. Applicability conditions

1. List any conditions which a proposed CDM project activity must satisfy in order for the methodology to be applicable. The applicability conditions shall describe the unique character of a methodology and cover, *inter alia*:

(a) Type and purpose of the project activity and pre-project land use;

(b) Conditions for the exclusion of carbon pools covered;

(c) Conditions for the exclusion of possible GHG emissions by sources or removals by sinks;

(d) Conditions for the exclusion of leakage activities and emission sources;

(e) Conditions related to the selection of baseline approach and procedure;

(f) Data requirements;

(g) Conditions related to the management of the project (e.g. indispensable infrastructure, disposal of waste, use of agrochemicals);

(h) Required sectoral circumstances and local conditions.

2. Applicability conditions have to be worded in a way that their compliance can be checked. In some cases, compliance with an applicability condition is obvious, easily validated, and unlikely to change. In other cases, however, methodological guidance including respective thresholds has to be provided on how to test ex-ante and/or ex-post the compliance with an applicability condition, and the consequences of non-compliance would need to be indicated in the methodology.

D. Selected carbon pools and emissions sources

1. State which carbon pools and project emission sources, and the corresponding gases, are included and accounted. Explain whether any GHG emissions by sources related to the actual net GHG removals by sinks have been excluded, and if so, justify their exclusion. Use the table provided in the CDM-AR-NM. If carbon pools and/or GHG emission sources are excluded, provide corresponding applicability conditions in the in the appropriate sub-section of Section I of the CDM-AR-NM.

E. Summary description of major baseline and monitoring methodological steps

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

(a) Sets the physical project boundary;

(b) Identifies the carbon pools, and emissions by sources, to be accounted;

(c) Selects the most plausible baseline scenario;

(d) Demonstrates additionality;

(e) Estimates baseline net GHG removals by sinks;

(f) Estimates ex-ante net GHG removals by sinks;

(g) Estimates leakage;

(h) Identifies and collects monitoring data;

(i) Estimates ex-post actual net GHG removals by sinks;

(j) Provides a conservative and transparent approach to estimating net GHG removals by sinks.

2. 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 methodology is to be provided in sections II and III of the CDM-NM form; however, this section should provide a clear enough picture of the methodology to enable a quick assessment – in combination with the applicability conditions – if the methodology is not applicable to a project activity without necessity of reading the entire document.

SECTION III. BASELINE METHODOLOGY DESCRIPTION

A. Project boundary

Describe and justify the physical delineation of the project boundary and the carbon pools, gases and sources included.

B. Procedure for selection of the most plausible baseline scenario

1. General issues

1. The baseline for an A/R CDM project activity is the scenario that reasonably represents the sum of the changes in carbon stocks in the carbon pools within the project boundary that would occur in the absence of the proposed A/R CDM project activity. A baseline shall cover all carbon pools within the project boundary, but project participants may choose not to account for one or more carbon pools if they provide transparent and verifiable information showing that the choice will not increase the expected net anthropogenic GHG removals by sinks. The general characteristics of a baseline are contained in paragraphs 20 to 22 of the CDM A/R modalities and procedures (pages 20 and 21 of the document http://cdm.unfccc.int/Reference/Documents/dec19_CP9/English/decisions_18_19_CP.9.pdf).

2. 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.

3. 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 applicability conditions.

4. 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.

5. Highlight the key logical assumptions and quantitative factors underlying the chosen baseline scenario the uncertainty associated to it, and how this uncertainty is to be addressed.

6. Ensure logical consistency between the baseline scenario selected as most likely, and the methodology and formulae used to calculate the baseline net GHG removals by sinks.

2. Afforestation/reforestation in the baseline scenario (EB24, Annex 19)

1. The following issues shall be addressed in afforestation / reforestation CDM methodologies that consider afforestation/reforestation as a baseline scenario and account for accelerated accumulation of carbon in selected carbon pools:

(a) At the start of the A/R CDM project all land areas included in the project boundary shall comply with eligibility of land;

(b) Project proponents shall propose and justify the method used to assess the baseline rate of afforestation/reforestation;

(c) Assessment of additionality shall include justification that the increased rate of afforestation/reforestation would not occur in the absence of the project activity and results from direct intervention by project participants;

(d) GHG emissions occurring outside the project boundary and attributable to the AR activity are to be considered both in the baseline situation as well as in the project situation. Therefore the provisions under paragraph 1b in annex 15 of EB22 does not apply in this case.

3. Consideration of national and/or sectoral policies and circumstances in baseline scenarios (EB23, Annex 19)

1. A baseline scenario shall be established taking into account relevant national and/or sectoral policies and circumstances, such as historical land use practices and the economic situation in the project sector.

2. 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.

3. National and/or sectoral land-use policies or regulations, which give comparative advantages to afforestation/reforestation activities and 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).

C. Additionality

1. General issues

1. 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-PDD in order to make a logical and well-substantiated case for the project's additionality.

2. Project Participants may propose their own approaches to demonstrate additionality. Examples of approaches that may be used to demonstrate that a project activity is additional and therefore not the baseline scenario include, among others (EB10 Annex1, Para 2&3 http://cdm.unfccc.int/EB/010/eb10repan1.pdf):

(a) A flow-chart or series of questions that lead to a narrowing of potential baseline options; and/or

(b) A qualitative or quantitative assessment of different potential options and an indication of why the non-project option is more likely; and/or

(c) A qualitative or quantitative assessment of one or more barriers facing the proposed project activity; and/or

(d) An indication that the A/R activity is not required by a Party's legislation/regulations or these legislation/regulations are systematically not enforced.

3. Present the procedures in each step in as much detail as needed, but avoid repetition that is not needed for reasons of clarity.

4. Justify in the "explanation/justification" section 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.

2. Use of the "Tool for the demonstration and assessment of additionality in A/R CDM project activities"

1. The use of the "Tool for the demonstration and assessment of additionality in A/R CDM project activities" (EB21, Annex 16 http://cdm.unfccc.int/EB/021/eb21repan16.pdf) is intended to facilitate the process of submitting methodologies, and the use of the tool is not mandatory for preparing methodologies (Para 9, Decision 12/CP.10, page 3 of the document http://unfccc.int/resource/docs/cop10/10a02.pdf#page=2; Para 28, Decision 7/CMP.1, page 97 of the document - http://unfccc.int/resource/docs/2005/cmp1/eng/08a01.pdf#page=93).

2. When reference is made in approved methodologies to the use of the tool, this means that the tool is part of the methodology and shall be used per se (EB21, paragraph 17 page 5 of the document http://cdm.unfccc.int/EB/021/eb21rep.pdf)

3. 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 "Tool for demonstrating the additionality of afforestation and reforestation", they propose to modify, clearly highlighting the proposed changes and/or additions to the tool. (EB18, Para 20)

3. Relationship between the demonstration of additionality and the selection of the baseline scenario

1. Submitted new afforestation and reforestation baseline and monitoring methodologies often try to identify and justify the baseline scenario as part of the additionality assessment. However, the selection of the baseline scenario and the additionality assessment should be methodologically separated. (EB21, Annex 20 http://cdm.unfccc.int/EB/021/eb21repan20.pdf))

2. 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. Project participants proposing new baseline methodologies

shall ensure consistency between the determination of additionality of a project activity and the determination of a baseline scenario. (EB17, Para 16, http://cdm.unfccc.int/EB/017/eb17rep.pdf; EB21, Annex 16, http://cdm.unfccc.int/EB/021/eb21repan16.pdf))

D. Net anthropogenic GHG removals by sinks, actual net GHG removals by sinks, baseline net GHG removals by sinks, and leakage

1. General guidance

1. Elaborate all algorithms and formulae used to estimate, measure or calculate actual net GHG removals by sinks, baseline net GHG removals by sinks, and leakage. 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:

(a) Present the mathematical descriptions as required in Section 1.C;

(b) Explain the underlying rationale for algorithm/formulae;

(c) Justify the conservativeness of the algorithms/procedures; to the extent possible, include methods to quantitatively account for uncertainty in key parameters and statistics.

2. Elaborate all statistics, parameters, coefficients, and variables used in the calculation of baseline GHG removals by sinks, actual net GHG removals by sinks, and leakage in accordance with Section 1.C:

(a) For those values that are provided in the methodology:

(i) Clearly indicate the precise references (author, title, date, publisher, and chapter/section/page/equation/table number as appropriate) from which these values are taken (e.g. official statistics, IPCC Guidelines, commercial and scientific literature);

(ii) Justify the conservativeness of the values provided.

(b) 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:

(i) What types of sources are suitable (official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.);

(ii) The vintage of data that is suitable (relative to the project crediting period);

(iii) What spatial level of data is suitable (local, regional, national, international);

(iv) How conservativeness of the values is to be ensured.

3. 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.). (EB09, Annex 3, Para 6, http://cdm.unfccc.int/EB/009/eb09repa3.pdf)

4. Explain in the “explanations/justifications” section any parts of the algorithm or formulae that are not self-evident (e.g. new or applied in circumstances that differ significantly from those in existing approved methodologies). 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 to maintain a conservative approach.

2. **Pre-project emissions (EB22, Annex 15 http://cdm.unfccc.int/EB/022/eb22_repan15.pdf)**

1. Where the baseline scenario is expected to correspond to approaches of paragraphs 22 (a) and (c) of the modalities and procedures for CDM A/R project activities:

(a) In accordance with paragraph 21 of the modalities and procedures for CDM A/R project activities, only the increase of pre-project GHG emissions as a consequence of the implementation of the project activity has to be taken into account in the calculation of net anthropogenic GHG removals by sinks.

(b) Pre-project GHG emissions by sources which are displaced outside the project boundary in order to enable an afforestation or reforestation project activity under the CDM shall not be included under leakage if the displacement does not increase these emissions with respect to the pre-project conditions. Otherwise, leakage for the displacement of pre-project activities is equal to the incremental GHG emissions compared with the pre-project conditions.

3. **N_2O Emissions from fertilizer application (EB26, para 50 http://cdm.unfccc.int/EB/026/eb26rep.pdf)**

1. Accounting for emissions of N_2O from fertilizer application shall be as follows:

(a) Only direct (e.g. volatilization), and not indirect (e.g. run-off), emissions of N_2O from application of fertilizers within the project boundary shall be accounted for in A/R project activities;

(b) If the only source of N_2O emissions, which is located outside the project boundary is due to the application of fertilizer in nurseries supplying seedlings to the A/R project activity, then these N_2O emissions (either direct or indirect), may be considered as negligible.

4. **Losses of carbon in carbon pools from road construction (EB26, para 50)**

1. Losses of carbon in carbon pools due to the construction of access roads, within the project boundary, are negligible compared to net anthropogenic GHG removals by sinks over the crediting period, and so may be ignored (EB24, paragraph 56).

5. **Transparency and conservativeness**

1. According to paragraph 45 (b) of the modalities and procedures (page 36 of the document http://unfccc.int/resource/docs/cop7/13a02.pdf#page=20), 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, statistics and parameters, the establishment of a baseline is considered conservative if the resulting projection of the baseline does not lead to an overestimation of net anthropogenic GHG removals by sinks attributable to the CDM project activity (that is, in the case of doubt, values that generate a higher baseline projection shall be used). (*mutatis mutandis* taken from EB05, Annex 3, Para 10(a), http://cdm.unfccc.int/EB/005/repann3.PDF) .

6. **Specific guidance on leakage**

1. "Leakage" is the increase in greenhouse gas emissions by sources which occurs outside the boundary of an afforestation or reforestation project activity under the CDM which is measurable and attributable to the afforestation or reforestation project activity.

2. Explain which sources of leakage are to be included, and which can be neglected.

3. Accounting of decreases of carbon pools outside the project boundary are to be considered as leakage and, in particular (EB22, Annex 15, http://cdm.unfccc.int/EB/022/eb22_repan15.pdf):

(a) In the case of deforestation as land clearance outside the project boundary due to activity shifting, effects on all carbon pools shall be considered;

(b) In the case of fuelwood collection or similar activities outside the project boundary, only the gathered volume of wood that is non-renewable shall be considered as an emission by sources if forests are not significantly degraded due to this activity. The equation (Eq. 3.2.8) for fuelwood gathering as outlined in IPCC GPG (2003, http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm) could be applied in combination with household surveys or Participatory Rural Appraisal (PRA). In the case that forests are significantly degraded, accounting rule 1 applies. "Not significantly degraded" means that the extracted volume results in emissions that are between 2% and 5 % of net actual GHG removals by sinks. If the extracted wood volume results in emissions which are below 2% of the net actual GHG removals by sinks, this type of leakage can be ignored.

7. Specific guidance on estimation of net anthropogenic GHG removals by sinks

1. Elaborate the algorithms and formulae used to estimate, measure or calculate the net anthropogenic GHG removals by sinks from the CDM project activity.

2. Ensure that the description of net anthropogenic GHG removals by sinks is consistent with the proposed new monitoring methodology.

8. Equations to calculate tCERs and lCERs (EB22, Annex 15)

1. The generic ways of calculating tCERs and lCERs are as follows:

(a) tCERs reflect the difference of carbon stock in the carbon pools in the project and baseline at the time of verification less cumulative project GHG emissions within the project boundary less cumulative GHG emissions outside the project boundary due to afforestation or reforestation less difference in carbon stocks in the carbon pools outside the project boundary (t CO_2), affected by afforestation or reforestation activity, in the baseline and project at the time of verification, i.e,

$$t-CER(t_v) = C_P(t_v) - C_B(t_v) - \sum_{0}^{t_v} E(t) - \sum_{0}^{t_v} L_E(t) - \left(L_{P\_B}(t_v) - L_{P\_P}(t_v)\right)$$

lCERs reflect the difference of increment of the carbon stock in the carbon pools, between two verification periods, in the project and the baseline, less project GHG emissions, between two verification periods, less GHG emissions outside the project boundary, less the difference of increment in carbon stock in the carbon pools outside the project boundary (tCO_2), affected by afforestation or reforestation project activity, in the baseline and project, i.e,

$$l-CER(t_v) = \left[C_P(t_v) - C_P(t_v - \kappa)\right] - \left[C_B(t_v) - C_B(t_v - \kappa)\right] - \sum_{t_v-\kappa}^{t_v} E(t) - \sum_{t_v-\kappa}^{t_v} L_E(t) -$$

$$- \left[\left(L_{P\_B}(t_v) - L_{P\_B}(t_v - \kappa)\right) - \left(L_{P\_P}(t_v) - L_{P\_P}(t_v - \kappa)\right)\right]$$

Where:

$t\text{-}CER(t_v)$	=	t-CERs emitted at time of verification t_v (t CO_2)
$l\text{-}CER(t_v)$	=	l-CERs emitted at time of verification t_v (t CO_2)
$C_P(t_v)$	=	Existing carbon stocks at the time of verification t_v (t CO_2)
$C_B(t_v)$	=	Estimated carbon stocks of the baseline scenario at time of verification t_v (t CO_2)

$E(t)$	=	Project emissions in year t (t CO_2)
$L_E(t)$	=	Leakage: estimated emissions by sources outside the project boundary in year t (t CO_2)
$L_{P\_B}(t_v)$	=	Leakage: estimated carbon pools outside the project boundaries in the baseline scenario on areas that will be affected due to the implementation of a project activity at time of verification t_v (t CO_2)
$L_{P\_P}(t)$	=	Leakage: existing carbon pools outside the project boundaries that have be affected by the implementation of a project activity at time of verification t_v (t CO_2)
t_v	=	Year of verification
κ	=	Time span between two verifications

2. Note that accounting for the volume of extracted wood products from forests outside the project boundary would be accounted for as leakage related to emissions by sources.

E. Changes required for methodology implementation in 2nd and 3rd crediting periods (EB20, Annex 7, http://cdm.unfccc.int/EB/020/eb20repan07.pdf)

1. At the start of the second and third crediting period for a project activity, two issues need to be addressed:

(a) Assessing the continued validity of the baseline; and

(b) Updating the baseline.

2. Provide a methodological procedure on how these two issues should be addressed.

3. Assessing the continued validity of the baseline

(a) 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 projects 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.

4. Updating the baseline

(a) 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 net GHG removals by sinks. However, new data available will be used to revise the baseline net GHG removals by sinks;

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

F. Data needed for ex ante estimations

1. This section should include a compilation of all data needed for ex-ante estimates of baseline net GHG removals by sinks, actual net GHG removals by sinks, and leakage. This includes 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 or default values specified in the methodology should not be included in the compilation.

2. Use the table provided in the CDM-AR-NM to provide the following information for each variable (EB09, Annex 3, Para 6, http://cdm.unfccc.int/EB/009/eb09repa3.pdf):

(a) Under "data / parameter", the name of the variable used in equations in the baseline methodology;

(b) The unit of measurement of the variable according to the International System Unit (SI units – refer to http://www.bipm.fr/enus/3_SI/si.html);

(c) A clear and unambiguous description of the parameter or statistic;

(d) The vintage of the parameter and geographical scale of the parameter.

(e) A description of data sources that should be used to estimate or calculate this parameter. Clearly indicate how the values could be selected and justified, for example, by explaining:

(i) What types of sources are suitable (official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.);

(ii) The vintage of data that is suitable (relative to the project crediting period);

(iii) What spatial level of data is suitable (local, regional, national, international);

(iv) How conservativeness of the values is to be ensured;

(v) 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.);

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

(g) The following table provides an example for these parameter estimates.

Data / Parameter	Unit	Description	Vintage	Data sources and geographical scale
$C_{L,ij}$	t C	Average annual decrease in carbon due to biomass loss for stratum *i,* species *j*	Most recent year	National, regional or local forestry inventory

3. The actual choice of data and, where necessary, justifications for the choice should be documented in the CDM-AR-PDD.

SECTION IV. MONITORING METHODOLOGY DESCRIPTION

A. Monitoring of project implementation

1. Provide a procedure to clearly identify and document the implementation of the project on the land areas within the project boundary. This should include the following aspects:

(a) The size and location with the geographical coordinates of the stands established as part of the project activity;

(b) The stands and the area of each stratum;

(c) Whether the stands are managed according to any previously established management plan.

B. Sampling design

1. Describe how the sampling design is to be undertaken for the *ex post* calculation of actual net GHG removals by sinks. The sampling design may, *inter alia*, include information on size and shape of the plots for each carbon pool considered in the project activity, determination of number of plots and sample size calculation, plot distribution, etc.

C. Determination of *ex post* baseline net GHG removals by sinks, if required

1. If the methodology requires, provide a consistent step-by-step procedure for the *ex post* determination of the baseline net GHG removals by sinks. Elaborate all algorithms and formulae required in conformity with the editorial guidance provided in Section I.C.

(a) Where values are provided in the methodology:

(i) Clearly indicate the precise references (author, title, date, publisher, and chapter/section/page/equation/table number as appropriate) from which these values are taken (e.g. official statistics, IPCC Guidelines, commercial and scientific literature);

(ii) Justify the conservativeness of the values provided.

(b) Where values are to be provided by the project participant, clearly indicate how the values are to be selected and justified, for example, by explaining:

(i) The vintage of data that is suitable;

(ii) What spatial level of data is suitable (local, regional, national, international);

(iii) How conservativeness of the values is to be ensured.

2. Where appropriate describe any quality assurance and quality control procedures, including standard operating procedures (SOPs) used, if necessary stating tolerable deviations from data values and operating procedures.

D. Data to be collected and archived for the determination of *ex post* baseline net GHG removals by sinks, if required, and for *ex post* actual net GHG removals by sinks

1. List all data that should be collected and archived for the determination of *ex post* baseline net GHG removals by sinks, if required, and ex-post actual net GHG removals by sinks, using the table below, as provided in the CDM-AR-NM.

2. Monitored data shall be archived for 2 years following the end of the crediting period. Add rows to the table below, as needed:

ID number	Data Variable	Data Unit	Data source	Measured (m) calculated (c) estimated (e)	Recording frequency	Proportion of data monitored	Comment

3. Use the tables provided in the CDM-AR-NM to provide the following information consecutively for each parameter, for the columns indicated above:

(a) A unique numeric identifier;

(b) The name of the variable used in equations in the baseline methodology, as well as a clear and unambiguous description of the parameter, if necessary;

(c) The unit of measurement of the variable according to the International System Unit (SI units – refer to http://www.bipm.fr/enus/3_SI/si.html);

(d) A description which data sources should be used to estimate this parameter. Clearly indicate how the values are to be selected and justified, for example, by explaining what types of sources are suitable (e.g. official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature, etc.). Detailed references to the source of the data should be provided, if this has not been done elsewhere;

(e) Whether the data is measured, calculated or estimated;

(f) The recording frequency of the data (e.g. continuously, annually, etc);

(g) The proportion of data that is monitored;

(h) Any other comments or explanation.

Annex 1. List of standard variables

1. This Annex contains standard variable names drawn from approved methodologies and IPCC guidelines that should be used for all new 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.

Variable	Symbol	Units	Comment
Baseline net GHG removals by sinks			
Baseline net GHG removals by sinks	ΔC_{BSL}	t CO_2-e.	
Average annual carbon stock change in living biomass of trees	ΔC_{ij}	t CO_2	*i* is stratum and *j* is species
Average annual increase in carbon due to biomass growth	$\Delta C_{G,ij}$	t CO_2	*i* is stratum and *j* is species
Average annual decrease in carbon due to biomass loss	$\Delta C_{L,ij}$	t CO_2	*i* is stratum and *j* is species
Area of stratum and species	A_{ij}	ha	*i* is stratum and *j* is species
Annual average increment of total biomass	$G_{TOTAL,ij}$	t d.m./ha	*i* is stratum and *j* is species
Carbon fraction of biomass	CF_j	t C/t d.m.	*j* is species
Average annual aboveground biomass increment	$G_{w,ij}$	t d.m./ha	*i* is stratum and *j* is species
Root-shoot ratio for tree species	R_j	dimensionless	*j* is species
Average annual net increment in volume suitable for industrial processing	$G_{I,ij}$	m^3/ha	*j* is species
Species specific basic wood density	ρ_j	t d.m./m^3	*j* is species
Biomass expansion factor for conversion of annual net increment (including bark) to aboveground biomass increment	$BEF_{1,j}$	dimensionless	*j* is species
Biomass expansion factor for conversion of merchantable volume to aboveground tree biomass	$BEF_{2,j}$	dimensionless	*j* is species
Total carbon stock in living biomass of trees, calculated at time 1 or 2	$C_{2,ij}$ $C_{1,ij}$	t C	*i* is stratum and *j* is species
Merchantable volume	V_{ij}	m^3/ha	*i* is stratum and *j* is species
Carbon stock in aboveground biomass	$C_{AB,ij}$	t C	*i* is stratum and *j* is species
Carbon stock in belowground biomass	$C_{BB,ij}$	t C	*i* is stratum and *j* is species

Verifiable changes in carbon stocks in the carbon pools			
Actual net greenhouse gas removals by sinks	ΔC_{ACTUAL}	t CO_2-e.	
Annual carbon loss due to commercial fellings	$L_{fellings,ij}$	t C	*i* is stratum and *j* is species
Annual carbon loss due to fuelwood gathering	$L_{fuelwood,ij}$	t C	*i* is stratum and *j* is species
Annual natural losses of carbon in living trees	$L_{other\ losses,ij}$	t C	*i* is stratum and *j* is species
Annually extracted volume	H_{ij}	m^3	*i* is stratum and *j* is species
Annual volume of harvested fuel wood	FG_{ij}	m^3	*i* is stratum and *j* is species
Areas affected by disturbances	$A_{D,ij}$	ha	*i* is stratum and *j* is species
The fraction of the biomass in living trees affected by disturbance	$F_{D,ij}$	dimensionless	*i* is stratum and *j* is species
Average biomass stock of living trees	$B_{W,ij}$	t d.m./ha	*i* is stratum and *j* is species
GHG emissions by sources			
Project GHG emissions by sources	PE	t CO_2-e.	
Emissions from burning of fossil fuels	PE_{FF}	t CO_2-e.	
Decrease in carbon stock in living biomass of existing non-tree vegetation	PE_{BML}	t CO_2-e.	
Increase in non-CO_2 emissions as a result of biomass burning	$PE_{non\text{-}CO2,BB}$	t CO_2-e.	
Increase of N_2O emissions as a result of direct nitrogen application	$N_2O_{direct\text{-}N\ fertiliser}$	t CO_2-e.	
Amount of diesel consumption	FC_{diesel}	l	
Amount of gasoline consumption	$FC_{gasoline}$	l	
Emission factor for diesel	$EF_{CO2,diesel}$	kg CO_2/l	
Emission factor for gasoline	$EF_{CO2,\ gasoline}$	kg CO_2/l	
Average biomass stock on land to be planted, before the start of a project	$B_{non\text{-}tree,j}$	t d.m./ha	*i* is stratum
Carbon fraction of dry biomass in non-tree vegetation	$CF_{non\text{-}tree}$	t C/t d.m.	
Loss of aboveground biomass due to slash and burn	$PE_{BiomassBurn,C}$	t C	
N_2O emissions from biomass burning in slash and burn	$PE_{BiomassBurn,\ N2O}$	t CO_2-e.	
CH_4 emission from biomass burning in slash and burn	$PE_{BiomassBurn,\ CH4}$	t CO_2-e.	

Average stock in living biomass before burning	B_i	t d.m./ha	*i* is stratum
Area of slash and burn	$A_{burn,i}$	ha	*i* is stratum
Average biomass combustion efficiency	CE	dimensionless	
N_2O emissions from nitrogen fertilization	$N_2O_{direct\text{-}N\ fertilizer}$	t CO_2-e.	
Synthetic fertilizer nitrogen applied, adjusted for volatilization as NH_3 and NO_X	F_{SN}	t N	
Annual amount of organic fertilizer nitrogen for volatilization as NH_3 and NO_X	F_{ON}	t N	
Emission factor for emissions from N fertilizer inputs	EF_1	t N_2O-N/t N input	
Fraction of N that volatilises as NH_3 and NO_X for synthetic fertilizers	$Frac_{GASF}$	dimensionless	
Fraction of N that volatilises as NH_3 and NO_X for organic fertilizers	$Frac_{GASM}$	dimensionless	
Amount of synthetic fertiliser nitrogen applied	$N_{SN\text{-}Fert}$	t N	
Amount of organic fertiliser nitrogen applied	$N_{ON\text{-}Fert}$	t N	
Leakage			
Total GHG emissions caused by transportation	LE_{TR}	t CO_2-e.	
CO_2 emissions caused by transportation	$LE_{TR,CO2}$	t CO_2-e.	
N_2O emissions caused by transportation	$LE_{TR,N2O}$	t CO_2-e.	
CH_4 emissions caused by transportation	$LE_{TR,CH4}$	t CO_2-e.	
Emission factor for vehicle type *v* with fuel type *f*	$EF_{CO2,vf}$	kg CO_2/l	
Consumption of fuel type *f* of vehicle type *v*	F_{vf}	l	vehicle type *v* with fuel type *f*
Vehicle specific energy consumption	SEC_{vf}	l/km	vehicle type *v* with fuel type *f*
Vehicle distance travelled	DT_{vf}	km	vehicle type *v* with fuel type *f*
Number of vehicles	N_v	dimensionless	vehicle type *v*

Financial/economic

Variable	Symbol	Units	Comment
Internal Rate of Return	*IRR*	%	
Discount rate	*dr*	%	
Net Present Value	*NPV*	$ or Local Currency Unit	