

**Draft afforestation and reforestation baseline and monitoring methodology
AR-AM00XX**

“Afforestation or reforestation of degraded or abandoned agricultural lands”

(Version 01.0.0)

I. SOURCE, DEFINITIONS AND APPLICABILITY

1. Sources

This methodology is based on the CDM-AR-PDD “Reforestation for the purpose of combating desertification, mitigating climate change and protecting biodiversity in Santiago del Estero, Argentina - Youth Environmental Groups”. The baseline study, monitoring and verification plan and project design document were prepared by:

- University of Tuscia, Italy;
- Grupo Ambiental para el Desarrollo, Argentina;
- Fundación del Sur, Argentina;
- Nacional Institute for Agricultural Technology (INTA), Argentina;
- Catholic University of Santiago del Estero (UCSE), Argentina;
- Ministry for the Environment and Territory, Italy.

For more information regarding the source methodologies and their consideration by the CDM Executive Board (the Board) please refer to the following URL on the internet:
<http://cdm.unfccc.int/methodologies/ARmethodologies/approved_ar.html>.

This methodology also refers to the latest approved versions of the following tools, procedures, guidelines and guidances:

- (a) Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities;
- (b) Guidance on application of the definition of the project boundary to A/R CDM project activities;
- (c) Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities;
- (d) Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities;
- (e) Calculation of the number of sample plots for measurements within A/R CDM project activities;
- (f) Tool for testing significance of GHG emissions in A/R CDM project activities;
- (g) Estimation of GHG emissions due to clearing, burning and decay of existing vegetation attributable to a CDM A/R project activity;
- (h) Guidelines on conditions under which increase in GHG emissions related to displacement of pre-project grazing activities in A/R CDM project activity is insignificant;

- (i) Guidelines on conditions under which increase in GHG emissions attributable to displacement of pre-project crop cultivation activities in A/R CDM project activity is insignificant;
- (j) Guidelines on conservative choice and application of default data in estimation of the net anthropogenic GHG removals by sinks;
- (k) Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities.

All the above-mentioned tools, procedures, guidelines and guidances are available at: <http://cdm.unfccc.int/Reference>.

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

“Existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary”

3. Definitions

For the purpose of this methodology the following definition applies:

- **Abandoned agricultural land** is that land where agricultural activities have occurred in the past, but are not taking place at the start of the A/R CDM project activity and are not expected to occur in the future.

4. Applicability

This methodology is applicable to A/R CDM project activities implemented in degraded agricultural lands or abandoned agricultural lands.

The methodology is applicable when all of the following conditions are met:

- (a) The area does not include organic soils (e.g. peat-lands) or wetlands;¹
- (b) If the lands to be afforested or reforested are degraded agricultural lands, then:
 - (i) It is expected that the lands would remain degraded in the absence of the project activity; and
 - (ii) Crops cultivated, if any, are non-perennial crops.
- (c) If lands to be afforested or reforested are abandoned agricultural lands, then they are expected to evolve into shrub lands with vegetation that is unable to reach, without anthropogenic intervention, the threshold values reported by the host Party for national definition of forest for CDM purposes;
- (d) The pre-project trees, if any, have no potential to reach a crown cover of more than 20% of the threshold value for tree crown cover reported by the host Party for national definition of forest for CDM purposes;
- (e) The project activity does not lead to displacement of pre-project activities outside the project boundary, or the increase in GHG emissions due to displacement of pre-project activities is insignificant.

¹“Wetlands”, “settlements”, “croplands” and “grasslands” are land uses as defined in the *Good Practice Guidance for Land Use, Land-use Change and Forestry* (IPCC, 2003).

The latest version of the “Tool for the identification of degraded or degrading lands for consideration in implementing A/R CDM project activities” shall be applied for demonstrating that the agricultural lands are degraded.

II. BASELINE METHODOLOGY PROCEDURE

1. Project boundary and eligibility of land

The “project boundary” geographically delineates the A/R CDM project activity under the control of the project participants (PPs). The A/R CDM project activity may contain more than one discrete parcel of land. Each discrete parcel of land shall have a unique geographical identification. PPs may identify the areas of land to be included in the A/R CDM project activity using the latest version of the “Guidance on application of the definition of the project boundary to A/R CDM project activities”.

PPs shall demonstrate that each discrete area of land to be included within the project boundary is eligible for an A/R CDM project activity using the current version of the “Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities”.

The carbon pools included in or excluded from accounting are shown in Table 1.

Table 1: Carbon pools accounted for in the project boundary

Carbon Pools	Accounted for	Justification / Explanation
Above-ground biomass	Yes	Major carbon pool affected by the project activity
Below-ground biomass	Yes	Major carbon pool affected by the project activity
Dead wood	No	Considering the applicability conditions of this methodology, the carbon stock in the pool is likely to increase less, or decrease more, in the baseline scenario compared to the project scenario. Therefore, excluding the pool from accounting will lead to a conservative estimation of net anthropogenic GHG removal by sinks
Litter	No	Considering the applicability conditions of this methodology, the carbon stock in the pool is likely to increase less, or decrease more, in the baseline scenario compared to the project scenario. Therefore, excluding the pool from accounting will lead to a conservative estimation of net anthropogenic GHG removal by sinks
Soil organic carbon (SOC)	Yes/No	Considering that dynamics of SOC are different for agricultural lands and abandoned agricultural lands, SOC stock increases can only be accounted for in agricultural land

The emission sources and associated GHGs included in or excluded from accounting are shown in Table 2. Any one of these sources can be neglected, i.e. accounted as zero, if the application of the most recent version of the “Tool for testing significance of GHG emissions in A/R CDM project activities” leads to the conclusion that the emission source is insignificant.

Table 2: Emission sources and GHGs included in or excluded from accounting

Source	Gas	Included/ excluded	Justification / Explanation
Burning of biomass	CO ₂	Excluded	Carbon stock decreases due to burning are accounted as a change in carbon stock
	CH ₄	Included	Burning of biomass for the purpose of site preparation or as part of forest management can lead to significant levels of emissions of methane
	N ₂ O	Excluded	Potential emissions are negligibly small

2. Identification of the baseline scenario and demonstration of additionality

PPs shall use the most recent version of the “Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities”.

3. Stratification

Stratification of the planned project area for baseline estimation is not required but may be carried out if it improves the accuracy and precision of biomass estimates.

Strata for biomass estimation may be defined on the basis of parameters that are key entry variables in the method (e.g. growth models or yield curves/tables) used for estimating changes in biomass stocks. Thus:

(a) **For baseline net GHG removals by sinks.** It will usually be sufficient to stratify the areas into:

- (i) Agricultural land;
- (ii) Abandoned agricultural land.

(b) **For actual net GHG removals by sinks.** The stratification for *ex ante* estimations shall be based on the project planting/management plan. The stratification for *ex post* estimations shall be based on the actual implementation of the project planting/management plan. If natural or anthropogenic impacts (e.g. local fires) or other factors (e.g. soil type) add variability to the growth pattern of the biomass in the project area, then the *ex post* stratification shall be revised accordingly.

PPs may use remotely sensed data acquired close to the time of project commencement and/or the occurrence of natural or anthropogenic impacts for *ex ante* and *ex post* stratification.

4. Baseline net GHG removals by sinks

The baseline net GHG removals by sinks is the sum of the changes in carbon stocks in the selected carbon pools within the project boundary that would have occurred in the absence of the A/R CDM project activity.

Under the applicability conditions of this methodology:

- Changes in carbon stock of above-ground and below-ground tree biomass may be conservatively assumed to be zero for all strata in the baseline scenario;
- In degraded agricultural land carbon stock in soil organic carbon (SOC) is unlikely to increase in the baseline, and therefore the change in carbon stock in SOC may be conservatively assumed to be zero for all strata of agricultural land in the baseline scenario.

- In abandoned agricultural land carbon stock in SOC may increase in the baseline, but is unlikely to increase above the C stock in SOC under project scenario. Therefore, change of C stock in SOC in the baseline scenario can be conservatively ignored provided that the change of C stock in SOC in the project scenario is also ignored. Since, as provided in Table 1, the SOC pool is excluded from accounting in case of abandoned agricultural land, the change of C stock in SOC in the baseline scenario can be conservatively assumed to be zero.

Therefore, the baseline net GHG removals by sinks can be determined as:

$$\Delta C_{BSL} = \Delta C_{SHRUB_BSL} \quad (1)$$

where:

ΔC_{BSL} Baseline net GHG removals by sinks; t CO₂-e

ΔC_{SHRUB_BSL} Change in carbon stock in above-ground and below-ground biomass of shrubs in the baseline; t CO₂-e

4.1 Carbon stock changes in above-ground and below-ground shrub biomass (ΔC_{SHRUB_BSL})

Change in carbon stock in above-ground and below-ground biomass of shrubs in the baseline in degraded agricultural land is conservatively assumed as zero.

Change in carbon stock in above-ground and below-ground biomass of shrubs in the baseline in abandoned agricultural land is estimated using the following equations:

$$\Delta C_{SHRUB_BSL,t} = \frac{44}{12} * CF_S * A_{AB} \cdot dB_{SHRUB} * 1year \text{ for } 1 \leq t \leq T_{GROWTH} \quad (2)$$

$$\Delta C_{SHRUB_BSL,t} = 0 \text{ for } t > T_{GROWTH} \quad (3)$$

where:

$\Delta C_{SHRUB_BSL,t}$ Change in carbon stock in above-ground and below-ground biomass of shrubs in the baseline in abandoned agricultural land, in year t ; t CO₂-e

CF_S Carbon fraction of shrub biomass; IPCC default value 0.50 t C t⁻¹ d.m. may be used

A_{AB} Area of abandoned agricultural land growing into shrub land at the start of the project activity; ha

dB_{SHRUB} Default rate of change in above-ground and below-ground shrub biomass content in abandoned agricultural land growing into shrub land; t d.m. ha⁻¹ yr⁻¹

T_{GROWTH} Time taken by abandoned agricultural land growing into shrub land to stabilize to its peak biomass (20 years by default); yr

The value of dB_{SHRUB} is calculated as:

$$dB_{SHRUB} = \frac{1}{2} * \frac{F_S * B_{FOREST} * (1 + R_S)}{T_{GROWTH}} \quad (4)$$

where:

dB_{SHRUB}	Default rate of change in above-ground and below-ground shrub biomass content in abandoned agricultural land growing into shrub land; t d.m. ha ⁻¹ yr ⁻¹
$\frac{1}{2}$	Coefficient reflecting the fact that different land parcels may have been abandoned in different years (ranging from one to T_{GROWTH}) prior to the year of project start; therefore the biomass accumulation averaged over all the parcels is estimated as half of the peak biomass
F_S	Ratio of the peak above-ground shrub biomass content to the default above-ground biomass content in forest (B_{FOREST}) in the region (or country) where the project site is located; dimensionless
B_{FOREST}	Default above-ground biomass content in forest; t d.m. ha ⁻¹
R_S	Root shoot ratio for shrubs; dimensionless
T_{GROWTH}	Time taken by abandoned agricultural land growing into shrub land to stabilize to its peak biomass (20 years by default); yr

The value of default above-ground biomass content in forest (B_{FOREST}) to be used in equation 4 is determined according to guidance provided in the relevant table following paragraph 8 of this section. The value of the ratio of the peak above-ground shrub biomass content to the default above-ground biomass content in forest in the region (or country) where the project site is located (F_S) should be determined using available regional (or country level) data. If such data is not available, then a default value of $F_S=0.1$ can be used.

4.2 Carbon stock in living trees at the start of the project activity

Carbon stock in living trees at the start of the project activity is calculated as:

$$C_{TREE_BSL} = CF_{TREE_BSL} * B_{TREE_BSL} \quad (5)$$

where:

C_{TREE_BSL}	Carbon stock in living trees in the baseline at the start of the project activity; t C
CF_{TREE_BSL}	Carbon fraction of dry matter for tree biomass in baseline; t C t ⁻¹ d.m.
B_{TREE_BSL}	Biomass of living trees in the baseline at the start of the project; t d.m.

The biomass of living trees in the baseline at the start of the project activity (B_{TREE_BSL}) is estimated using any one of the following methods:

4.2.1 Estimation based on existing data

If published data is available from which biomass content per unit area for the project area can be estimated, the data may be used provided that the estimated value of biomass content per unit area does not underestimate biomass in the project area. In this case, the biomass of living trees in the baseline at the start of the project activity is calculated as:

$$B_{TREE_BSL} = BD_{TREE_BSL} * A_{TREE_BSL} \quad (6)$$

where:

B_{TREE_BSL}	Biomass of living trees in the baseline at the start of the project activity; t d.m.
BD_{TREE_BSL}	Tree biomass content per unit area of the project area (obtained from published literature); t d.m. ha ⁻¹
A_{TREE_BSL}	Area of land within the project boundary where living trees are standing at the start of the project activity; ha

4.2.2 Default estimation using parameter ratio

Under this method one of the following parameters of the existing trees in baseline is estimated (denoted by P_{BSL} in the equation below): (a) Crown cover; (b) Basal area per hectare; and (c) Stand density index. Project area may be stratified on the basis of the variability of the parameter selected.

The biomass of living trees in the baseline at the start of the project activity is then calculated as:

$$B_{TREE_BSL} = \frac{P_{BSL}}{P_{FOREST}} * B_{FOREST} * (1 + R_{TREE_BSL}) * A_{TREE_BSL} \quad (7)$$

where:

B_{TREE_BSL}	Biomass of living trees in the baseline at the start of the project activity; t d.m.
P_{BSL}	Parameter for living trees in the baseline at the start of the project activity
P_{FOREST}	The same parameter for a fully stocked forest in the region (or country) where the project activity is located
B_{FOREST}	Default above-ground biomass content in forest; t d.m. ha ⁻¹
A_{TREE_BSL}	Area of land within the project boundary where living trees are standing at the start of the project activity and to which the parameter P_{BSL} relates; ha
R_{TREE_BSL}	Root-shoot ratio of trees in the baseline; dimensionless

Value of B_{FOREST} is obtained according to guidance provided in the relevant table following paragraph 8 of this section.

4.2.3 Complete inventory of trees

If the trees in the baseline are few and scattered out, all the trees may be inventoried and dimensional measurements (of diameter or height or both) may be carried out on them. One of the methods explained in paragraph 5.1.1 of this methodology is then used for estimating the biomass of each tree. Biomass of living trees in the baseline at the start of the project is then calculated as:

$$B_{TREE_BSL} = \sum_{i=1}^n B_{TREE,i} \quad (8)$$

where:

B_{TREE_BSL} Biomass of living trees in the baseline at the start of the project activity; t d.m.

$B_{TREE,i}$ Biomass of the i^{th} tree as estimated from dimensional measurements; t d.m.

n Total number of living trees in the baseline at the start of the project activity

4.2.4 Inventory of trees in sample plots

If the number of trees in the baseline scenario is too large for a complete inventory to be carried out, sample plots are laid out and dimensional measurements are carried out on the trees in these sample plots. Project area may be stratified on the basis of the variability of tree stocking.

One of the methods explained in paragraph 5.1.1 of this methodology is then used for estimating the biomass of each tree. The biomass of living trees in the baseline at the start of the project activity is then calculated as:

$$B_{TREE_BSL} = \frac{A_{TREE}}{A_{PLOT}} \sum_p B_{TREE,p} \quad (9)$$

where:

B_{TREE_BSL} Biomass of living trees in the baseline at the start of the project activity; t d.m.

A_{TREE} Area of land within the project boundary where living trees are standing at the start of the project activity; ha

A_{PLOT} Area of sample plots where dimensional measurements are carried out on the trees; ha

$B_{TREE,p}$ Biomass of living trees in plot p as estimated from dimensional measurements; t d.m.

If project area is stratified, then the equation 9 is applied to each stratum separately and the stratum estimates are summed up to get biomass of living trees in the baseline at the start of the project activity (B_{TREE_BSL}).

4.3 Steady state under the baseline conditions

The baseline net GHG removals by sinks, if greater than zero, shall be estimated using the approach provided in Section 4.1 until steady state is reached under the baseline conditions. Under steady state:

$$\Delta C_{BSL} = 0 \quad (10)$$

PPs may, on a project specific basis, assess when a steady state is reached during the crediting period. This shall be estimated on the basis of transparent and verifiable information originating as appropriate from available literature, data from comparable areas, from field measurements in the planned project area, or from other sources relevant to the baseline circumstances. If no data is available, a default period of 20 years since commencement of the CDM project activity will be applied.

5. Actual net GHG removals by sinks

Changes in carbon stock of above-ground and below-ground biomass of non-tree vegetation in the project scenario is equal to the decrease of shrub biomass in abandoned agricultural lands where the shrub land is cleared as part of site preparation. Growth of shrub biomass in the project, if any, is conservatively accounted as zero.

Actual net GHG removals by sinks shall be calculated using the equations in this sub-section. When applying these equations for the *ex ante* calculation of net anthropogenic GHG removals by sinks, PPs shall provide estimates of the values of those parameters that are not available before the start of the crediting period.

Actual net GHG removals by sinks shall be calculated as:

$$\Delta C_{ACTUAL} = \Delta C_P - GHG_E \quad (11)$$

where:

ΔC_{ACTUAL}	Actual net GHG removals by sinks; t CO ₂ -e
ΔC_P	Sum of changes in the C stocks in all selected carbon pools including loss of initial shrub biomass; t CO ₂ -e
GHG_E	Increase in non-CO ₂ GHG emissions within the project boundary, attributable to the A/R CDM project activity; t CO ₂ -e

5.1 Estimation of changes in the carbon stocks

The verifiable changes in carbon stocks in selected carbon pool in each stratum within the project boundary are calculated using the following equation:

$$\Delta C_P = \frac{44}{12} * \left(\sum_{t=1}^{t^*} \Delta C_t - C_{TREE_BSL} \right) \quad (12)$$

where:

ΔC_P	Sum of the changes in carbon stock in all selected carbon pools in stratum <i>i</i> , since start of the project; t CO ₂ -e
ΔC_t	Change in carbon stock in all selected carbon pools, in year <i>t</i> ; t C
C_{TREE_BSL}	Carbon stock in living trees in the baseline at the start of the project activity; t C
<i>t</i>	1, 2, 3, ... <i>t</i> [*] years elapsed since the start of the A/R project activity; yr
44/12	Ratio of molecular weights of CO ₂ and carbon

Change in carbon stock in all selected carbon pools (ΔC_t) is calculated using the following equation:

$$\Delta C_t = \sum_{i=1}^{M_{PS}} (\Delta C_{TREE,i,t} + \Delta C_{SHRUB,i,t} + \Delta C_{SOC,i,t}) \quad (13)$$

where:

ΔC_t	Change in carbon stock in all selected carbon pools, in year <i>t</i> ; t C
$\Delta C_{TREE,i,t}$	Change in carbon stock in above-ground and below-ground biomass of trees in stratum <i>i</i> , in year <i>t</i> ; t C
$\Delta C_{SHRUB,i,t}$	Change (decrease only, that is, the change is negative) in carbon stock in above-ground and below-ground biomass of shrubs removed during the site preparation in stratum <i>i</i> , in year <i>t</i> ; t C

$\Delta C_{SOC,i,t}$	Change in carbon stock in the SOC pool in stratum i , in year t ; t C
i	1, 2, 3, ... M_{PS} strata in the project scenario
t	1, 2, 3, ... t^* years elapsed since the start of the A/R CDM project activity

5.1.1 Estimating change in carbon stock in tree biomass ($\Delta C_{TREE,i,t}$)

The change in carbon stock in tree biomass is estimated on the basis of field measurements in permanent sample plots at a point of time in year t_1 and again at a point of time in year t_2 . The rate of change of carbon stock in trees is calculated as:

$$dC_{TREE,i,(t_1,t_2)} = \frac{C_{TREE,i,t_2} - C_{TREE,i,t_1}}{T} \text{ for } t_1 \leq t \leq t_2 \quad (14)$$

where:

$dC_{TREE,i,(t_1,t_2)}$	Rate of change in carbon stock in above-ground and below-ground biomass of trees in stratum i , for the period between year t_1 and year t_2 ; t C yr ⁻¹
C_{TREE,i,t_2}	Carbon stock in trees in stratum i , at a point of time in year t_2 ; t C
C_{TREE,i,t_1}	Carbon stock in trees in stratum i , at a point of time in year t_1 ; t C
T	Time elapsed between two successive estimations ($T=t_2 - t_1$); yr
i	1, 2, 3, ... M_{PS} strata in the project scenario

For the first verification, $C_{TREE,i,t_1} = 0$ for all strata.

Change in carbon stock in tree biomass in year t ($t_1 \leq t \leq t_2$) is then calculated as:

$$\Delta C_{TREE,i,t} = dC_{TREE,i,(t_1,t_2)} * 1year \quad (15)$$

where:

$\Delta C_{TREE,i,t}$	Change in carbon stock in above-ground and below-ground biomass of trees in stratum i , in year t ; t C
$dC_{TREE,i,(t_1,t_2)}$	Rate of change in carbon stock in tree biomass within the project boundary during the period between a point of time in year t_1 and a point of time in year t_2 ; t C yr ⁻¹

Carbon stock in above-ground and below-ground tree biomass ($C_{TREE,i,t}$) is estimated by one of the following two methods as applied at a given point of time in year t :

- The biomass expansion factor (*BEF*) method; or
- The allometric equation method.

BEF method

In this method, first the stem volume (the commercial volume) of standing trees is estimated. *Ex ante* estimations of stem volume are based on tree growth models and *ex post* estimations are based on field

measurements. The stem volume is expanded to the above-ground tree biomass using biomass expansion factor (*BEF*) and basic wood density (*D*). Total tree biomass is then obtained by multiplying the above-ground tree biomass by $(1+R)$ where *R* is the root-shoot ratio.

The following step-by-step procedure shows practical application of this method:

Step 1: This step is applied differently for *ex ante* and *ex post* estimations.

Step 1 (a): *Ex ante* estimation

- (i) For each tree species or group of species under the project scenario, select a tree growth model from existing data or literature. Available growth models could be in form of yield tables, growth curves/equations, or growth simulation models. See paragraph 8 of Section II for guidance on selecting the growth model applicable;
- (ii) From the growth model selected, calculate the stem volume of trees per unit area according to the project planting/management plan.

Step 1 (b): *Ex post* estimation

Ex post estimation of tree biomass must be based on actual measurements carried out on all trees in the permanent sample plots. The permanent sample plots are laid out according to the approved methodological tool “Calculation of the number of sample plots for measurements within A/R CDM project activities”.

The following sub-steps apply for *ex post* estimation:

- (i) Select the volume tables (these could be in form of equations or curves) applicable to the tree species or group of species planted under the project. See paragraph 8 of Section II for exact guidance on selecting the volume tables applicable;
- (ii) Depending on the volume tables selected in the sub-step above, measure the diameter at breast height (*DBH*) and/or tree height (*H*) of all trees in the sample plots;
- (iii) Insert the above field measurements into the selected volume tables and calculate the stem volume of all trees in each sample plot.

Note: It is also possible to combine the Sub-steps (i) and (ii) above if a suitable field instrument (such as a relascope) is used.

Step 2: Convert the stem volume to total carbon stock in tree biomass using the following equation:

$$C_{TREE,j,p,i} = V_{TREE,j,p,i} * D_j * BEF_{2,j} * (1 + R_j) * CF_j \quad (16)$$

where:

$C_{TREE,j,p,i}$	Total carbon stock in trees of species or group of species <i>j</i> in sample plot <i>p</i> in stratum <i>i</i> ; t C
$V_{TREE,j,p,i}$	Stem volume of trees of species or group of species <i>j</i> in plot <i>p</i> in stratum <i>i</i> estimated by using the diameter at breast height (<i>DBH</i>) and/or tree height (<i>H</i>) as entry data into a volume table; m ³
D_j	Basic wood density of species or group of species <i>j</i> ; t d.m. m ⁻³
$BEF_{2,j}$	Biomass expansion factor for conversion of stem biomass to above-ground tree biomass for species or group of species <i>j</i> ; dimensionless
R_j	Root-shoot ratio for tree species or group of species <i>j</i> ; dimensionless

CF_j	Carbon fraction of biomass for tree species or group of species j ; t C (t d.m.) ⁻¹
j	1, 2, 3, ... tree species or group of species in the project scenario
p	1, 2, 3, ... sample plots in stratum i
i	1, 2, 3, ... strata in the project scenario

Allometric method

The allometric method directly calculates above-ground tree biomass without relating it to tree stem volume. The method depends upon availability of allometric equations which express above-ground tree biomass as a function of diameter at breast height (*DBH*) and/or tree height (*H*). Total tree biomass is then obtained by multiplying the above-ground tree biomass by $(1+R)$ where R is the root-shoot ratio.

The following step-by-step procedure shows how this method is practically applied:

Step 1: This step is applied differently for *ex ante* and *ex post* estimations.

Step 1 (a): *Ex ante* estimation

- (i) For each tree species or group of species, select an allometric equation from existing data or literature. See the relevant table in paragraph 8 of Section II for exact guidance on selecting the allometric equation applicable;
- (ii) For each tree species or group of species, select a tree growth model from existing data and literature, as explained in Sub-step 1 (a) (i) of the *BEF* method above;
- (iii) Obtain the diameter at breast height (*DBH*) and/or tree height (*H*) corresponding to the age of tree at a given time from the tree growth model selected above;
- (iv) Insert the diameter at breast height (*DBH*) and/or tree height (*H*) into the allometric equation and calculate the total above-ground tree biomass per unit area according to the project planting/management plan.

Step 1 (b): *Ex post* estimation

Ex post estimation of tree biomass must be based on actual measurements carried out on all trees in the permanent sample plots. The permanent sample plots are laid out according to the approved methodological tool “Calculation of the number of sample plots for measurements within A/R CDM project activities”.

The following sub-steps apply for *ex post* estimation.

- (i) Select an allometric equation for the tree species or group of species as described in sub-step 1 (a) (i) above;
- (ii) Depending on the allometric equation, measure the diameter at breast height (*DBH*) and/or tree height (*H*) of all trees in the permanent sample plots;
- (iii) Insert the above measurements into the allometric equation and calculate the total above-ground tree biomass for each sample plot.

Step 2: Convert the above-ground tree biomass to total carbon stock in tree biomass using the following equation:

$$C_{TREE,j,p,i} = f_j(DBH, H) * (1 + R_j) * CF_j \quad (17)$$

where:

$C_{TREE,j,p,i}$	Total carbon stock in trees of species or group of species j in sample plot p in stratum i ; t C
CF_j	Carbon fraction of biomass for tree species or group of species j ; t C (t d.m.) ⁻¹
$f_j(DBH, H)$	Allometric function returning total above-ground tree biomass on the basis of breast height (DBH) and/or height of the tree (H), for species or group of species j ; t d.m.
R_j	Root-shoot ratio for tree species or group of species j ; dimensionless
j	1, 2, 3, ... tree species or group of species in the project scenario
p	1, 2, 3, ... sample plots in stratum i
i	1, 2, 3, ... strata in the project scenario

For both the BEF method and the allometric equation method, the total carbon stock in tree biomass for each stratum is calculated as follows:

$$C_{TREE,i} = \frac{A_i}{A_{PLOT,i}} \sum_{p=1}^{P_i} \sum_{j=1}^{J_i} C_{TREE,j,p,i} \quad (18)$$

where:

$C_{TREE,i}$	Carbon stock in trees in stratum i ; t C
$C_{TREE,j,p,i}$	Carbon stock in trees of species or group of species j in plot p of stratum i ; t C
$A_{PLOT,i}$	Total area of sample plots in stratum i ; ha
A_i	Total area of stratum i ; ha
j	1, 2, 3, ... species or group of species of trees in stratum i
p	1, 2, 3, ... sample plots in stratum i in the project scenario
i	1, 2, 3, ... strata in the project scenario

Equation 18, when applied at two consecutive points of time in years t_1 and t_2 (e.g. the starting year and the ending year of a verification period), provides two values C_{TREE,i,t_1} and C_{TREE,i,t_2} which are then inserted in equation 14. It should be noted that for the first verification period C_{TREE,i,t_1} is set to zero for all strata, as the year t_1 in this case corresponds to the start of the project activity.

5.1.2 Estimation of carbon stock changes (decrease only) in shrub biomass removed during site preparation

During site preparation the shrub biomass is cleared and left on-site. Hence the carbon stock in shrub biomass is assumed to have been lost in the year in which shrubs are cleared. It is assumed that all of the shrub biomass decays within the year in which shrubs are cleared. Based on this assumption carbon stock changes (decrease only) in shrub biomass during site preparation is calculated as:

$$\Delta C_{SHRUB,i,t} = -dB_{SHRUB} * CF_S * A_{SHRUB,i,t} * T_{GROWTH} \text{ for } t = t_{PREP,i} \quad (19)$$

where:

$\Delta C_{SHRUB,i,t}$	Change (decrease only) in carbon stock in biomass of shrubs removed during the site preparation in stratum i , in year t ; t C
dB_{SHRUB}	Default rate of change in above-ground and below-ground shrub biomass content in abandoned agricultural land growing into shrub land; t d.m. ha ⁻¹ yr ⁻¹
CF_S	Carbon fraction of shrub biomass; IPCC default value 0.5 t C t ⁻¹ d.m. may be used
$A_{SHRUB,i,t}$	Area of land in stratum i from which shrubs are cleared in year t ; ha
T_{GROWTH}	Time taken by abandoned agricultural land growing into shrub land to stabilize to its peak biomass (20 years by default); yr
$t_{PREP,i}$	Year in which site preparation takes place in stratum i

Default rate of change in above-ground and below-ground shrub biomass content in abandoned agricultural land growing into shrub land (dB_{SHRUB}) is calculated as in equation 4.

5.1.3 Estimation of carbon stock changes in the soil organic carbon

For abandoned agricultural land, change in C stock in the SOC pool shall be conservatively assumed to be zero.

For agricultural land, change in C stock in the SOC pool shall either be conservatively assumed to be zero or estimated as follows:

$$\Delta C_{SOC,i,t} = \Delta SOC_{AL,t} \quad (20)$$

where:

$\Delta C_{SOC,i,t}$	Change in carbon stock in the SOC pool in stratum i , in year t ; t C
$\Delta SOC_{AL,t}$	Change in carbon stock in the SOC pool as estimated in the tool “Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities” applied to stratum i ; t C

5.2 Estimation of GHG emissions within the project boundary

The only possible increase in GHG emissions to be accounted for as a result of the implementation of the A/R CDM project activity within the project boundary is non-CO₂ GHG emissions from biomass burning for site preparation and/or forest management. It is estimated as:

$$GHG_E = \sum_{t=1}^{t^*} E_{BIOMASS_BURN,t} \quad (21)$$

where:

GHG_E	Increase in non-CO ₂ GHG emissions within the project boundary as a result of the implementation of the proposed A/R CDM project activity; t CO ₂ -e
$E_{BIOMASS_BURN,t}$	Non-CO ₂ GHG emissions due to burning of biomass of existing woody vegetation, as part of site preparation and/or forest management, in year t ; t CO ₂ -e
t	1, 2, 3, ... t^* years elapsed since the start of the A/R CDM project activity

The non-CO₂ emissions due to burning of biomass of existing woody vegetation² as part of site preparation and/or forest management ($E_{BIOMASS_BURN,t}$) shall be estimated using the latest version of the methodological tool “Estimation of GHG emissions due to clearing, burning and decay of existing vegetation attributable to a CDM A/R project activity”.

6. Leakage

Under the applicability conditions for this methodology, the project activity does not lead to a displacement of pre-project activities outside the project boundary, or the displacement activity does not lead to significant increase of GHG emissions.

Therefore, under the applicability conditions of the project activity:

$$LK = 0 \quad (22)$$

where:

LK Total GHG emissions due to leakage; t CO₂-e

If the project activity leads to displacement of pre-project activities, whether partially or fully, outside the project boundary, the PPs shall use:

- (a) “Guidelines on conditions under which increase in GHG emissions attributable to displacement of pre-project crop cultivation activities in A/R CDM project activity is insignificant”; and
- (b) “Guidelines on conditions under which increase in GHG emissions related to displacement of pre-project grazing activities in A/R CDM project activity is insignificant”,

to demonstrate that increase in GHG emissions related to displacement of the pre-project activities is insignificant.

7. Net anthropogenic GHG removals by sinks

The net anthropogenic GHG removals by sinks is the actual net GHG removals by sinks *minus* the baseline net GHG removals by sinks *minus* leakage. Therefore, the following general equation can be used to calculate the net anthropogenic GHG removals by sinks under the project:

$$C_{AR-CDM} = \Delta C_{ACTUAL} - \Delta C_{BSL} - LK \quad (23)$$

where:

C_{AR-CDM} Net anthropogenic GHG removals by sinks; t CO₂-e

ΔC_{ACTUAL} Actual net GHG removals by sinks; t CO₂-e

ΔC_{BSL} Baseline net GHG removals by sinks; t CO₂-e

LK Total GHG emissions due to leakage; t CO₂-e

7.1 Calculation of tCERs and ICERs

To calculate the CERs that can be issued at time $t^* = t_2$ (the date of verification) for the monitoring period $T = t_2 - t_1$, this methodology uses the most recent version of the equations approved by the Board,³ which produce the same estimates as the following:

² GHG emissions from burning of herbaceous vegetation are negligible (EB 42, para 35).

³ See <<http://cdm.unfccc.int/Reference/Guidclarif/>>.

$$tCERs = C_{AR-CDM,t_2} \quad (24)$$

$$lCERs = C_{AR-CDM,t_2} - C_{AR-CDM,t_1} \quad (25)$$

where:

$tCERs$ Number of units of temporary Certified Emission Reductions

$lCERs$ Number of units of long-term Certified Emission Reductions

C_{AR-CDM,t_2} Net anthropogenic GHG removals by sinks, at time $t = t_2$; t CO₂-e

C_{AR-CDM,t_1} Net anthropogenic GHG removals by sinks at beginning of the monitoring period, that is, at $t = t_1$; t CO₂-e

8. Data and parameters not monitored

In addition to the parameters listed in the tables below, the provisions relating to data and parameters contained in the tools referred to in this methodology apply.

In choosing key parameters or making important assumptions based on information that is not specific to the project circumstances, such as in use of existing published data, PPs should retain a conservative approach: that is, if different values for a parameter are equally plausible, a value that does not lead to over-estimation of net anthropogenic GHG removals by sinks should be selected.

Data / Parameter:	B_{FOREST}
Data unit:	t d.m. ha ⁻¹
Used in Equation:	4, 7
Description:	Default above-ground biomass content in forest in the region (or country) where the A/R CDM project activity is located
Source of data:	The source of data shall be selected, in order of preference, from the following: <ul style="list-style-type: none"> (a) Regional/national inventories e.g. national forest inventory, national GHG inventory; (b) Inventory from neighbouring countries with similar conditions; (c) Globally available data applicable to the project site or to the region/country where the site is located (e.g. latest FAO data); (d) IPCC default values from Table 3A.1.4 of IPCC GPG-LULUCF 2003

Data / Parameter:	$BEF_{2,j}$
Data unit:	Dimensionless
Used in Equation:	16
Description:	Biomass expansion factor for conversion of stem biomass to above-ground biomass for tree species or group of species j

Source of data:	The source of data shall be selected, in order of preference, from the following: (a) Local sources of species or group of species-specific data; (b) National sources of species or group of species-specific data (e.g. national forest inventory or national GHG inventory); (c) Species or group of species-specific data from neighbouring countries with similar conditions; (d) Globally available data applicable to species or group of species; (e) IPCC default values (e.g. Table 3A.1.10 of IPCC GPG-LULUCF 2003) ⁴
Comments:	<i>BEFs</i> in IPCC literature and national forest inventories are usually applicable to closed canopy forests. If applied to individual trees growing in open field, it is recommended that the selected <i>BEF</i> ₂ be increased by 30%

Data / Parameter:	BD_{TREE_BSL}
Data unit:	t d.m. ha ⁻¹
Used in Equation:	6
Description:	Tree biomass content per unit area of the project area, in baseline (obtained from published literature)
Source of data:	Published data may relate to the project area or to another area similar to the project area. If published data is in terms of volume and not in terms of biomass, or the biomass data does not include the below-ground biomass, then transparent and verifiable method using suitable parameters may be used for calculating the tree biomass per unit area from the available data

Data / Parameter:	CF_s
Data unit:	t C t ⁻¹ d.m.
Used in Equation:	2, 19
Description:	Carbon fraction of shrub biomass
Source of data:	IPCC default value of 0.50 t C t ⁻¹ d.m. may be used

Data / Parameter:	CF_j
Data unit:	t C t ⁻¹ d.m.
Used in Equation:	16, 17
Description:	Carbon fraction of tree biomass for species or group of species <i>j</i>
Source of data:	The source of data, in order of preference, shall be the following: (a) National level species or group of species-specific data (e.g. from national GHG inventory); (b) Species or group of species-specific data from neighbouring countries with similar conditions; (c) Globally available data (e.g. IPCC GPG-LULUCF 2003); (d) The IPCC default value of 0.5 t C t ⁻¹ d.m.

Data / Parameter:	CF_{TREE_BSL}
Data unit:	t C t ⁻¹ d.m.
Used in Equation:	5
Description:	Carbon fraction of dry matter for tree biomass in baseline
Source of data:	IPCC default value 0.50 t C t ⁻¹ d.m. may be used

⁴ Although the *BEFs* in Table 3A.1.10 apply to biomass, the dimensionless factors can be equally applied for wood volume expansions.

Data / Parameter:	D_j
Data unit:	t d.m. m ⁻³
Used in Equation:	16
Description:	Basic wood density for species or group of species j
Source of data:	The source of data, in order of preference, shall be any of the following: <ul style="list-style-type: none"> (a) National and species or group of species-specific data (e.g. from national forest inventory or national GHG inventory); (b) Species or group of species-specific data from neighbouring countries with similar conditions; (c) Globally available species or group of species-specific data (e.g. Table 3A.1.9 IPCC GPG-LULUCF 2003)

Data / Parameter:	$f_j(DBH, H)$
Data unit:	t d.m.
Used in Equation:	17
Description:	Allometric function returning total above-ground tree biomass on the basis of breast height (DBH) and/or height of the tree (H), for species or group of species j
Source of data:	The source of data, in order of preference, shall be any of the following: <ul style="list-style-type: none"> (a) Existing local and species or group of species-specific data; (b) National and species or group of species-specific data (e.g. national forest inventory or national GHG inventory); (c) Species or group of species-specific data from neighbouring countries with similar conditions; (d) Globally available data applicable to species or group of species (e.g. Tables 4.A.1–4.A.3 of IPCC GPG-LULUCF 2003)

Data / Parameter:	R_j
Data unit:	Dimensionless
Used in Equation:	16, 17
Description:	Root-shoot ratio for species or group of species j
Source of data:	The source of data, in order of preference, shall be any of the following: <ul style="list-style-type: none"> (a) Existing local and species or group of species-specific data; (b) National and species or group of species-specific data (e.g. national forest inventory or national GHG inventory); (c) Species or group of species-specific data from neighbouring countries with similar conditions; (d) Globally available data applicable to species or group of species growing under similar conditions or similar forest type. <p>If none of the above sources are available, then the value of R_j may be calculated as B/A where $B = \exp[-1.085 + 0.9256 \cdot \ln(A)]$, where A is above-ground biomass (t d.m. ha⁻¹) and B is below-ground biomass (t d.m. ha⁻¹) [Source: Table 4.A.4 of IPCC GPG-LULUCF 2003]</p>

Data / Parameter:	R_s
Data unit:	Dimensionless
Used in Equation:	4
Description:	Root-shoot ratio for shrubs

Source of data:	The source of data, in order of preference, shall be any of the following: (a) Existing local and species or group of species-specific data; (b) National and species or group of species-specific data (e.g. national forest inventory or national GHG inventory); (c) Species or group of species-specific data from neighbouring countries with similar conditions; (d) Globally available data applicable to species or group of species. If none of the above sources are available, then a default value of 0.40 may be used [Table 4.4 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories]
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Data / Parameter:	R_{TREE_BSL}
Data unit:	dimensionless
Used in Equation:	7
Description:	Root-shoot ratio for the trees in the baseline
Source of data:	The source of data, in order of preference, shall be any of the following: (a) Existing local and species or group of species-specific data; (b) National and species or group of species-specific data (e.g. national forest inventory or national GHG inventory); (c) Species or group of species-specific data from neighbouring countries with similar conditions; (d) Globally available data applicable to species or group of species growing under similar conditions or similar forest type. If none of the above sources are available, then the value of R_{TREE_BSL} may be calculated as B/A where $B = \exp[-1.085 + 0.9256 \cdot \ln(A)]$, where A is above-ground biomass (t d.m. ha ⁻¹) and B is below-ground biomass (t d.m. ha ⁻¹) [Source: Table 4.A.4 of IPCC GPG-LULUCF 2003]

Data / Parameter:	T_{GROWTH}
Data unit:	year
Used in Equation:	2, 3, 4, 19
Description:	Time period in which shrub land biomass in an abandoned agricultural land stabilises to its maximum value
Source of data:	A default value of 20 years is used

Data / Parameter:	$V_{TREE,j,p,i}$
Data unit:	m ³
Used in Equation:	16
Description:	Stem volume of trees of species or group of species j in plot p in stratum i estimated by using the diameter at breast height (DBH) and/or tree height (H) as entry data into a volume table

Source of data:	The source of data, in order of preference, shall be the following: (a) Existing local and species or group of species-specific tree growth data or local volume tables; (b) National and species or group of species-specific tree growth data or standard volume tables (e.g. from national forest inventory or national GHG inventory); (c) Species or group of species-specific tree growth data or volume tables from neighbouring countries with similar conditions; (d) Globally available data applicable to species or group of species
Comments:	In case of <i>ex ante</i> estimation, it would not be possible to measure diameter of trees to be used in volume tables. In such cases, species-specific or group of species-specific age-diameter curves from local/national sources may be used to estimate the diameter at a given point of time. Age of trees in baseline may be estimated from historical records, participatory appraisal, or tree dendrometry methods

III. MONITORING METHODOLOGY

All data collected as part of monitoring shall be archived electronically and be kept at least for two years after the end of the last crediting period. One hundred percent of the data should be monitored if not indicated otherwise in the tables below. All measurements should be conducted according to relevant standards. In addition, the monitoring provisions in the tools referred to in this methodology apply.

1. Monitoring of project implementation

Information shall be provided, and recorded in the project design document (PDD), to establish that:

- (a) The geographic coordinates of the project boundary (and any stratification inside the boundary) are established, recorded and archived;
- (b) Commonly accepted principles of forest inventory and management in the host country are implemented. In absence of these, standard operating procedures (SOPs) and quality control/quality assurance (QA/QC) procedures for inventory operations, including field data collection and data management, shall be identified, recorded and applied. Use or adaptation of SOPs available from published handbooks, or from the *IPCC GPG LULUCF 2003*, is recommended;
- (c) The forest planting and management plan, together with a record of the plan as actually implemented during the project, shall be available for validation and/or verification.

2. Sampling design and stratification

Stratification of the project area into relatively homogeneous units can either increase the measuring precision without increasing the cost unduly or reduce the cost without reducing measuring precision because of the lower variance within each homogeneous unit. PPs should present in the AR-CDM-PDD an *ex ante* stratification of the project area or justify the lack of it. The number and boundaries of the strata defined *ex ante* may change during the crediting period (*ex post*).

2.1 Updating of strata

The *ex post* stratification shall be updated for the following reasons:

- (a) Unexpected disturbances occurring during the crediting period (e.g. due to fire, pests or disease outbreaks) that have differing impacts on various parts of an originally homogeneous stratum;

- (b) Forest management activities (cleaning, planting, thinning, harvesting, re-planting) that are implemented in a way that affects the existing stratification.

Established strata may be merged if reasons for their establishing have disappeared.

2.2 Precision requirements

The required precision level for biomass estimation is $\pm 10\%$ of the mean at a 90% confidence level. PPs may use the latest version of the approved tool for “Calculation of the number of sample plots for measurements within A/R CDM project activities” to determine the sample size and allocation of sample plots among strata.

3. Data and parameters monitored

The following data and parameters should be monitored during the project activity. When applying all relevant equations provided in this methodology for the *ex ante* calculation of net anthropogenic GHG removals by sinks, PPs shall provide transparent estimations for the data and parameters that are monitored during the crediting period. These estimations shall be based on measured or existing published data where possible, using a conservative approach: that is, if different values for a parameter are equally plausible, a value that does not lead to over-estimation of net anthropogenic GHG removals by sinks should be selected.

Data / Parameter:	A_{AB}
Data unit:	ha
Used in Equation:	2
Description:	Area of abandoned agricultural land growing into shrub land at the start of the project activity
Source of data:	Field measurement
Measurement procedures (if any):	See paragraph 1(b) of Section III
Monitoring frequency:	Measured in the year in which the project activity starts
QA/QC procedures:	See paragraph 1(b) of Section III

Data / Parameter:	A_i
Data unit:	ha
Used in Equation:	18
Description:	Area of stratum i
Source of data:	Delineation of strata boundaries shall be done preferably using a Geographical Information System (GIS) which allows for integrating data from different sources (including GPS coordinates and remotely sensed data)
Measurement procedures (if any):	See paragraph 1(b) of Section III
Monitoring frequency:	Every five years since the year of the first verification
QA/QC procedures:	See paragraph 1(b) of Section III

Data / Parameter:	$A_{PLOT,i}$
Data unit:	ha
Used in Equation:	18
Description:	Total area of sample plots in stratum i
Source of data:	Field measurement

Measurement procedures (if any):	See paragraph 1(b) of Section III
Monitoring frequency:	Every five years since the year of the first verification
QA/QC procedures:	See paragraph 1(b) of Section III

Data / Parameter:	$A_{SHRUB,i,t}$
Data unit:	ha
Used in Equation:	19
Description:	Area of shrub land in stratum i from which shrubs are cleared in year t
Source of data:	Field measurement
Measurement procedures (if any):	See paragraph 1(b) of Section III
Monitoring frequency:	Measured in the year in which shrubs are cleared
QA/QC procedures:	See paragraph 1(b) of Section III

Data / Parameter:	DBH
Data unit:	Any unit of length used in the model or data source used
Used in Equation:	Implicitly used in equations 16 and 17
Description:	Usually the diameter at breast height of the tree; but it could be any other diameter or dimensional measurement used in the model or data source used, e.g. basal diameter, root-collar diameter, basal area, etc.
Source of data:	Field measurements in sample plots. For <i>ex ante</i> estimations, DBH values should be estimated for tree species or group of species j in stratum i , at time t using a growth curve, a growth model, or a yield table that gives the expected tree dimensions as a function of tree age
Measurement procedures (if any):	Typically measured 1.3 m above-ground. Measure all the trees above some minimum DBH in the permanent sample plots. The minimum DBH varies depending on tree species or group of species and climate; for instance, the minimum DBH may be as small as 2.5 cm for arid environments where trees grow slowly, whereas it could be up to 10 cm for humid environments where trees grow rapidly
Monitoring frequency:	Every five years since the year of the first verification
QA/QC procedures:	See paragraph 1(b) of Section III

Data / Parameter:	H
Data unit:	Any unit of length used in the model or data source used
Used in Equation:	Implicitly used in equations 16 and 17
Description:	Height of tree
Source of data:	Field measurements in sample plots. For <i>ex ante</i> estimations, H values should be estimated for tree species or group of species j in stratum i , at time t using a growth curve, a growth model, or a yield table that gives the expected tree dimensions as a function of tree age
Measurement procedures (if any):	Models used may be based on total tree height (top height) or height of stem (clear bole height). The relevant dimension should be measured and used

Monitoring frequency:	Every five years since the year of the first verification
QA/QC procedures:	See paragraph 1 (b) of Section III
Comments:	Models used may be based on units of length other than metre (e.g. feet), in which case the appropriate unit of length only should be used

Data / Parameter:	<i>T</i>
Data unit:	year
Used in Equation:	14
Description:	Time period elapsed between two successive estimations of carbon stock in trees
Source of data:	Recorded time
Measurement procedures :	N/A
Comments:	If the two successive estimations of carbon stock in trees are carried out at different points of time in year t_2 and t_1 , (e.g. in the month of April in year t_1 and in the month of September in year t_2), then a fractional value shall be assigned to <i>T</i>

4. Conservative approach and uncertainties

While applying this methodology the PPs shall ensure that “Guidelines on conservative choice and application of default data in estimation of the net anthropogenic GHG removals by sinks” are followed for addressing uncertainty.

In choosing key parameters or making important assumptions based on information that is not specific to the project circumstances, such as in use of default data, PPs should select values that will lead to an accurate estimation of net GHG removals by sinks, taking into account uncertainties. If uncertainty is significant, PPs should choose data such that it tends to under-estimate, rather than over-estimate, net anthropogenic GHG removals by sinks.

5. References

All references are quoted in footnotes.

History of the document

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01.0.0	EB 58, Annex # 26 November 2010	To be considered at EB 58.
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