PROPOSED NEW BASELINE AND MONITORING METHODOLOGY FOR FOREST MANAGEMENT (Version 02)

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TABLE OF CONTENTS

[1] www.quest.bris.ac.uk/JIFOR

[2] www.nerc.ac.uk

Section I. Summary and applicability of the baseline and monitoring methodology

1. Methodology title (for baseline and monitoring) and history of submission

Methodology title:

Improved forest management to increase biomass and ecological value (Version 2.0)

If this methodology is based on a previous submission or an approved methodology, please state the relevant reference number (ARNMXXXX/AR-AMXXXX). Explain briefly the main differences and/or rationale for not using the approved methodology.

This is a new methodology for LULUCF projects (CP.3 Art. 3.4). According to decision 17/CMP.1, paragraph 1, Parties included in Annex I to the Convention that have ratified the Kyoto Protocol shall apply for the first commitment period the Good Practice Guidance for LULUCF, as developed by the IPCC. Furthermore, the "*Guidance on Criteria for Baseline Setting and Monitoring*" (Annex 6, JISC 04, 15.09.2006) was taken into account for development of this methodology.

A/R WG recommendation ***(to be completed by the A/R WG)*:**

a) To approve this proposed A/R methodology as contained in an annex to the A/R WG meeting report
>>

b) To reconsider this proposed A/R methodology, subject to required changes
Major required changes:
>>

Other required changes:
>>

c) Not to approve the proposed A/R methodology
Reasons for non-approval
>>

2. Selected baseline approach for A/R CDM project activities

Choose one (delete others):

- ☐ Existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary;
- ☐ Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment;
- ☒ Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time the project starts.

Explanation/justification of choice:

This methodology applies to forests that have or have not been under management before. In both cases the baseline implies a usual exploitation of an accumulated forest stock, i.e. forest logging, which has been planned by the forest owner. This represents *the most likely land use at the time the project starts*.
The first baseline option is not suitable because the existing or historical land use may be discontinued if the forests are used for the first time. The second baseline option could also be applied leading to the same result: The most likely land use (forest logging as usual, e.g. within a concession system or directly by the private, communal or state owner) represents at the same time an attractive course of action for the forest owner.

3. Applicability conditions

Methodology procedure:

Project activities that improve forest management in such a way that it maintains higher carbon stocks in the forest ecosystem are considered as improved forest management according to Article 3.4 of the Kyoto Protocol.
This methodology is applicable to *improved forest management (IFM)* projects in forests, fulfilling the following conditions:

1. *Type of forest*: The methodology is applicable for all types of forests.
2. *State of forest.* The project forests are forests fulfilling the national legal requirements that allow for the harvesting of their timber.
3. *Logging operation*s. The project forests are foreseen to be logged directly by the owner or via a concession system evidenced by the existence of a forest management plan and a logging permit. The validity of both documents shall be equal or exceed the crediting period of the project activity. If not, the project participant shall renew both documents. Otherwise the project activity can not claim any carbon credits. This also applies to potential time gaps between the expired management plan and logging permit and the approval of a new management plan and a new logging permit, which in no case shall exceed one year. Logging operations should be legal at the time the project will start and focus on clear cutting harvesting systems.
4. *Baseline Forest Management Plan.* Normal logging operations, reflecting the business-as-usual (BAU) case, must be described in a forest management plan. To ensure the conservativeness of the baseline assumption, the management plan must be approved by a responsible state agency or

any other entity appointed by the national forestry law. The approval must be issued prior to the start of the project activity. The permitted harvests, outlined in the baseline case, shall not exceed typical levels for other concessions in the region, as stated under §6.

5. *Measures of Improved Forest Management.* The present methodology covers the following types of IFM measures:

   a) *Forest conservation*, where stands are excluded from cutting due to certain criteria which do not apply in the BAU case (e.g. excluding stands below a defined growing stock[3], slope, species composition, etc.) (FC)

   b) Excluding specific *tree classes* from cutting due to certain criteria, which otherwise would be cut in the BAU case. Such criteria could be the tree dimension (defined by stem diameter or tree height) the tree species, or age (ST). The amount of wood volume of specific tree classes shall be determined according to the approved management plan and logging permit and shall be evidenced through monitoring.

   c) Reducing wood harvesting to a previously agreed fraction of the total harvestable stand by *exempting* a predefined *volume* of different species, age classes or diameter classes of the growing stock from cutting (EV). EV shall not overlap with the volume of specific tree classes (ST) as specified under §5.b. It shall be determined according to the approved management plan and the logging permit and shall be evidenced through monitoring.

6. *Annual Allowable Cut.* The approved forest management plan shall specify an official Annual Allowable Cut (AAC) which shall be within typical ranges for approved AAC values within the region and / or similar forest types. The effectively harvested wood volume shall not be more than the AAC minus the wood volume saved by the project activity.

7. *Concession lifetime*. The concession(s) making up the project area shall be leased during the total crediting period and may comprise one single or several leasing periods.

8. *Litter, Dead Wood and Soil Organic Carbon.* Under the project scenario of forest protection, the sum of carbon pools in litter, dead wood and soil organic carbon is increasing more or decreasing less compared to the rotation average in the baseline scenario.

9. *Host Country's Forest Definition.* The area included in the project boundary qualifies as forest according to the Host country's definition of forest.

10. *Leakage.* If the IFM diminished logged volume exceeds one per cent of the wood market volume, then leakage effects shall be monitored as specified in section II, chapter 6.

Emissions from fertilizer application, emission reduction of grass and transportation need not be covered in baseline and monitoring methodologies of forestry projects, and would not be significantly different in this project case than in the baseline[4].

Explanation/justification (if methodology procedure is not self-explanatory):

[3] Growing stock is a forestry term which defines the standing wood volumes above a defined minimum diameter e.g. 7 cm including aboveground stem volume and branches.

[4] Compare to the decision of EB 42 and EB 44 (2008)

Improved forest management measures will increase the biomass carbon pool inside the project boundary.

A/R WG recommendation ***(to be completed by the A/R WG):***

a) Please provide your assessment of the suggested applicability conditions of the proposed new A/R methodology (e.g. project type, national and regional circumstances / policies, data and resource availability, environmental conditions, past land-use and land use changes, purpose of the activity and practices). If necessary, explain any changes that should be made to the applicability conditions.

b) Please specify whether this methodology can be applied to other potential CDM A/R project activities

c) Indicate whether an approved methodology exists for the same applicability conditions

4. Selected carbon pools and emissions sources

Table A: Selected carbon pools

Carbon pools	Selected (Yes or No)	Justification / Explanation of choice
Above ground	yes	Above ground tree biomass is the most important carbon pool to be saved from logging operations
Below ground	yes	Tree root biomass is another significant carbon pool to be accounted in this methodology
Dead wood	no	The dead wood carbon pool is conservatively disregarded because preserving stands or individual trees (project case) would lead to the same, or an even slightly increased amount of dead wood
Litter	no	The litter carbon pool is conservatively disregarded for the same reason cited for the deadwood carbon pool
Soil organic carbon	no	The soil organic carbon pool is equally larger in the project case of preserving individual trees or stands, because after tree stem extraction with some soil carbon gains, a long period of mineralization diminishes the soil carbon pool. The eventual growth of seedlings only adds a fraction of the carbon to the soil than uneven aged or old growth forest do. Therefore, the soil organic carbon pool is conservatively disregarded.

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

Sources	Gas	Included/ excluded	Justification / Explanation of choice
Forest fires	CO_2	no	If forest fires occur on forest units or affecting trees which were conserved from harvesting, the related carbon stock decrease of biomass is accounted

	CH_4	yes	The amount of CH_4 related to forest fires according to IPCC GPG has to be subtracted
	N_2O	yes	The amount of N_2O related to forest fires according to IPCC GPG has to be equally subtracted
Use of fertilizers	CO_2	no	No fertilizers used in stand or tree preservation. The eventual use of fertilizers in the baseline case is conservatively disregarded.
	CH_4	no	Same reason as above.
	N_2O	no	Same reason as above.
Combustion of fossil fuels by vehicles	CO_2	no	In the project case of IFM, the amount of fossil fuels used, e.g. monitoring, is less than the fossil fuels used for the alternative logging operations
	CH_4	no	Same reason as above.
	N_2O	no	Same reason as above.

Explanation/justification of choice (only if space in the table is not sufficient).

A/R WG recommendation ***(to be completed by the A/R WG)***:

a) State whether the selection of carbon pools is appropriate in the context of the applicability conditions and the determination of actual net GHG emission reductions by sinks and baseline net GHG emission reductions by sinks. If not, explain the shortcomings and required changes. Note that the same carbon pools should be considered for the actual net GHG emission reductions by sinks and baseline net GHG emission reductions by sinks.

b) State whether the selection of emissions by sources is appropriate taking into account the applicability conditions of the proposed AR methodology.

5. Summary description of major baseline and monitoring methodological steps

a. Baseline methodology:

The following procedures will be applied to calculate the green house gas (GHG) emission reduction effect of the project activity:

1. Obtain national forest definition from the national Designated Focal Point or from a Designated National Authority. Get the annual allowable cut (AAC) for the project forest area stipulated by a legal or independent source or get it from an approved forest management plan.
2. Delineation of the Project Boundary: Identify those areas as project areas, that fulfil the Host country's definition of forest according to minimum area (ha), tree cover (% of crown closure) and tree height (m).
3. Based on forest inventory data, not older than ten years, and based on the forest road infrastructure, planned or taken from the management plan, a cutting plan will be drawn up, specifying for every year over the crediting period which units will be harvested (species groups,

species or volumes). It is conservative if forest management plans are based on a 0-10 year old inventory because the growing stocks will have increased since that time. However it shall be checked annually that forest areas have not decreased due to fire, climatic or biologic impacts.

4. Calculation of commercial wood volumes per species group or species separately for each of the IFM measures, i.e. the commercial wood volumes exempted from logging operations.
5. Estimating wood densities for the different species groups or species, possibly differentiating age classes.
6. Estimating of expansion factors for commercial wood volumes to calculate total above and below ground tree biomass. Expansion factors shall take into account, if available different species groups, species and/or age classes. Reliable local data for species/age class specific expansion factors should be preferred over regional/national or generic values.
7. Calculation of the carbon losses and gains over a crediting period of 30 or 20 years twice renewable (ex-ante net GHG emission reduction by sinks).
8. Assessment of possible leakage effects to compensate for the reduced wood volume i.e. assessment of direct displacement of cutting areas and/or market leakage.
9. Calculation of net anthropogenic GHG emission reductions by sinks over the crediting period.

For this type of Improved Forest Management no JI or CDM baseline and monitoring methodology is available. Hence a baseline is established in accordance with appendix B of the JI guidelines.
The baseline methodology is built on the following corner stones ensuring a time- and cost-effective project implementation:

- The *project area* shall be identified using the following criteria:
  - ***a)*** The project area contains one or several forests subject to harvesting operations under a clear cutting system, where IFM measures are introduced by the project activity.
  - ***b)*** The project area shall meet the host country's forest definition.
  - ***c)*** The project area shall only comprise those areas of a concession that would be logged in absence of the project activity in the course of the crediting period.
- The *project boundary* shall account for all changes in the above- and below-ground biomass carbon pool of the forest areas included in the project activity. Other carbon pools are conservatively disregarded.
- *Annual logging volumes* in the baseline scenario (BAU forest management) are determined by an approved management plan and logging permits. Both shall be in line with the official annual allowable cut (AAC). The AAC shall be calculated fulfilling both, the applicable forest legislation and local forest management practice.
- One or several of the following *IFM measures* are applied:
  - ***a)*** Forest conservation, where stands are excluded from cutting due to certain criteria which do not apply in the BAU case (i.e.. excluding stands below a defined growing stock, slope or species composition),
  - ***b)*** Excluding specific tree classes from cutting due to certain criteria, which otherwise would be cut in the BAU case. Such criteria could be the tree dimension (e.g. stem diameter, tree height) or the tree species, stem form or age,

c) Reducing wood harvesting to a previously agreed fraction of the total harvestable stand by exempting a predefined volume of different species, age classes or diameter classes of the growing stock from cutting.

- A crediting period of 30 or 20 years twice renewable shall be adopted. Please note, that the crediting period is dependent on the host country approval.
- Carbon sequestration by forest growth before and after logging is conservatively disregarded because it is assumed equal or slightly lower in the baseline case compared to the project case. This assumption is valid because in both cases the same forests will be logged in a similar way. Before and after logging, the conventionally logged forests have exactly the same growth in the baseline and in the project case. Only the growth of IFM preserved low diameter and/or low stocking trees in the project case, over the crediting period, will be higher than, or at least equal to the growth of seedlings which under the baseline case would start growing after logging from natural regeneration or plantation.
- This baseline methodology conservatively excludes the carbon pools dead wood, soil and litter.

b. Monitoring methodology:

The monitoring methodology is built on the following corner stones:

- The baseline case (conventional logging) is dynamic because the (usually annual) logging plans are only decided shortly before execution. The baseline also needs the monitoring of AAC and forest regulations, relevant to the IFM measures. If the AAC for the respective concession increases or decreases, the baseline must be adopted accordingly.
- The project shall monitor the integrity of the forest unit (e.g. concession) including
  a) The proof that the project boundary is intact.
  b) The proof that the project area being accounted for emission rights is intact. If a deforestation or forest degradation is detected, this will be deducted from the emission certificates generated. Both aspects are assured by means of either aerial photos or high resolution satellite images.
- New inventory information shall be collected periodically including the location of forest borders. Risks are seen in the occurrence of forest fires, big insect or fungi calamities, windthrow on those areas where IFM measures have been applied, and new forest policies enforcing the economic use of forest resources. All these risks shall be monitored (please refer to Section III.1.e).
- Monitoring of harvesting: It shall be monitored that the project activity effectively reduces the annual harvested volume of the forest enterprise. This shall be checked by comparing the annual harvested wood volume with the allowed volumes stipulated in the management plan (AAC). If the annual harvested volume is not adequately reduced, the calculated difference shall be subtracted from the emission certificates.
- Leakage monitoring: Monitoring of leakage implies to determine the volume of timber logged outside the project area per year attributable to the project activity. In this methodology it is assumed that only a timber volume reduction of at least 1% of the total timber market volume of the potential leakage area (see chapter II.6) will cause a reaction of other wood suppliers to increase their cutting activity. If the *IFM measures* have red*uced the*

*logge*d wood volume by at least 1% of the market volume, the existence of "*leakage forests" and "leakage timber*" shall be determined annually. This can be done by checking if forests within the *leakage belt* which were not foreseen for logging are logged because some forest units inside the project boundary are protected from logging by IFM measures. The exact procedure is outlined in chapter II.6.

A/R WG recommendation *(to be completed by the A/R WG)*:

Relationship with approved or pending A/R methodologies (if applicable).

a) Does the proposed new A/R methodology include part(s) of an already-approved A/R methodology or an A/R methodology pending approval (see recent EB reports)? If so, please briefly note the relevant methodology reference numbers (AR-AMXXXX or ARNMXXXX), titles, and parts included.

b) In particular, is the proposed new A/R methodology largely an amendment or extension of an approved A/R methodology? (i.e. the methodology largely consists of expanding an approved methodology to cover additional project contexts, applicability conditions, etc., and is thus largely comprised of text from an existing methodology).

c) Please briefly note any significant differences or inconsistencies (baseline net GHG emission reductions by sink calculations, leakage methods, and boundary definitions, etc.) between the proposed new A/R methodology and already-approved A/R methodology of similar scope.

d) To avoid potential repetition, feel free to provide one comprehensive answer here that covers question a) through c).

Section II. Baseline methodology description

1. Project boundary

Methodology procedure:

The project boundary for the LULUCF project shall geographically delineate and encompass all anthropogenic GHG emissions by sources and emission reductions by sinks on lands under the control of project participants which are significant[5] and reasonably attributable to the proposed project activity. Only CO2 emission reductions are accounted under this methodology.

[5] The significance of project emissions shall be determined according to the latest version if the 'tool for testing significance of GHG emissions in A/R CDM project activities..

The project boundary may comprise those areas that a) will be logged in the course of the crediting period and b) that would be eligible to clear cutting. The project may contain more than one discrete parcel of land. Each discrete parcel of land shall have a unique geographical identification with a well defined boundary. The discrete parcels of lands are usually defined by polygons. To make the boundary geographically verifiable and transparent, the coordinates of the polygons shall be measured (using GPS, analysis of geo-referenced spatial data, or other appropriate techniques and data sources, e.g. maps, aerial photos, cadastral information, management plans, etc.), recorded and listed in an archive separately to the PDD.
The project boundary shall be determined with a minimum accuracy of 10m. The project boundary shall not include the areas in between these discrete parcels of lands. There should be consistency between the property or concession area, forest area and inventory area. The property / concession area may be larger than the project area, because the project boundary only comprises forests fulfilling the forest definition of the national Designated Focal Point and the concession area includes forest and non-forest areas. The inventoried area should cover at least the forest area.

The project boundary shall contain only those forest areas that would be logged under the baseline scenario during the crediting period. If the project retires a concession, which would not be completely logged during the crediting period, then the project boundary shall enclose only those areas of the concession that would be logged during the crediting period.

A/R WG recommendation ***(to be completed by the A/R WG):***

Assess the methodological procedure to identify the physical delineation of the land areas included in the project boundary. Explain the shortcomings and list the required changes (if any).

2. Procedure for selection of the most plausible baseline scenario

Methodology procedure:

For this Forest Management Project no JI or CDM baseline and monitoring methodology is available. Hence a baseline is established in accordance with appendix B of the JI guidelines. The following step-by-step approach is prescribed:

Step 1: Identify and list plausible alternative land use scenarios on the project lands

For the forest lands possible land use scenarios are

a) Having forest harvesting according to a normal forest management plan over the crediting period
b) Applying IFM measures not implemented under the climate project

Scenario (b) presents a baseline case identical with the project case and where no emission reduction units could be earned. The plausibility of scenario (a) shall be demonstrated with the following information:

- The forest owner holds an approved forest management plan to harvest timber in the project forest areas with a specific date when logging is scheduled to start;

- There are no financial constraints (availability of investment funds, profitability of forest logging) that would impede forest harvesting.

Explanation/justification (if methodology procedure is not self-explanatory):

The methodology formulae framework follows IPCC GPG for LULUCF (2003).

A/R WG recommendation ***(to be completed by the A/R WG)*****:**

a) State whether the methodology provides an appropriate stepwise approach for identifying various possible candidate baseline scenarios and a procedure for determining the most likely baseline scenario (taking into account paragraph 20 and 21 of the A/R modalities and procedures). Describe any shortcomings and required changes.

b) State whether national and / or sectoral policies and circumstances are appropriately taken in to account in the stepwise approach for selecting the baseline scenario. If not, explain the shortcomings and list the required changes.

c) State whether the determination of baseline scenario is consistent with the applicability conditions of the methodology and if not, why?

3. Additionality

Methodology procedure:

For this project and following the rational of the JISC, it is recommended to use the latest version of the CDM '*Tool for the demonstration and assessment of additionality in A/R CDM project activities*'[6].
For the additionality it is important to make sure that the project owner effectively reduces the timber extraction by the Improved Forest Management. This should be demonstrated by the respectively reduced AAC.

Explanation/justification (if methodology procedure is not self-explanatory):

The "*Tool for the demonstration and assessment of additionality*" is an integral part of this methodology and project proponents shall use it.

A/R WG recommendation ***(to be completed by the A/R WG)*****:**

[6] The tool can be downloaded from http://cdm.unfccc.int/Reference/tools/ar/methAR_tool01_v02.pdf

a) Explain whether the methodology provides for an appropriate step-wise procedure for demonstration that the proposed A/R project activity is additional and therefore not the baseline scenario. Assess the appropriateness of this procedure, including the appropriateness of information to be presented in the resulting CDM-AR-PDD. Explain any shortcomings and list the required changes.

b) State whether and how national and/or sectoral policies and circumstances are taken into account and whether this is appropriate. Explain any shortcomings and list the required changes.

c) State whether the procedure to demonstrate additionality is consistent with the procedure to identify the most plausible baseline scenario. If not, explain the inconsistencies.

4. Estimation of baseline net GHG emission reductions by sinks

Methodology procedure:

General description. The baseline case is a forest scheduled for conventional logging. Logging operations are limited to a legal "annual allowable cut" (AAC) , which has been stipulated in volume of commercial timber per area and per year (m^3/ha/yr) by the forest authority. The AAC is lower than the mean annual increment (MAI) to guarantee a sustainable management of the forest, taking into account uncertainties. Forest logging will take place annually on defined forest units, which are exploited in a predefined rotation period. For the project boundary compliant with the national forest definition, annual or periodic plans of logging operations are elaborated on the basis of an existing forest management plan, listing every year which forest units will be logged. The logging in each of the forest units will be smaller than the AAC. With this, the baseline is clearly defined.

An initial forest inventory provides the data of the commercial timber volumes of each forest unit, if possible specified for each tree species and age class. Tier 3 or tier 2 level should be used and the inventory take into account the stipulations of the *IPCC Good Practice Guidance for Land-Use Change and Forestry*. Uncertainty levels of inventory data should be specified. All future inventories should be consistent with the periodicity prescribed by forest law and with the initial forest inventory. If the latter is not possible for all data, then the new data should be made comparable or be more conservative. A precision level of measurements of at least 10% at a 95% confidence level should be envisaged and the use of the Methodological Tool "*Calculation of the number of sample plots for measurements within A/R CDM project activities*" is recommended.
Carbon sequestration from tree growth is not accounted because there is no significant difference between the baseline and the project case.

Detailed calculations. According to the *Good Practice Guidance for LULUCF (3.23*) the emissions or emission reductions from forest land remaining forest land over a crediting period of *n* years are defined as follows:

$$C_{BSL} = \sum_{t=1}^{t=n} \sum_{fu=1}^{fu=q} (\Delta C_{FF,LB,t,fu} + \Delta C_{FF,DOM,t,fu} + \Delta C_{FF,Soils,t,fu}) * MW_{CO2\text{-}C} \quad (1)$$

Where:

C_{BSL}	total change in carbon stocks from baseline forest land remaining forest land over a period of n years, for q forest units, Mg CO_2
$\Delta C_{FF,LB,t,fu}$	annual change in carbon stocks in living biomass (includes above- and belowground biomass) in forest land remaining forest land for time *t* and forest unit *fu*; Mg C yr^{-1}
$\Delta C_{FF,DOM,t,fu}$	annual change in carbon stocks in dead organic matter (includes dead wood and litter) in forest land remaining forest land for time *t* and forest unit *fu*; Mg C yr^{-1}. In this methodology it will be conservatively assumed that $\Delta C_{FF,DOM,fu} = 0$
$\Delta C_{FF,Soils,t,fu}$	annual change in carbon stocks in soils in forest land remaining forest land for time *t* and forest unit *fu*; Mg C yr^{-1}. In this methodology it will be conservatively assumed that $\Delta C_{FF,Soils,t,fu} = 0$
MW_{CO2-C}	ratio of molecular weights of CO_2 and C (44/12); Mg CO_2 $(Mg\ C)^{-1}$

Emissions from burning of fossil fuels in forest management and logging operations are disregarded. They are certainly higher compared to such emissions from protecting the same forest area. Up to present there are no explicit stipulations for JI forest management preservation projects. However, in the related "*Modalities and procedures for A/R project activities under the CDM in the first CP of the KP*" (Decision 19/CP.9, 2003) only carbon pools are regarded and all other GHG are excluded from the baseline.

For estimating carbon stock changes in the baseline biomass, the following default equation (2) is used where only biomass carbon loss is accounted. All biomass carbon increment due to biomass growth before and after logging operations is disregarded in the baseline. This is conservative because biomass growth is equally disregarded in the project case, where even less trees are cut and trees left on the ground will then grow more than in the baseline scenario of a clear cut area[7].

$$\Delta C_{FF,LB,\,t,\,fu} = -\,\Delta C_{FF,L,\,t,fu} \qquad (2)$$

Where:

$\Delta C_{FF,LB,t,fu}$	annual change in baseline carbon stocks in living biomass (LB) (includes above- and belowground biomass) in forest land remaining forest land for time *t* and forest unit *fu*, Mg C yr^{-1}
$\Delta C_{FF,L,t,\,fu}$	annual decrease in baseline carbon stocks due to biomass loss for time *t* and forest unit *fu*, Mg C yr^{-1}

Annual baseline biomass loss is the loss from commercial roundwood fellings including stemwood and branchwood.
Other carbon losses may be losses from disturbances such as windstorms, pest outbreaks, water stress, or fires. They are therefore conservatively disregarded for the baseline[8]. The following equation calculates the annual baseline carbon stock decrease for each forest unit[9]

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[7] Compare also the justification given in section I 5.a.

[8] Although it is assumed that forests under IFM are generally not less but more resistant against these disturbances than forests under a conventional logging regime, the carbon and other GHG emissions from such disturbances will

$$\Delta C_{FF,L,t,fu} = \sum_{i=1}^{i=n} L_{fellings,i,t,fu} = \sum_{i=1}^{i=n} LIFM_{fellings,i,t,fu} + \sum_{i=1}^{i=n} LFC_{fellings,i,t,fu} + \sum_{i=1}^{i=n} LST_{fellings,i,t,fu} + \sum_{i=1}^{i=n} LEF_{fellings,i,t,fu} \quad (3)$$

Where:

$\Delta C_{FF,L,t,fu}$	annual decrease in baseline carbon stocks due to biomass loss in forest land remaining forest land for time *t* and forest unit *fu*, Mg C yr^{-1}
$L_{fellings,i,t,fu}$	annual baseline carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu*, Mg C yr^{-1}
$LIFM_{fellings,i,t,fu}$	annual carbon loss from commercial fellings under Improved Forest Management (IFM) of species group or species *i* for time *t* and forest unit *fu*, Mg C yr^{-1}
$LFC_{fellings,i,t,fu}$	annual carbon loss from conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* in ***Forest Conservation*** stands that under IFM are excluded from cutting, Mg C yr^{-1}
$LST_{fellings,i,t,fu}$	annual carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* of ***Specific Tree Classes*** which under IFM are excluded from cutting, Mg C yr^{-1}
$LEF_{fellings,i,t,fu}$	annual carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** of tree groups whichunder IFM are excluded from cutting, Mg C yr^{-1}

Under this methodology, there is no need to calculate in the baseline equation the value for the annual carbon loss from commercial fellings under IFM, $LIFM_{fellings,i,t,fu}$, because in the final equation for the net anthropogenic GHG emission reductions by sinks this value is subtracted again. This is explained by the fact that conventional (baseline) fellings include this part of IFM avoided fellings plus other fellings. In this methodology the difference between biomass stock changes of the BAU (baseline) and the project IFM case is calculated. The biomass stock change of the baseline (= conventional clear cutting) is the sum of fellings which are equally done in the project case of IFM ($LIFM_{fellings,i,t,fu}$) plus other fellings, leading together to the clear cutting of the logging plots. In the calculation of the difference between biomass stock change of baseline and the biomass stock change of the project case, the $LIFM_{fellings,i,t,fu}$ (baseline) is subtracted from $LIFM_{fellings,i,t,fu}$ (project case) and the difference is necessarily zero. Hence, there is no need to calculate the $LIFM_{fellings,i,t,fu}$ value in the equations.

$$LFC_{fellings,i,t,fu} = HFC_{i,t,fu} * D_i * BEF_{2,i} * (1 + R_i) * CF \quad (4)$$

$$LST_{fellings,i,t,fu} = HST_{i,t,fu} * D_i * BEF_{2,i} * (1 + R_i) * CF \quad (5)$$

$$LEF_{fellings,i,t,fu} = HEF_{i,t,fu} * D_i * BEF_{2,i} * (1 + R_i) * CF \quad (6)$$

be accounted in the project case (see equations 8-13) if they occur in forest units where IFM measures have been applied.

[9] Forest units (FU) are the basic management units where cutting and other treatments are applied. They are also the basic units for data taking and analysis.

Where:

$LFC_{fellings,i,t,fu}$	annual carbon loss from conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* in ***Forest Conservation*** stands that under IFM are excluded from cutting, Mg C yr^{-1}
$LST_{fellings,i,t,fu}$	annual carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* of ***Specific Tree Classes*** which under IFM are excluded from cutting, Mg C yr^{-1}
$LEF_{fellings,i,t,fu}$	annual carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting, Mg C yr^{-1}
$HFC_{i,t,fu}$	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* in ***Forest Conservation*** stands that under IFM are excluded from cutting, m^3 yr^{-1}
$HST_{i,t,fu}$	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of ***Specific Tree Classes*** which under IFM are excluded from cutting, m^3 yr^{-1}
$HEF_{i,t,fu}$	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting, m^3 yr^{-1}
D_i	basic wood density of species group or species *i*, Mg d.m. m^{-3}; Values from IPCCC GPG for LULUCF (2003) Table 3A.1.9 can be used, or country-specific values, if available
$BEF_{2,i}$	biomass expansion factor for converting volumes of extracted roundwood to total aboveground biomass (including bark) for species group or species *i*; dimensionless, values from IPCCC GPG for LULUCF (2003) Table 3A.1.10 can be used, or country-specific values, if available
R_i	root-to-shoot ratio is the average belowground to aboveground biomass ratio of species group or species *i*, dimensionless; Values from IPCCC GPG for LULUCF (2003) Table 3A.1.8 can be used
CF	carbon fraction of dry matter (default = 0.5), Mg C (tonne d.m.)$^{-1}$

Explanation/justification (if methodology procedure is not self-explanatory):

Although the mentioned approach of subtracting equal fellings of baseline and project case is different from the usual methodological approaches, it greatly relieves the project activity and validation / verification from unnecessary works and related costs. The final result of net anthropogenic GHG emission reductions by sinks of the project activity is not influenced by this procedure.

A/R WG recommendation *(to be completed by the A/R WG)*:

a) State whether the methodology provides an ex-ante estimation of baseline net GHG emission reduction by sinks. State whether the approach is appropriate and, if not, explain the shortcomings and list required changes.

b) Provide an assessment of the appropriateness and correctness of the methodological procedure to calculate baseline net GHG emission reductions by sinks, including an assessment of:

(i) The choice of algorithms/formulae and/or models used and correctness of their application (e.g. mathematical deficiencies, inconsistencies in calculus of dimensions).

(ii) The appropriateness (adequacy, consistency, accuracy and reliability) of the parameters provided by the methodology.

(iii) The appropriateness of procedures on how project participants should select any parameters in cases where these are not provided in the methodology (e.g. from official statistics, expert judgment, proprietary data, IPCC Good Practice Guidance for LULUCF, commercial data and scientific literature.

(iv) Any data gaps:

(v) State, whether the procedure results in a conservative estimation of the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the proposed CDM A/R project activity, taking into account the uncertainties associated with the data and parameters used. Assess whether the procedure can be carried out in an unambiguous way, replicated, and subjected to a validation and/or verification study. Explain any shortcomings and list the required changes.

c) State whether the potential baseline scenarios derived through the procedure for selection of the most plausible baseline scenario are consistent with the procedures and formulae used to calculate the baseline net GHG emission reductions by sinks. If not, explain the shortcomings and list the required changes.

5. *Ex ante* actual net GHG emission reductions by sinks

Methodology procedure:

The actual net greenhouse gas emission reductions by sinks represent the sum of the verifiable changes in carbon stocks in the carbon pools within the project boundary attributable to the project activity, minus the increase in non-CO_2 GHG emissions measured in CO_2 equivalents by sources that are increased as a result of the implementation of the project activity, while avoiding double counting. Therefore,

$$C_{ACTUAL} = C_{LB} - GHG_E \quad (7)$$

Where:

C_{ACTUAL} actual net greenhouse gas emission reductions by sinks; Mg CO_2-e
C_{LB} sum of changes in living biomass carbon stocks of trees (above- and belowground); Mg CO_2-e

GHG_E sum of increase in GHG emissions by sources within the project boundary as a result of the implementation of project activity; Mg CO_2-e

Because the annual increase in carbon stocks due to biomass growth in the forest before and after cutting is equally disregarded in the project case like in the baseline case, the sum of changes in living biomass carbon stocks of trees is confined to decreases in carbon stocks due to commercial fellings under IFM and to the eventually occurring decreases in carbon stocks due to biomass losses by unplanned events (storm, fire, illegal cutting, etc.) in those forest units (*fuI*), where IFM measures have already been applied.

$$C_{LB} = \sum_{t=1}^{t=n} \sum_{fu=1}^{fu=q} - LIFM_{fellings,i,t,fu} * 44/12 - \sum_{t=1}^{t=n} \sum_{fuI=1}^{fuI=q} \Delta C_{PF,L,t,fuI} \quad (8)$$

Where:

C_{LB} total change in carbon stocks in living biomass (includes above- and belowground biomass) in forest land remaining forest land from year 1 to year n and over all forest units, Mg CO_2

$LIFM_{fellings,i,t,fu}$ annual carbon loss from commercial fellings under Improved Forest Management (IFM) of species group or species *i* for time *t* and forest unit *fu*, Mg C yr^{-1}

44/12 ratio of molecular weights of CO_2 and C; Mg CO_2 (Mg C)$^{-1}$

$\Delta C_{PF,L,t,fuI}$ annual carbon emissions due to biomass losses for time *t* and forest unit *fuI* where IFM measures have been applied already, Mg CO_2 yr^{-1}

As mentioned above, under this methodology there is no need to calculate the value for the annual carbon loss from commercial fellings under IFM, $LIFM_{fellings,i,t,fu}$, because in the final equation for the net anthropogenic GHG emission reductions by sinks this value is subtracted again from the identical term in the baseline.

There are many threats that may result in a decrease of carbon stocks in the project area. These include anthropogenic impacts such as logging, deforestation, settlements, fires, but may also include natural hazards such as pests or diseases. If one of the above mentioned threats reduces the carbon stocks of those forest units where IFM were applied, then this carbon stock decrease needs to be accounted. All impacts (i.e. including natural hazards) are therefore judged as "attributable to the project activity".

For those forest units which were already treated with IFM measures where degradation/deforestation is detected, the biomass decrease shall be evaluated and an appropriate preservation factor shall be assessed. The preservation factor indicates the integrity of carbon stocks of a specific forest unit compared to the inventory data. E.g. if a hazard reduces the carbon stock of a forest unit by 30% compared to the inventory data, then the forest unit shall be assigned a preservation factor of 0,7 instead of 1.

Carbon stock reduction by disturbances of those forest units where IFM measures were already applied shall be subtracted from the volume of emission certificates generated since the last verification/initial determination.

In general, is estimated that carbon stock reductions by disturbances will be less than 5% of the carbon stocks in living biomass. In the **ex-ante calculation** a PF value of 95% shall be assumed and INC shall be set to 0.

$$\Delta C_{PF,L,t,fuI} = \Delta C_{B,t,fuI} *(1+ INC * 10^{-2})^{m} * (1-PF_{t,fuI}) * 44/12 \qquad (9)$$

Where:

$\Delta C_{PF,L,t,fuI}$	annual carbon emissions from living biomass (includes above- and belowground biomass) in all forest units (*fuI*) where IFM measures were already applied until year t; Mg CO_2 yr^{-1}
$\Delta C_{B,t,fuI}$	carbon stocks in living biomass (includes above- and belowground biomass) according to the valid forest inventory for time *t* and forest unit *fuI*, Mg C yr^{-1}
INC	average forest increment expressed in per cent (%)[10]
m	number of years since the last forest inventory, dimensionless
$PF_{t,fuI}$	preservation factor; the fraction of actual carbon stocks in living biomass in relation to $\Delta C_{B,t,fuI}$ for time *t* and for each forest unit where IFA measures were applied ($_{fuI}$), estimated in steps of 0.1 (range: 0 until 1.0). In the ex-ante calculation PF = 0.95, dimensionless
44/12	ratio of molecular weights of CO_2 and C; Mg CO_2 (Mg C)$^{-1}$

The assessment of annual carbon loss emissions from living biomass, as specified in formula 9, allows for the evaluation of changes in living biomass carbon stocks as specified in formula 8. Formula 8 is part of the overall assessment of net greenhouse gas emission reductions by sinks (formula 7). Thus, annual carbon emissions from living biomass are subtracted from the generation of carbon certificates.

$$\Delta C_{B,t,fuI} = (HFC_{i,t,fuI} + HST_{i,t,fuI} + HEF_{i,t,fuI}) * D_i * BEF_{2,i} * (1 + R_i) * CF \qquad (10)$$

Where:

$\Delta C_{B,t,fuI}$	carbon stocks in living biomass (includes above- and belowground biomass) in all forest units (*fuI*) where IFM measures were already applied according to the valid forest inventory for time *t* and forest unit *fuI*, Mg C yr^{-1}
$HFC_{i,t,fuI}$	merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fuI* in *Forest Conservation* stands that under IFM are excluded from cutting, m^3 yr^{-1}
$HST_{i,t,fuI}$	merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fuI* of ***Specific Tree Classes*** which under IFM are excluded from cutting, m^3 yr^{-1}
$HEF_{i,t,fuI}$	merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fuI* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting, m^3 yr^{-1}

[10] Although protected forests are all over the cutting diameter and partly include mature forests, the average forest increment is conservatively applied to update the carbon stocks since the last forest inventory. For ex-ante calculation, INC = 0.

D_i	basic wood density of species group or species *i*, Mg d.m. m^{-3}; Values from IPCCC GPG for LULUCF (2003) Table 3A.1.9 can be used, or country-specific values, if available
$BEF_{2,i}$	biomass expansion factor for converting volumes of extracted roundwood to total aboveground biomass (including bark) for species group or species *i*; dimensionless, values from IPCCC GPG for LULUCF (2003) Table 3A.1.10 can be used, or country-specific values, if available
R_i	root-to-shoot ratio is the average belowground to aboveground biomass ratio of species group or species *i*, dimensionless; Values from IPCCC GPG for LULUCF (2003) Table 3A.1.8 can be used
CF	carbon fraction of dry matter (default = 0.5), Mg C (tonne d.m.)$^{-1}$

In general, non-CO_2 emissions from forest fires are insignificant when compared to the loss of carbon caused by the fire. The non-CO_2 emissions are roughly 1% of the equivalent C emissions. To account for the non-carbon emissions from forest fires in those forest units (*fuI*) where IFM measures have been applied, the following equations shall be applied:

$$GHG_E = \sum_{t=1}^{t=n} \sum_{fuI=1}^{fuI=q} E_{Non-CO2,ForestFire,t,fuI} \quad (11)$$

Where:

GHG_E	sum of increase in GHG emissions by sources within the project boundary as a result of the implementation of project activity; Mg CO_2-e
$E_{Non-CO2,ForestFire,t,fuI}$	increase in Non-CO_2 emission as a result of biomass burning in forest fires for time *t* and forest unit *fuI*; Mg CO_2-e. yr^{-1}

Any CO_2 emissions from tree biomass have been covered above as decreases in the stocks of the carbon pools. Hence, only non-CO2 emissions are accounted in the equation 11. Based on the IPCC GPG for LULUCF[11] and CDM AR-AM0007, this type of emission can be estimated as follows:

$$E_{Non-CO2,ForestFire,t,fuI} = E_{ForestFire,N2O,t,fuI} + E_{ForestFire,CH4,t,fuI} \quad (12)$$

$$E_{ForestFire,N2O,t,fuI} = E_{ForestFire,C,t,fuI} * (N/C\ ratio) * ERat_{N2O} * MW_{N2O-N} * GWP_{N2O} \quad (13)$$

$$E_{ForestFire,CH_4,t,fuI} = E_{ForestFire,C,t,fuI} * ERat_{CH4} * MW_{CH4-C} * GWP_{CH4} \quad (14)$$

Where:

$E_{Non-CO2,ForestFire,t,fuI}$	increase in Non-CO_2 emission as a result of biomass burning in forest fires for time *t* and forest unit *fuI*; Mg CO_2-e. yr^{-1}
$E_{ForestFire,N_2O,t,fuI}$	N_2O emission from biomass burning in forest fires for time *t* and forest unit *fuI*; Mg CO_2-e. yr^{-1}
$E_{ForestFire,CH_4,t,fuI}$	CH_4 emission from biomass burning in forest fires for time *t* and forest unit *fuI*; Mg CO_2-e. yr^{-1}

[11] Equations 3.2.19 and 3.2.20 in the IPCC (2003) GPG for LULUCF, p. 3.49.

$E_{ForestFire,C,t,fuI}$	loss of carbon stock in aboveground biomass due to forest fires for time *t* and forest unit *fuI*; Mg C yr^{-1}
N/C ratio	nitrogen-carbon ratio with a general IPCC default value of about 0.01 applying to leaf litter, lower values would be appropriate for fuels with greater woody content, if data are available; Mg N $(Mg\ C)^{-1}$
MW_{N2O-N}	ratio of molecular weights of N_2O and N (44/28); Mg N_2O $(Mg\ N)^{-1}$
MW_{CH4-C}	ratio of molecular weights of CH_4 and C (16/12); Mg CH_4 $(Mg\ C)^{-1}$
$ERat_{N2O}$	IPCC default emission ratio for N_2O (0.007); dimensionless
$ERat_{CH4}$	IPCC default emission ratio for CH_4 (0.012); dimensionless
GWP_{N2O}	Global Warming Potential for N_2O (310 for the 1^{st} C.P.); Mg CO_2-e. $(Mg\ N_2O)^{-1}$
GWP_{CH4}	Global Warming Potential for CH_4 (21 for the 1^{st} C.P.); Mg CO_2-e. $(Mg\ CH_4)^{-1}$

$$E_{ForestFire,C,t,fuI} = \Delta C_{AB,t,fuI} * (1+ INC * 10^{-2})^{m} * CE \qquad (15)$$

Where:

$E_{ForestFire,C,t,fuI}$	loss of carbon stock in aboveground biomass due to forest fires for time *t* and forest unit *fuI*; Mg C yr^{-1}
$\Delta C_{AB,t,fuI}$	carbon stocks in above ground living biomass according to the valid forest inventory before getting effected by fire for time *t* and forest unit *fuI*, Mg C yr^{-1}
INC	average forest increment expressed in per cent (%)[12]
m	number of years since the last forest inventory, dimensionless
CE	combustion efficiency. According to chapter 3.2.1.4.2.2 and Table 3.A.14 of IPCC GPG-LULUCF the following default values shall be used: boreal forests 0.25, temperate forests 0.5, tropical dry forest 0.95, tropical moist secondary forests 0.4, tropical moist primary forest 0.3. For **ex-ante calculation** CE = 0[13]; dimensionless

$$\Delta C_{AB,t,fuI} = \Delta C_{B,t,fuI} * (1+ R_i)^{-1} \qquad (16)$$

Where:

$\Delta C_{AB,t,fuI}$	carbon stocks in above ground living biomass according to the valid forest inventory before getting effected by fire for time *t* and forest unit *fuI*, Mg C yr^{-1}
$\Delta C_{B,t,fuI}$	carbon stocks in living biomass (includes above- and belowground biomass) in all forest units (*fuI*) where IFM measures were already applied according to the valid forest inventory for time *t* and forest unit *fuI*, Mg C yr^{-1} (as defined in equation 3)
R_i	root-to-shoot ratio is the average belowground to aboveground biomass ratio of species group or species *i*, dimensionless; Values from IPCCC GPG for LULUCF (2003) Table 3A.1.8 can be used

[12] Although protected forests are all over the cutting diameter and partly include mature forests, the average forest increment is conservatively applied to update the carbon stocks since the last forest inventory.

[13] For ex-ante calculation the non-carbon emissions from fires are already taken into account in the 5% carbon stock discount expressed by the preservation factor of 0.95 (compare equation 9).

Selection of parameters for estimation of carbon stocks in biomass

The following hierarchical order shall be used to select the respective parameters for the equations, i.e. INC, D_i, $BEF_{2,i}$, R_i, CF, CE:

1. Locally-derived species-specific information, if sufficiently accurate and comprehensive data are available;
2. Species-specific information from regional datasets, or species-specific information extracted from national datasets for sites with similar soil and climatic conditions;
3. Species-specific information extracted from nationally-derived datasets avoiding only sites with very different soil and climate conditions;
4. Locally-, regionally-, or nationally-derived information for similar species;
5. Default values provided by the IPCC (e.g. IPCC 2003, Annex 3A.1, Annex 4A.2) or other scientific sources.

Conservative estimates shall be used for all parameters; the conservativeness of any parameter used to estimate tree biomass shall be substantiated in the PDD.

Explanation/justification (if methodology procedure is not self-explanatory):

In the case of fire, only above-ground living biomass carbon pool is included. Trees may survive or in case of broadleaf species, resprout from the root. Dead wood carbon pool is not accounted. Carbon sequestration of the forest is conservatively disregarded. The sum of the increases in GHG emissions by sources within the project boundary as a result of project implementation, e.g. burning of fossil fuels from IFM activities, is not accounted because according to the EB44 (2008) decision, they are insignificant and, on the other side, in the baseline, the corresponding and much higher emissions from forest logging activities on these sites are also not accounted. In the *ex-ante* calculations a preservation factor *PF = 1* should be assumed if disasters are not frequent in the project forest area. In case of fires, the carbon losses and other GHG emissions from methane and nitrous oxide are accounted.

A/R WG recommendation ***(to be completed by the A/R WG):***

Provide an assessment of the appropriateness and mathematical correctness of the methodological procedure to calculate ex-ante actual net anthropogenic GHG emission reductions by sinks. Explain any shortcomings and list the required changes.

6. Leakage

Methodology procedure:

Leakage (LK) represents the increase in GHGs emissions by sources, including any decrease in carbon stocks, which occurs outside the boundary of a climate project activity which is measurable and attributable to the project activity.

By preserving forest trees with IFM project activities, the project might cause a shift of concessions (own or other enterprises) or wood loggers towards other forest areas, which have not been exploited until then. Under this methodology it is assumed that such leakage effects will only occur if the IFM decreased wood volumes exceed 1% of the total addressed market volume inside a boundary described below.

Table C: Emissions sources included in or excluded from leakage

Sources	Gas	Included/ excluded	Justification / Explanation of choice
Activity displacement of timber logging	CO_2	Yes	Potentially significant source of leakage
	CH_4	No	Not significant
	N_2O	No	Not significant
Combustion of fossil fuels by vehicles	CO_2	No	If this would occur, the vehicle activity level would be identical to the baseline level, where it is conservatively ignored
	CH_4	No	Not significant
	N_2O	No	Not significant

For an ex-ante leakage estimation a lump sum fraction of 1-5 %) of the baseline logging emissions shall be reduced, or leakage shall be estimated using the following equations 17-20.

$$LK = \sum_{t=1}^{t=n} LK_{timber\text{-}logging,\ t} \qquad (17)$$

Where:

LK total leakage over the period from year 1 to year n; Mg CO_2-e
$LK_{timber\text{-}logging,\ t}$ leakage due to displacement of timber logging per year; Mg CO_2-e year^{-1}

Estimation of LK $_{timber\text{-}logging}$ (Leakage due to displacement of timber harvesting operations). The following steps should be followed to determine if leakage due to displacement of timber logging, attributable to the project, exists:

a) *Determine the maximum commercially feasible distance for the transportation of roundwood (DI_t)*
First, the location where the roundwood would be transported to under the baseline scenario shall be identified, e.g. a sawmill located in a given city or where it would likely be installed, in case of bigger new concessions[14]. Second, the most remote concession from which roundwood is transported to the location/city shall be identified. The distance 'concession-city' shall be measured in km

b) *Identify the potential leakage area (PLA_t)*

These findings shall be inserted in a map. The location/city shall be marked as the origin, the distance shall be the radius, and the radius shall be used to draw a circle. The area within the circle shall be identified as potential leakage area

[14] If this is estimated for the ex-ante case, it will need later on to be confirmed with monitoring.

$$PLA_t = DI_t^2 * \pi / 100 \qquad (18)$$

Where:

PLA_t	potential leakage area in year t; ha
DI_t	feasible distance for the transportation of roundwood, km

c) *Assess the total timber market volume ($TMV_{,t}$)*

Assess the timber market volume traded in the potential leakage area. The assessment shall be made in m^3 roundwood for all species on an annual basis.

d) *Determine the timber market volume decrease*

Determine the ratio timber supply reduction caused by the project activity by the total timber market volume (assessed under c).

$$TVD_t = \sum_{i=1}^{i=n} \sum_{fu=1}^{fu=q} (HFC_{i,t,fu} + HST_{i,t,fu} + HEF_{i,t,fu}) / TMV_t * 100 \qquad (19)$$

Where:

TVD_t	timber volume decrease of year t; (%)
$HFC_{i,t,fu}$	annual merchantable volume of growing stock, roundwood of species group or species i for time t and forest unit fu in ***Forest Conservation*** stands that under IFM are excluded from cutting, $m^3\ yr^{-1}$
$HST_{i,t,fu}$	annual merchantable volume of growing stock, roundwood of species group or species i for time t and forest unit fu of ***Specific Tree Classes*** which under IFM are excluded from cutting, $m^3\ yr^{-1}$
$HEF_{i,t,fu}$	annual merchantable volume of growing stock, roundwood of species group or species i for time t and forest unit fu of an ***Exempted Felling Volume*** that under IFM is excluded from cutting, $m^3\ yr^{-1}$
TMV_t	the total timber market volume in the potential leakage area for time t, m^3

If TVD is smaller or equal to 1%, it is assumed that the project activity will not result in any market reaction to the project activity. Hence, it is assumed that leakage will be insignificant and can be neglected.

If the TVD is above 1% of the market volume, then proceed with steps e).

e) *Identify mature forests (MF_t)*
Check if there exist any mature forests within the potential leakage area[15].

[15] Mature forest means forest that fulfils the legal requirements, so that a logging permit could be obtained.

f) *Identify mature forests foreseen for logging ($MF_{logging,t}$)*
If there are mature forests within the potential leakage area, then check what parts of these forests are already foreseen for logging. If in the leakage area the forest protected through the project activity is the last mature forest where no logging is practiced, then leakage is nil. Otherwise proceed to step g).

g) *Identify mature forests not foreseen for logging ($MF_{non\ logging,t} = MF_t - MF_{logging,t}$)*
Check if there are parts of these forests that are not yet foreseen for logging. If there are such forest areas, then protocol the reasons why they are not foreseen for logging.

h) *Identify potential leakage forests ($LF_{potential,t}$)*
Check if these parts of the forests, which were not foreseen for logging, may be logged if some of the forests inside the project boundary are protected by IFM measures from logging. These forests shall be clearly identified in the potential leakage area.

i) *Identify leakage due to displacement of timber operations by the project activity ($FG_{outside,i,t}$)*
Determine the annual amount of timber that would be logged from these parts of the forests if some of the forests inside the project boundary are exempted from logging

This information research can be done by interviewing forest administrations, private forest owners, forest owner associations, concessionaires or sawmill operators. Others sources of information, such as local studies by research institutions on timber markets and forest exploitations may also be used.

Leakage due to displacement of timber harvesting operations shall be estimated as follows (IPCC GPG-LULUCF - Eq. 3.2.8):

$$LK_{timber\text{-}logging,t} = \sum_{i=1}^{i=p} FG_{outside,i,t} * D_i * BEF_{2,i} * (1 + R_i) * CF * MW_{CO2\text{-}C} \quad (20)$$

Where:

$LK_{timber\text{-}logging,t}$	leakage due to displacement of timber logging per year; Mg CO_2-e yr^{-1}
$FG_{outside,i,t}$	volume of timber of species or species group *i* logged outside the project area per year attributable to the project activity; $m^3\ yr^{-1}$
D_i	basic wood density of species or species group *i* (see IPCC GPG-LULUCF, Table 3A.1.9); Mg d.m. m^{-3}
$BEF_{2,i}$	biomass expansion factor for converting volumes of extracted roundwood to total aboveground biomass (including bark) of species or species group *i*, dimensionless; Values from IPCCC GPG for LULUCF (2003) Table 3A.1.10 can be used, or country-specific values, if available
$R_{,i}$	root-to-shoot ratio is the average belowground to aboveground biomass ratio of species group or species *i*, dimensionless; Values from IPCCC GPG for LULUCF (2003) Table 3A.1.8 can be used
CF	carbon fraction of dry matter (default = 0.5); Mg C $(t\ d.m.)^{-1}$
$MW_{CO2\text{-}C}$	ratio of molecular weights of CO_2 and C (44/12); Mg CO_2 $(Mg\ C)^{-1}$

Explanation/justification (if methodology procedure is not self-explanatory):

The existence of "*leakage forests*" shall be predetermined by checking if forests within the *leakage belt* which were not foreseen for logging, would probably be logged if some of the forests inside the project boundary are protected from logging in the future. This type of leakage can be roughly estimated *ex-ante*, by taking an expert opinion on the amount of $FG_{outside,t}$ but should later be monitored, unless it is insignificant or the forest protected through the project activity is the last mature forest in the region (defined by maximum commercial roundwood transport distance) where no logging is practiced. In the latter case leakage is nil.

A/R WG recommendation ***(to be completed by the A/R WG)***:

a) State, whether the choice of leakage emission sources considered is appropriate. Indicate any important leakage emissions sources that have been neglected in the context of the applicability conditions.

b) Provide an assessment of the appropriateness and mathematical correctness of the methodological procedure to calculate ex-ante leakage emissions. Explain any shortcomings and list required changes.

(Please note that even if the calculation of the leakage is to be performed ex post, the methodology should include the ex ante leakage estimate).

7. ***Ex ante*** net anthropogenic GHG emission reduction by sinks

Methodology procedure:

The net anthropogenic GHG emission reductions by sinks is the actual net GHG emission reductions by sinks minus the baseline net GHG emission reductions by sinks minus leakage (in t CO_2-e), as defined in the following general equation:

$$C_{FF,FC} = C_{ACTUAL} - C_{BSL} - LK \qquad (21)$$

Where:

$C_{FF,FC}$	net anthropogenic greenhouse gas emission reductions by sinks for forest remaining forest, forest conservation; Mg CO_2-e
C_{ACTUAL}	actual net greenhouse gas emission reductions by sinks; Mg CO_2-e
C_{BSL}	baseline net greenhouse gas emission reductions by sinks; Mg CO_2-e
LK	leakage; Mg CO_2-e

This equation estimates net anthropogenic GHG emission reductions by sinks for the period of time elapsed between project start (t=1) and the year t=n, n being the year for which actual net greenhouse gas emission reductions by sinks are estimated. All project emissions and leakage are permanent, which requires to calculate their cumulative values since the starting date of the project activity.

A/R WG recommendation *(to be completed by the A/R WG)*:

Provide an assessment of the appropriateness and mathematical correctness of the methodological procedure to calculate ex-ante actual net anthropogenic GHG emission reductions by sinks. Explain any shortcomings and list the required changes.

State whether the methodology ensures that the net anthropogenic GHG emission reductions by sinks are estimated in conservative manner, taking into account the uncertainties associated with the data and parameters used. If not explain the shortcomings and list the required changes.

8. Data needed for *ex ante* estimations

Data / Parameter	Unit	Description	Vintage	Data sources and geographical scale
Project boundary	m	physical limitation of included forest area	Project lifetime	GPS, maps and remotely sensed data
PF	dimensionless	preservation factor; the fraction of actual carbon stocks in living biomass in relation to $\Delta C_{B,t,ful}$ for each forest unit, estimated in steps of 0.1 (range: 0 until 1.0). In the ex-ante calculation PF = 0.95.	Project lifetime	-
INC	%	average forest increment. For ex-ante calculation: INC = 0%	Project lifetime	-
$MW_{CO2\text{-}C}$	Mg CO_2 (Mg C)$^{-1}$	ratio of molecular weights of CO_2 and C (44/12)	Project lifetime	IPCC
$fu_{i,j}$	ha	forest unit remaining forest land, by species group or species (i = 1 to n) and site classes (j = 1 to m)	Project lifetime	Forest management plan
CF	Mg C (Mg d.m.)$^{-1}$	carbon fraction of dry matter (default = 0.5)	Project lifetime	IPCC
D_i	Mg d.m. m^{-3}	basic wood density of species type *i*	Project lifetime	IPCC GPG for LULUCF (2003) Table 3A.1.9 or specific country values
R_i	dimensionless	root-to-shoot ratio appropriate to increments of species group or species *i*	Annual check if new values are available	IPCCC GPG for LULUCF (2003) Table 3A.1.8

Data / Parameter	Unit	Description	Vintage	Data sources and geographical scale
$BEF_{2,i}$	dimensionless	biomass expansion factor for converting volumes of merchantable roundwood to total aboveground biomass (including bark) for species group or species *i*;	Annual check if new values are available	IPCCC GPG for LULUCF (2003) Table 3A.1.10, or country-specific values
N/C ratio	Mg N(Mg C)$^{-1}$	nitrogen-carbon ratio with a general IPCC default value of about 0.01 applying to leaf litter, lower values would be appropriate for fuels with greater woody content, if data are available	Project lifetime	IPCC
MW_{N2O-N}	Mg N_2O (Mg N)$^{-1}$	ratio of molecular weights of N_2O and N (44/28)	Project lifetime	IPCC
MW_{CH4-C}	Mg CH_4 (Mg C)$^{-1}$	ratio of molecular weights of CH_4 and C (16/12)	Project lifetime	IPCC
$ERat_{N2O}$	dimensionless	IPCC default emission ratio for N_2O (0.007)	Project lifetime	IPCC
$ERat_{CH4}$	dimensionless	IPCC default emission ratio for CH_4 (0.012)	Project lifetime	IPCC
GWP_{N2O}	Mg CO_2-e. (Mg N_2O)$^{-1}$	Global Warming Potential for N_2O (310 for the 1st C.P.)	Project lifetime	IPCC
GWP_{CH4}	Mg CO_2-e. (Mg CH_4)$^{-1}$	Global Warming Potential for CH_4 (21 for the 1st C.P.)	Project lifetime	IPCC
CE	dimensionless	Combustion efficiency. According to chapter 3.2.1.4.2.2 and Table 3.A.14 of IPCC GPG-LULUCF the following default values shall be used: boreal forests 0.25, temperate forests 0.5, tropical dry forest 0.95, tropical moist secondary forests 0.4, tropical moist primary forest 0.3. For ex-ante calculation: CE=0.	Project lifetime	Table 3.A.14 and chapter 3.2.1.4.2.2 of IPCC GPG-LULUCF

A/R WG recommendation ***(to be completed by the A/R WG):***

State whether the compilation of data needed for ex-ante estimations of net anthropogenic GHG emission reductions by sinks is complete, appropriate, and justified. Explain any shortcomings and list the required changes.

9. Other information

None.

A/R WG recommendation *(to be completed by the A/R WG):*

Assessment of the description and consistency of the methodology and its appropriateness for the proposed project activity

State whether the A/R baseline methodology has been described in an adequate and transparent manner. If not, explain the shortcomings and list the required changes.

Any other comments:

a) *State whether any other source of information (i.e. other than documentation on this proposed A/R baseline methodology available on the UNFCCC CDM web site) has been used by you in evaluating this A/R baseline methodology. If so, please provide specific references:*

b) *Indicate any further comments:*

Section III: Monitoring methodology description

1. Monitoring of project implementation

Methodology procedure:

Monitoring of project implementation includes

a) Monitoring of project boundary
b) Monitoring of IFM forest units
c) Monitoring of harvesting
d) Monitoring of leakage
e) Monitoring of forest laws and regulations

a) Monitoring of project boundary

This monitoring shall demonstrate that the actual forest management area conforms with the area specified in the PDD. The project boundary shall be monitored annually all through the crediting period, including through remote sensing as applicable. If the forest area changes during the crediting period, for instance, because deforestation occurs on the project area, the specific location and area of the deforested land shall be identified and the project boundary shall be rectified accordingly.

b) Monitoring of IFM forest units

Through monitoring it shall be checked that the forest carbon pool claimed to be protected from logging corresponds in its size to the carbon pool calculated via extrapolation for every year of the project activity on the basis of the forest inventory data.
IFM forest units include all forest units where one or several of the following IFM measures are applied:

a) Forest conservation, where stands are excluded from cutting due to certain criteria which do not apply in the BAU case, i.e. stands with a defined growing stock, slope, or species composition,

b) Excluding specific tree classes from cutting due to certain criteria, which otherwise would be cut in the BAU case. Such criteria could be the tree dimension i.e.. stem diameter or tree height, or the tree species, stem form or age,

c) Reducing wood harvesting to a previously agreed fraction of the total harvestable stand by exempting a predefined volume of different species, age classes or diameter classes of the growing stock from cutting.

The forest management enterprise shall derive the necessary monitoring information from its approved forest management plan, annual logging permits, and the valid forest inventory on which the management plan is based. This inventory has to include all forests that are legally foreseen for harvesting with their exact location (e.g. GPS coordinates, number of forest unit), extension (in hectares), tree species, classes of age, diameter, and growing stock, in form of tables and maps.

Based on each forest unit, the growing stock volumes effectively covered by one or several of the three IFM measures shall be calculated. These theoretical values shall be checked one year after harvesting using the sampling design described in chapter III 2b below.

c) Monitoring of harvesting
It shall be monitored that in each year the allowed volumes stipulated in the management plan (AAC_{orig}) would have been fully used, adequately reduced by the fraction of the growing stock volumes preserved by the IFM measures to define the actual cut ($AAC_{adjusted}$). It shall be checked with the forest enterprise to what extent the AAC_{orig} is implemented in other ongoing concessions[16], with, e.g. an $I_{AAC} = 0.9$ indicating a 90% use of the AAC_{orig}. The fraction is the growing stock volumes preserved ($HFC_{i,t,fu} + HST_{i,t,fu} + HEF_{i,t,fu}$[17]) is multiplied with the logging efficiency (LEF). A LEF default value of 0.8 shall be used, if the forest enterprise cannot provide a reliable value based on their annual cutting experience:

$$AAC_{adjusted} = AAC_{orig} * I_{AAC} - (HFC_{i,t,fu} + HST_{i,t,fu} + HEF_{i,t,fu}) * LE \qquad (22)$$

Where:

$AAC_{adjusted}$	adjusted logging volume; m³
AAC_{orig}	originally allowed logging volume stipulated in the management plan; m³
I_{AAC}	implementation index of AAC, indicating the execution grade of AAC in practice; dimensionless

[16] If no other ongoing concessions are present, then the most recent past concession of the enterprise shall be used. If the enterprise has no other present or past concessions then an average of the three nearest neighbouring forest concessions shall be used.

[17] Compare equations 4, 5 and 6.

$HFC_{i,t,fu}$ annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* in ***Forest Conservation*** stands that under IFM are excluded from cutting, $m^3\ yr^{-1}$

$HST_{i,t,fu}$ annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of ***Specific Tree Classes*** which under IFM are excluded from cutting, $m^3\ yr^{-1}$

$HEF_{i,t,fu}$ annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting, $m^3\ yr^{-1}$

LE logging efficiency indicating the relation of harvested wood / growing stock of all logged trees; dimensionless

The forest enterprise shall provide evidence that in all their harvesting activities in the same country the correspondent AACs have not been raised with an intention to compensate for the reduced amount of timber derived from the project activity.

d) Monitoring of leakage

Monitoring of leakage implies to determine the volume of timber logged outside the project area per year attributable to the project activity. In this methodology it is assumed that only a reduction of at least 1% of the wood market volume will cause a reaction of other wood suppliers to increase their cutting activity.

This should be detected by means of a regional survey if there are suitable forest areas in a commercially feasible wood transport distance and to what extent such areas are foreseen to be exploited without and with the IFM project taking place. If the IFM measures have reduced the logged wood volume by at least 1% of the wood market volume, the existence of "*leakage forests*" and "*leakage timber*" shall be determined annually by checking if forests within the *leakage belt* (compare explanation in chapter II.6) which were not foreseen for logging are logged. These checks can be based on:

- Statistics from forest administrations, private forest owners, forest owner associations, concessionaires or sawmill operators
- Local studies by research institutions on timber markets, forest ownership and forest exploitations

e) Monitoring of forest laws and regulations

New forest laws and regulations can change the legal requirements for harvesting. This can directly change the additionality of IFM measures. E.g. if by a new regulation forest enterprises are required to leave a certain part of the forest volume, or not to cut certain species or not to harvest on specified sites, this may be identical to some of the IFM measures, which then become obsolete, i.e. loose their additionality. If a renewable crediting period is chosen, then the project shall undergo a baseline re-evaluation by a DOE/AIE.
This monitoring information survey should be repeated annually. All information should be stored electronically in at least two independent localities and one paper version.

Explanation/justification (if methodology procedure is not self-explanatory):

No other comments.

A/R WG recommendation ***(to be completed by the A/R WG):***

Assess the appropriateness of the procedure to monitor and document the implementation of the project on land areas within project boundary. Explain any shortcomings and list the required changes.

2. Sampling design

Methodology procedure:

A formal sampling design will only apply to the following monitoring type:

Monitoring of IFM forest units

Through monitoring it shall be checked that the forest carbon pool claimed to be protected from logging corresponds in its size to the carbon pool calculated from the forest inventory data in every year of the project activity. IFM forest units include all forest units where one or several of the described IFM measures are applied.
Based on the information of the management plan, logging plan and forest inventory, for each forest unit the growing stock volumes effectively covered by one or several of the three IFM measures shall be calculated. These theoretical values shall be checked in the 13.-23. months after harvesting with a complete inventory of a sample of all forest units where IFM measures were carried out (b and c may be combined in the same forest units):

a) Forest conservation, where complete stands are excluded from cutting due to certain criteria which do not apply in the BAU case (e.g. excluding stands below a defined growing stock, slope, species composition, etc.),

b) Excluding specific tree classes from cutting due to certain criteria, which otherwise would be cut in the BAU case. Such criteria could be the tree dimension (e.g. stem diameter, tree height) or the tree species, stem form or age,

c) Reducing wood harvesting by a previously agreed amount of the total harvestable stand by exempting a predefined volume of different species, age classes or diameter classes of the growing stock from cutting.

In this sample inventory the diameters at breast height of all living commercial trees left in the plots shall be taken together with a tree height class (measured or estimated). The plot samples shall be chosen systematically along a continuous numbering of all IFM forest units of that year. The starting number shall be the third digit of the total wood volume (in m^3) cut by the forest enterprise in that year[18].

The sample size should be chosen according to data heterogeneity to keep the resulting error up to 10% at 95% probability.

[18] Supposed the total harvested volume were 117,359 m^3, than the first sample plot is No. 7, followed by 27, 47, 67 and so on.

To be conservative, the volumes pre-calculated from management plan of each of the IFM measures shall be maintained for the ex-post carbon stock calculation if the average sample wood volume for IFM measure a) to c) is greater or equal to the average pre-calculated IFM volumes for a) to c).
Otherwise, the wood volumes (growing stock) of all forest units of a) to c) must be corrected with an IFM correction fraction (*F*). F is defined by: *F (a,b,c)* = average sample volume / average pre-calculated wood volume.

Additionally, the total project area shall be monitored with remote sensing (high resolution satellite images or aerial photos) in a 5 year interval to check for any unplanned or illegal interventions and project boundaries.

All these data and calculations should be properly documented and safely kept in at least two digital copies stored in distinct places and printed in reports. Additionally, the instructions provided in chapter 4.3.4.4 Quality Assurance and Quality Control Plan of IPCC GPG for LULUCF (2003) shall be taken into account.

Explanation/justification (if methodology procedure is not self-explanatory):

No other comments.

A/R WG recommendation ***(to be completed by the A/R WG)***:

Assess the appropriateness and correctness of the sampling design procedures for the ex-post calculation of actual net GHG emission reductions by sinks and determination of the ex-post baseline net GHG emission reductions by sinks (if required). The sampling design may, include determination of number of plots, and plot distribution, etc. Explain any shortcomings and list the required changes.

3. Determination of *ex post* baseline net GHG emission reductions by sinks, if required

Methodology procedure:

For the determination of the ex post baseline net GHG emission reductions by sinks, the same equations as for the ex-ante baseline net GHG emission reductions by sinks are used (see equations No. 1 until No. 6 in chapter II.4).
However, they should be checked against actual information derived from the monitoring procedures outlined in chapter III.1.
This requires that the equations 4 until 6 may have to be corrected by multiplying the carbon stocks with the appropriate correction IFM factors *Fa, Fb, Fc* (see chapter III.2 above):

$$LFC_{EP,fellings,i,t,fu} = LFC_{fellings,i,t,fu} * Fa \quad (23)$$

$$LST_{EP,fellings,i,t,fu} = LST_{fellings,i,t,fu} * Fb \quad (24)$$

$$LEF_{EP,fellings,i,t,fu} = LEF_{fellings,i,t,fu} * Fc \qquad (25)$$

Where:

$LFC_{EP,fellings,i,t,fu}$	ex-post annual carbon loss from conventional commercial fellings of species group or species i for time t and forest unit fu in ***Forest Conservation*** stands that under IFM are excluded from cutting, Mg C yr^{-1}
$LST_{EP,fellings,i,t,fu}$	ex-post annual carbon loss due to conventional commercial fellings of species group or species i for time t and forest unit fu of ***Specific Tree Classes*** which under IFM are excluded from cutting, Mg C yr^{-1}
$LEF_{EP,fellings,i,t,fu}$	ex-post annual carbon loss due to conventional commercial fellings of species group or species i for time t and forest unit fu of an ***Exempted Felling Volume*** that under IFM is excluded from cutting, Mg C yr^{-1}
$LFC_{fellings,i,t,fu}$	annual carbon loss from conventional commercial fellings of species group or species i for time t and forest unit fu in ***Forest Conservation*** stands that under IFM are excluded from cutting, Mg C yr^{-1}
$LST_{fellings,i,t,fu}$	annual carbon loss due to conventional commercial fellings of species group or species i for time t and forest unit fu of ***Specific Tree Classes*** which under IFM are excluded from cutting, Mg C yr^{-1}
$LEF_{fellings,i,t,fu}$	annual carbon loss due to conventional commercial fellings of species group or species i for time t and forest unit fu of an ***Exempted Felling Volume*** that under IFM is excluded from cutting, Mg C yr^{-1}
Fa	correction fraction for ***Forest Conservation*** stands that under IFM are excluded from cutting: Fa = average sample volume / average pre-calculated wood volume, dimensionless
Fb	correction fraction for ***Specific Tree Classes*** stands that under IFM are excluded from cutting: Fb = average sample volume / average pre-calculated wood volume, dimensionless
Fc	correction fraction for ***Exempted Felling Volume*** stands that under IFM are excluded from cutting: Fc = average sample volume / average pre-calculated wood volume, dimensionless

If the legally stipulated AAC lifetime is inferior to the crediting period, the AAC should be monitored and a revision of AAC baseline should be fixed every 10 years.

Explanation/justification (if methodology procedure is not self-explanatory):

No other comments.

A/R WG recommendation ***(to be completed by the A/R WG)***:

a) Provide an assessment of the appropriateness and correctness of the methodological procedure to determine ex-post baseline net GHG emission reductions by sinks, including an assessment of:

(i) The choice of algorithms/formulae used and correctness of their application (e.g.

mathematical deficiencies, inconsistencies in calculus of dimensions).

(ii) The appropriateness (adequacy, consistency, accuracy and reliability) of the parameters provided by the methodology.

(iii) The appropriateness of procedures how project participants should select any parameters in cases where these are not provided in the methodology (e.g. from official statistics, expert judgment, proprietary data, IPCC Good Practice Guidance for LULUCF, commercial data and scientific literature),

(iv) Any data gaps:

(v) State, whether the procedure results in a conservative estimation of the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the proposed CDM A/R project activity, taking into account the uncertainties associated with the data and parameters used. Assess whether the procedure can be carried out in an unambiguous way, replicated, and subjected to a validation and/or verification study. Explain any shortcomings and list the required changes.

4. Data to be collected and archived for the determination of *ex post* baseline net GHG emission reductions by sinks, if required

ID Nr.	Data Variable	Data Unit	Data source	Measured (m) calculated (c) estimated (e)	Recording frequency	Proportion of data monitored	Comment
4.1	*AAC*	$m^3\ ha^{-1}\ yr^{-1}$	Forest management plan for forest management unit, in line with updated legal requirements	c	Until present every 10 years. In future according to forest law	100%	Annual allowable cut. Legal stipulation of forest management plan regarding the amount of timber that can be harvested
4.2	*Fa*	none	Average sample volume of forest conservation stands	m	Annual	100% of sample	*Fa* = average sample volume / average pre-calculated wood volume
4.3	*Fb*	none	Average sample	m	Annual	100% of	*Fb* = average

ID Nr.	Data Variable	Data Unit	Data source	Measured (m) calculated (c) estimated (e)	Recording frequency	Proportion of data monitored	Comment
			volume of single tree stands			sample	sample volume / average pre-calculated wood volume
4.4	*Fc*	none	Average sample volume of Exempted Felling Volume stands	m	Annual	100% of sample	*Fc* = average sample volume / average pre-calculated wood volume

A/R WG recommendation ***(to be completed by the A/R WG)**:*

Assess the completeness and appropriateness of data compiled in the table, including the appropriateness of the indicated data sources, monitoring frequency, measurements procedures, etc. Assess whether the frequency of recording reflects the dynamics of the processes that would determine the changes in carbon stocks within the project boundary in the absence of the project activity. Explain any shortcomings and list the required changes.

5. Calculation of *ex post* actual net GHG emission reduction by sinks

Methodology procedure:

As explained in section II.5, the actual net greenhouse gas emission reductions by sinks represent the sum of the verifiable changes in carbon stocks in the carbon pools within the project boundary attributable to the project activity, minus the increase in non-CO_2 GHG emissions measured in CO_2 equivalents by sources that are increased as a result of the implementation of the project activity, while avoiding double counting.

The *ex-post* actual net GHG emission reduction by sinks are calculated with the same set of equations (No. 7. until No. 14) which were presented for the ex-ante calculation in section II.5.

The carbon stocks in living biomass ($\Delta C_{B,t,fuI}$) are calculated *ex-post* in the following way:

$$\Delta C_{B,t,fuI} = LFC_{EP,fellings,i,t,fu} + LST_{EP,fellings,i,t,fu} + LEF_{EP,fellings,i,t,fu} \quad (26)$$

Where:

$\Delta C_{B,t,fuI}$ annual carbon emissions from living biomass (includes above- and belowground biomass) in all forest units (*fuI*) where IFM measures were already applied until year t; Mg CO_2 yr^{-1}

$LFC_{EP,fellings,i,t,fu}$ ex-post annual carbon stock in ***Forest Conservation*** stands that under IFM are excluded from conventional commercial fellings of species group or species i for time t and forest unit fu, Mg C yr^{-1} (see equation 23)

$LST_{EP,fellings,i,t,fu}$ ex-post annual carbon stock of ***Specific Tree Classes*** which under IFM are excluded from conventional commercial fellings of species group or species i for time t and forest unit fu, Mg C yr^{-1} (see equation 24)

$LEF_{EP,fellings,i,t,fu}$ ex-post annual carbon stock of an ***Exempted Felling Volume*** that under IFM is excluded from conventional commercial fellings of species group or species i for time t and forest unit fu, Mg C yr^{-1} (see equation 25)

A/R WG recommendation *(to be completed by the A/R WG)*:

a) Provide an assessment of the appropriateness and correctness of the methodological procedure to calculate ex-post actual net GHG emission reduction by sinks, including an assessment of:

(i) The choice of algorithms/formulae used and correctness of their application (e.g. mathematical deficiencies, inconsistencies in calculus of dimensions).

(ii) The appropriateness (adequacy, consistency, accuracy and reliability) of the parameters provided by the methodology.

(iii) The appropriateness of procedures how project participants should select any parameters in cases where these are not provided in the methodology (e.g. from official statistics, expert judgment, proprietary data, IPCC Good Practice Guidance for LULUCF, commercial data and scientific literature).

(iv) Any data gaps:

>>

(v) Assess whether the procedure does not increase the net anthropogenic GHG emission reductions by sinks. Explain any shortcomings and list the required changes.

6. Data to be collected and archived for *ex post* actual net GHG emission reductions by sinks

ID Nr.	Data Variable	Data unit	Data source	Measured (m) calculated (c) estimated (e)	Recording frequency	Proportion of data monitored	Comment
6.1	$HFC_{i,t,fu}$	m^3 yr^{-1}	Logging plan	c	annually	100%	annual merchantable volume of growing stock, roundwood

ID Nr.	Data Variable	Data unit	Data source	Measured (m) calculated (c) estimated (e)	Recording frequency	Proportion of data monitored	Comment
							of species group or species *i* for time *t* and forest unit *fu* in ***Forest Conservation*** stands that under IFM are excluded from cutting,
6.2	$HST_{i,t,fu}$	$m^3\ yr^{-1}$	Logging plan	c	annually	100%	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of ***Specific Tree Classes*** which under IFM are excluded from cutting
6.3	$HEF_{i,t,fu}$	$m^3\ yr^{-1}$	Logging plan	c	annually	100%	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting
6.4	$PF_{t,\ fuI}$	dimensionless	survey	e	annual	100%	Preservation factors in forest units treated with IFM measures
6.5	$\Delta C_{AB,t,fuI}$	$Mg\ C\ yr^{-1}$	forest inventory	e	annually	100%	carbon stocks in above ground living biomass according to the valid forest inventory before getting effected by fire for time *t* and forest unit *fuI*
6.6	*Fa*	dimensionless	forest sampling	m,c	annually	100% of samples	correction fraction for ***Forest Conservation*** stands that under IFM are excluded from cutting
6.7	*Fb*	dimensionless	forest sampling	m,c	annually	100% of samples	correction fraction for ***Specific Tree Classes*** stands that under IFM are excluded from cutting
6.8	*Fc*	dimensionless	forest sampling	m,c	annually	100% of samples	correction fraction for ***Exempted Felling Volume*** stands that under IFM are excluded from cutting
6.9	*AAC*	$m^3\ ha^{-1}$	Forest	c	10 years	100%	Annual allowable cut

ID Nr.	Data Variable	Data unit	Data source	Measured (m) calculated (c) estimated (e)	Recording frequency	Proportion of data monitored	Comment
		yr^{-1}	manage ment plan				

A/R WG recommendation ***(to be completed by the A/R WG)**:*

Assess the completeness and appropriateness of data compiled in the table, including the appropriateness of the indicated data sources, monitoring frequency, measurements procedures, etc. Assess whether the frequency of recording reflect the dynamics of the processes that determine the emissions of GHG or the changes in carbon stocks within the project boundary. Explain any shortcomings and list the required changes.

7. Leakage

Methodology procedure:

The methodology procedure of determining **ex-post** leakage is the same as described in section II.6 above and the equations 15 and 16 of this section can be used.

Explanation/justification (if methodology procedure is not self-explanatory):

No other comments.

A/R WG recommendation ***(to be completed by the A/R WG)**:*

a) Provide an assessment of the appropriateness and correctness of the methodological procedure to calculate ex-post leakage, including an assessment of:

(i) The choice of algorithms/formulae used and correctness of their application (e.g. mathematical deficiencies, inconsistencies in calculus of dimensions).

(ii) The appropriateness (adequacy, consistency, accuracy and reliability) of any parameters provided by the methodology.

(iii) The appropriateness of procedures used by project participants to select parameters in cases where these are not provided in the methodology (e.g. from official statistics, expert

judgment, proprietary data, IPCC Good Practice Guidance for LULUCF, commercial data and scientific literature).

(iv) Any data gaps:

(v) State, whether the procedure does not underestimate leakage effects. Assess whether the procedure can be carried out in an unambiguous way, replicated, and subjected to a validation and/or verification study. Explain any shortcomings and list the required changes.

8. Data to be collected and archived for leakage

ID number	Data Variable	Data unit	Data source	Measured (m) Calculated (c) estimated (e)	Recording frequency	Proportion of data monitored	Comment
8.01	$FG_{outside,i,t}$	$m^3\ yr^{-1}$	Forest Management Plans of outside forests and statistics	e	Annual	100%	volume of timber of species or species group *i* logged outside the project area per year attributable to the project activity
8.02	DI_t	km	Interview of logging companies	e	Annual	100%	maximum commercially feasible distance for roundwood transports
8.03	TMV_t	$m^3\ yr^{-1}$	Local forest agency	c	Annual	100%	Timber market volume
8.04	$HFC_{i,t,fu}$	$m^3\ yr^{-1}$	Local forest agency	c	Annual	100%	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* in ***Forest Conservation*** stands that under IFM are excluded from cutting
8.05	$HST_{i,t,fu}$	$m^3\ yr^{-1}$	Local forest agency	c	Annual	100%	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of

ID number	Data Variable	Data unit	Data source	Measured (m) Calculated (c) estimated (e)	Recording frequency	Proportion of data monitored	Comment
							Specific Tree Classes which under IFM are excluded from cutting
8.06	$HEF_{i,t,fu}$	$m^3\ yr^{-1}$	Local forest agency	c	Annual	100%	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting
8.07	MF_t	ha	Local forest agency	c	Annual	100%	Mature forests within the potential leakage area
8.08	$MF_{logging,t}$	ha	Local forest agency	c	Annual	100%	Mature forests within the potential leakage area foreseen for logging
8.09	$MF_{non-ogging,t}$	ha	Local forest agency	c	Annual	100%	Mature forests within the potential leakage area not foreseen for logging
8.10	$LF_{potential,t}$	ha	Local forest agency	c	Annual	100%	Potential leakage forests

A/R WG recommendation *(to be completed by the A/R WG)*:

Assess the completeness and appropriateness of data compiled in the table, including the appropriateness of the indicated data sources, monitoring frequency, measurements procedures, etc. Explain any shortcomings and list the required changes.

9. *Ex post* net anthropogenic GHG emission reduction by sinks

Methodology procedure:

The *ex-post* net anthropogenic GHG emission reductions by sinks is the actual net GHG emission reductions by sinks minus the baseline net GHG emission reductions by sinks minus leakage (in t CO_2-e), as defined in section II.7 (equation 17).

A/R WG recommendation ***(to be completed by the A/R WG):***

State, whether the formulae provided to calculate ex-post net anthropogenic GHG emission reductions by sinks for the project activities using lCERs or tCERs are consistent with the latest guidance provided by the CDM Executive Board, and if not evaluate the validity of the formulae.

10. Conservative approach and uncertainties

Methodology procedure:

a) Conceptual approach to reduce uncertainties

The "*Improved forest management to increase biomass and ecological value*" methodology combines several conservative approaches in order to reduce uncertainty:

1. For emission reductions, only the biomass carbon pool is included. Dead wood, litter and soil carbon pools are conservatively disregarded, although it is evident that these carbon pools are decreased in the medium and long term by forest clear cutting systems and even age forests from natural regeneration or plantation compared to the protected uneven aged forests of the project case.
2. Apart from CO_2 emissions resulting from forest stock decreases, no other GHG emissions are included. This is conservative because emissions from fertilization and combustion of fossil fuels are clearly much higher in the baseline case, where forest plantations may be fertilized and the logging operations with connected forest road construction will emit much more carbon dioxide and other GHG than any low-level conservation management of the forest (project case).
3. Carbon sequestration of the protected uneven aged forest is conservatively disregarded, although it is evident that the growth of these trees above the minimum felling diameter is accumulating carbon in the ecosystem. This effects is much larger over the 30 year project lifetime than carbon sequestration of the gradually regrowing young trees after harvesting.
4. It is conservative to account eventual carbon stock decreases from anthropogenic impacts such as logging, deforestation, settlements, fires, or natural hazards such as pests or diseases only in areas where IFM were applied in the project activity, and not in the baseline case, where such impacts may also occur.
5. To be conservative to maintain the pre-calculated volumes of each of the IFM measures for the carbon stock calculation if the ex-post sampling shows a higher growing stock than the average pre-calculated IFM volumes.

Uncertainties are perceived in the identification of leakage emissions. The motivations for wood cutting may not always be declared unambiguously to decide if the increase of cutting activity of other wood suppliers really constitutes a reaction to a reduced timber volume (e.g. a few percent) in the market.

Depending on the quality of satellite images changes in forest biomass from unplanned events (as quoted in chapter II.2) can be detected with more or less precision. Therefore, low resolution satellite images c should be avoided.

b) Conservative approach on data collection

To reduce uncertainties in accounting of emissions and emission reductions**,** this methodology uses whenever possible proven methods from the GPG-LULUCF, GPG-2000, and the IPCC's Revised 2006 Guidelines, Tools and guidance from the CDM Executive Board on conservative estimation of emissions and emission reductions are also used as well. Despite this, potential uncertainties still arise from the choice of parameters. For example, the use of biomass expansion factors (*BEFs*) or wood densities, could result in uncertainties in the estimation of both baseline carbon stocks decrease and the actual net GHG emission reductions by sinks—especially when global default values are used.

It is recommended that project participants identify key parameters which significantly influence the accuracy of estimates. Local, regional or national values that are more specific to the project circumstances should then be obtained for these key parameters, whenever possible. These values should be based on:

- Data from well-referenced peer-reviewed literature or other well-established published sources[19] or, if these are not available,
- National inventory data or default data from IPCC literature that has, whenever possible and necessary, been checked for consistency against available local data specific to the project circumstances; or, if these are also not available,
- Expert opinion may be used to assist with data selection. Experts will often provide a range of data, as well as a most probable value for the data. The rationale for selecting a particular data value should be briefly noted in the PDD. For any data provided by experts, the PDD shall also record the experts name, affiliation, and principal qualification as an expert (e.g., that they are a member of a country's national forest inventory technical advisory group).

In choosing key parameters or making important assumptions based on information that is not specific to the project circumstances, e.g. in case of default data, project participants should select values that will lead to a conservative estimation of net GHG emission reductions by sinks, i.e. data that tends to under-estimate, rather than over-estimate, net GHG emission reductions by sinks. E.g. regarding the estimation of preservation factors the technical staff should in case of doubts, always choose the lower of two values.

Explanation/justification (if methodology procedure is not self-explanatory):

No other explanation or justification.

A/R WG recommendation ***(to be completed by the A/R WG)****:*

[19] Typically, citations for sources of data used should include: the report or paper title, publisher, page numbers, publication date etc (or a detailed web address). If web-based reports are cited, hardcopies should be included as Annexes in the JI-FM-PDD if there is any likelihood such reports may not be permanently available.

State, whether the methodology takes into account uncertainties by appropriate choice of monitoring methods, such as number of samples, to achieve reliable estimates of net anthropogenic greenhouse gas emission reductions by sinks. State whether the methodology ensures that the net anthropogenic GHG emission reductions by sinks are estimated in conservative manner, taking in to account the uncertainties of the methodology. If not explain the shortcomings and list the required changes.

11. Other information

A/R WG recommendation *(to be completed by the A/R WG):*

Assessment of the description and consistency of the methodology

a) State whether this proposed A/R monitoring methodology is compatible and consistent with the proposed A/R baseline methodology and if not what are the inconsistencies?

b) State whether the A/R monitoring methodology has been described in an adequate and transparent manner. If not, explain the shortcomings and list the required changes.

c) State whether any other source of information (i.e. other than documentation on this proposed A/R methodology available on the UNFCCC CDM web site) has been used by you in evaluating this methodology. If so, please provide specific references:

d) Indicate any further comments:

Section IV: Lists of variables, acronyms and references

1. List of variables used in equations:

Variable	SI Unit	Description
$AAC_{adjusted}$	m^3	adjusted logging volume
AAC_{orig}	m^3	originally allowed logging volume stipulated in the management plan
$BEF_{2,i}$	dimensionless	biomass expansion factor for converting volumes of merchantable roundwood of species or species group i to total aboveground biomass (including bark)
C_{ACTUAL}	Mg CO_2-e	actual net greenhouse gas emission reductions by sinks
C_{BSL}	Mg CO_2 yr^{-1}	Total change in carbon dioxide stocks from baseline forest land remaining forest land over a period of n years
CE	dimensionless	combustion efficiency. . According to chapter 3.2.1.4.2.2 and Table 3.A.14 of IPCC GPG-LULUCF the following default values shall be used: boreal forests 0.25, temperate forests 0.5, tropical dry forest 0.95, tropical moist secondary forests 0.4, tropical moist

		primary forest 0.3
CF	Mg C (Mg d.m.)$^{-1}$	carbon fraction of dry matter (default = 0.5)
$C_{FF,FC}$	Mg CO_2-e	net anthropogenic greenhouse gas emission reductions by sinks for forest remaining forest, forest conservation
D_i	Mg d.m. m^{-3}	basic wood density of species or species group i
$E_{ForestFire,\ CH_4,t,fuI}$	Mg CO_2-e. yr^{-1}	CH_4 emission from biomass burning in forest fires for time t and forest unit *fuI*
$E_{ForestFire,\ N_2O,t,fuI}$	Mg CO_2-e. yr^{-1}	N_2O emission from biomass burning in forest fires for time t and forest unit *fuI*
$E_{ForestFire,C,t,fuI}$	Mg C yr^{-1}	loss of carbon stock in aboveground biomass due to forest fires for time t and forest unit *fuI*
$E_{Non-CO2,\ ForestFire,t,fuI}$	Mg CO_2-e	increase in Non-CO2 emission as a result of biomass burning in forest fires for time t and forest unit *fuI*
$ERat_{CH4}$	dimensionless	IPCC default emission ratio for CH_4 (0.012)
$ERat_{N2O}$	dimensionless	IPCC default emission ratio for N_2O (0.007)
Fa	dimensionless	correction fraction for ***Forest Conservation*** stands that under IFM are excluded from cutting: *Fa* = average 5% sample volume / average pre-calculated wood volume
Fb	dimensionless	correction fraction for ***Specific Tree Classes*** that under IFM are excluded from cutting: *Fb* = average 5% sample volume / average pre-calculated wood volume
Fc	dimensionless	correction fraction for ***Exempted Felling Volume*** stands that under IFM are excluded from cutting: *Fc* = average 5% sample volume / average pre-calculated wood volume
$FG_{outside,i,t}$	m^3 yr^{-1}	volume of timber of species or species group i logged outside the project area per year attributable to the project activity
GHG_E	Mg CO_2-e	sum of increase in GHG emissions by sources within the project boundary as a result of the implementation of project activity
GWP_{CH4}	Mg CO_2-e. (Mg CH_4)$^{-1}$	Global Warming Potential for CH_4 (21 for the 1st C.P.)
GWP_{N2O}	Mg CO_2-e. (Mg N_2O)$^{-1}$	Global Warming Potential for N_2O (310 for the 1st C.P.)
$HEF_{i,t,fu}$	m^3 yr^{-1}	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting
$HFC_{i,t,fu}$	m^3 yr^{-1}	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* in ***Forest Conservation*** stands that under IFM are excluded from cutting
$HST_{i,t,fu}$	m^3 yr^{-1}	annual merchantable volume of growing stock, roundwood of species group or species *i* for time *t* and forest unit *fu* of ***Specific Tree Classes*** which under IFM are excluded from cutting
I_{AAC}	dimensionless	implementation index of AAC, indicating the execution grade of AAC in practice
INC	%	average forest increment expressed in per cent
$L_{fellings,i,t,fu}$	Mg C yr^{-1}	annual baseline carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu*

LE	dimensionless	logging efficiency indicating the relation of harvested wood / growing stock of all logged trees
$LEF_{EP,fellings,i,t,fu}$	Mg C yr^{-1}	ex-post annual carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting
$LEF_{fellings,i,t,fu}$	Mg C yr^{-1}	annual carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* of an ***Exempted Felling Volume*** that under IFM is excluded from cutting
$LFC_{EP,fellings,i,t,fu}$	Mg C yr^{-1}	ex-post annual carbon loss from conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* in ***Forest*** *Conservation* stands that under IFM are excluded from cutting
$LFC_{fellings,i,t,fu}$	Mg C yr^{-1}	annual carbon loss from conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* in ***Forest*** *Conservation* stands that under IFM are excluded from cutting
$LIFM_{fellings,i,t,fu}$	Mg C yr^{-1}	annual carbon loss from commercial fellings under Improved Forest Management (IFM) of species group or species *i* for time *t* and forest unit *fu*
LK	Mg CO_2-e	total leakage over the period from year 1 to year n
$LK_{timber\text{-}logging,\ t}$	Mg CO_2-e $year^{-1}$	leakage due to displacement of timber logging per year
$LST_{EP,fellings,i,t,fu}$	Mg C yr^{-1}	ex-post annual carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* of ***Specific Tree Classes*** which under IFM are excluded from cutting
$LST_{fellings,i,t,fu}$	Mg C yr^{-1}	annual carbon loss due to conventional commercial fellings of species group or species *i* for time *t* and forest unit *fu* of ***Specific Tree Classes*** which under IFM are excluded from cutting
$MW_{CH4\text{-}C}$	Mg CH_4 (Mg $C)^{-1}$	ratio of molecular weights of CH_4 and C (16/12)
$MW_{CO2\text{-}C}$	Mg CO_2 (Mg $C)^{-1}$	ratio of molecular weights of CO_2 and C (44/12)
$MW_{N2O\text{-}N}$	Mg N_2O (Mg $N)^{-1}$	ratio of molecular weights of N_2O and N (44/28)
m	dimensionless	number of years since the last forest inventory
N/C ratio	Mg N (Mg $C)^{-1}$	nitrogen-carbon ratio with a general default value of about 0.01 applying to leaf litter, lower values would be appropriate for fuels with greater woody content, if data are available
$PF_{t,fuI}$	dimensionless	preservation factor; the fraction of actual carbon stocks in living biomass in relation to ΔCLB,fu,t for time *t* and for each forest unit *fuI*, where IFM measures were applied, estimated in steps of 0.1 (range: 0 until 1.0)
R_i	dimensionless	root-to-shoot ratio of species or species group i appropriate to increments
$\Delta C_{AB,t,fuI}$	Mg C yr^{-1}	carbon stocks in above ground living biomass according to the valid forest inventory before getting effected by fire for time t and forest unit *fuI*
$\Delta C_{B,\ t,fuI}$	Mg C yr^{-1}	carbon stocks in living biomass (includes above- and belowground biomass) according to the valid forest inventory for time *t* and

		forest unit
$\Delta C_{FF,DOM,t,fu}$	Mg C yr^{-1}	annual change in carbon stocks in dead organic matter (includes dead wood and litter) in forest land remaining forest land for time t and forest unit fu
$\Delta C_{FF,LB,t,fu}$	Mg C yr^{-1}	annual change in carbon stocks in living biomass (includes above- and belowground biomass) in forest land remaining forest land for time t and forest unit fu
$\Delta C_{FF,L,t,fu}$	Mg C yr^{-1}	annual decrease in baseline carbon stocks due to biomass loss for time *t* and forest unit *fu*
$\Delta C_{FF,Soils,t,fu}$	Mg C yr^{-1}	annual change in carbon stocks in soils in forest land remaining forest land for time t and forest unit fu
C_{LB}	Mg CO_2-e	sum of changes in living biomass carbon stocks of trees (above- and belowground)
$\Delta C_{PF,L,t,fu,I}$	Mg CO_2 yr^{-1}	annual carbon emissions due to biomass losses for time *t* and forest unit *fuI* where IFM measures have been applied

2. List of acronyms used in the methodologies:

Acronym	Description
AAC	Annual allowable cut (m^3/ha/yr)
CAI	Current annual increment (m^3/ha/yr)
d.m.	Dry matter
fu	Forest unit
GHG	Greenhouse gas
GPG	Good practice guidance
GPS	Global Positioning System
MAI	Mean annual increment (m^3/ha/yr)
Mg	Mega gram (= 1 tonne)
yr	Year

3. References:

Reference is made to the following documents:

EB (2007): Methodological tool. Tool for the demonstration and assessment of additionality (Version 04). EB36, Annex 13. Bonn, 10 pp

IPCC (2003): Good practice guidance for land use, land-use change and forestry. IGES, Kamiyamaguchi, Japan.

UNFCCC JI (2006): Guidance on criteria for baseline setting and monitoring. Version 01. JISC 04, Annex 6, Bonn, 19 pp

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