AR-AMS0003

Simplified baseline and monitoring methodology for small scale CDM afforestation and reforestation project activities implemented on wetlands

(Version 02.0.0)

I. SOURCE, DEFINITIONS AND APPLICABILITY

1. Source

This methodology uses the latest versions of the following procedures, tools, guidelines and guidances:

- Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities;
- Guidance on application of the definition of the project boundary to A/R CDM project activities;
- Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities;
- Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity;
- Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity.

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

2. Definitions

This methodology uses the following methodology-specific definitions:

(a) "Wetland" means wetland as defined in "Annex A: Glossary" of the IPCC GPG LULUCF 2003;

(b) "Soil disturbance attributable to the A/R CDM project activity" is any activity that impacts the soil profile, e.g. ploughing, ripping, scarification, digging of pits and trenches, stump removal, bulldozing, peat extraction, grading, compacting, and drainage of soil;

(c) "Planting" means propagation of tree or shrub species on land subject to project activity, and includes propagation using any of the following: (i) Nursery raised seedlings or saplings; (ii) Propagules; (iii) Direct sowing of seeds; (iv) Human-induced promotion of natural regeneration.

For definition of all other terms used in this methodology the following sources should be referred to:

(a) Modalities and procedures for afforestation and reforestation project activities under the clean development mechanism (A/R CDM modalities and procedures) as contained in the annex to decision 5/CMP.1;

(b) "Annex A: Glossary" of the Good Practice Guidance for Land Use, Land-Use Change and Forestry by the Intergovernmental Panel on Climate Change, 2003 (IPCC GPG LULUCF 2003);

(c) Glossary of CDM terms.[1]

3. Applicability

This methodology is applicable under the following conditions:

(a) The land subject to the project activity falls under one of the following wetland categories:

(i) Intertidal wetlands (e.g. mangrove habitats) with a tree crown cover that is less than 20% of the minimum tree crown cover adopted by the host Party for the purpose of definition of forest under the CDM;

(ii) Flood plain areas on inorganic soils;

(iii) Seasonally flooded areas on margin of water bodies/reservoirs;

(b) The project activity does not lead to alteration of the water regime[2] of the project area or areas hydrologically connected to the project area;

(c) Soil disturbance attributable to the A/R CDM project activity does not exceed 10% of the project area;

(d) The land subject to the project activity does not contain peat[3] soils (histosols).

4. Best practice option

Where the potential vegetation community in the project area is multi-species and/or zoned, planting should, as far as possible, be designed to re-establish the multi-species composition and/or zonation, taking into account the ecological requirements of each species concerned.

5. Scope covered under appendix B of annex to decision 6/CMP.1

This simplified baseline and monitoring methodology allows the following types of small-scale afforestation or reforestation project activities as listed in appendix B of the annex to decision 6/CMP.1, paragraph 4:

(c) Wetland to forested land.

[1] Available at <http://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf>.

[2] For the purpose of this methodology any change in water regime in the project area resulting from changes in the carbon pools due to the A/R CDM project activity is not considered a change in water regime.

[3] Peat soil as defined in "Annex A: Glossary" of the IPCC GPG LULUCF 2003.

Small-scale afforestation or reforestation project activities implemented on other lands, including those mentioned under paragraphs 4(a), 4(b), and 4(d) of the appendix B, are covered by the simplified baseline and monitoring methodology AR-AMS0007 "Small-scale A/R CDM project activities implemented on lands other than wetlands".

II. BASELINE AND MONITORING METHODOLOGY

1. Project boundary and eligibility of land

The "project boundary" geographically delineates the afforestation or reforestation project activity under the control of the project participants (PPs). The A/R CDM project activity may contain more than one discrete area of land. Each discrete area of land shall have a unique geographical identification.

The "Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities" shall be used for demonstrating that each discrete area of land to be included in the project boundary is eligible for an A/R CDM project activity.

The "Guidance on application of the definition of the project boundary to A/R CDM project activities" may be applied in identification of areas of land planned for an A/R CDM project activity.

The carbon pools selected for accounting of carbon stock changes are shown in Table 1.

Table 1: Carbon pools selected for accounting of carbon stock changes

Carbon pool	Whether selected	Justification/Explanation
Above-ground biomass	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity
Below-ground biomass	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity
Dead wood	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity
Litter	No	Litter biomass may be subjected to high turnover and displacement due to hydraulic movement. It is a conservative choice to exclude the pool from accounting because the project activity will not decrease the rate of accumulation of the litter
Soil organic carbon (SOC)	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity

The emission sources and associated GHGs selected for accounting of GHG emissions are shown in Table 2.

Table 2: Emission sources and GHGs selected for accounting of GHG emissions

Sources	Gas	Whether Selected	Justification/Explanation
Burning of woody biomass	CO_2	No	CO_2 emissions due to burning of biomass are accounted as a change in carbon stock
	CH_4	Yes	CH_4 emissions due to burning of biomass can be significant
	N_2O	Yes	N_2O emissions due to burning of biomass can be significant
Change in water regime of the project area	CO_2	No	The applicability conditions of the methodology do not allow any change in water regime of the project area or areas hydrologically connected to the project area
	CH_4	No	
	N_2O	No	

2. Identification of the baseline scenario and demonstration of additionality

The baseline scenario of a small-scale A/R CDM project activity implemented under this methodology is continuation of the pre-project land use.

PPs shall demonstrate that the project activity is additional using the barrier analysis outline contained in appendix 1 of this methodology.

3. Stratification

If the project area is not homogeneous, stratification should be carried out to improve the precision of carbon stock estimations. Different stratifications may be required for the baseline and project scenarios in order to achieve optimal precision of estimation of net GHG removals by sinks. In particular:

(a) For baseline net GHG removals by sinks, it is usually sufficient to stratify the area according to major vegetation types and their crown cover and/or land use type;

(b) For actual net GHG removals by sinks the stratification for ex ante estimations is based on the project planting/management plan and/or tidal regime. Stratification for ex post estimations is based on the actual implementation of the project planting/management plan taking into account the tidal regime. If natural or anthropogenic impacts (e.g. local fires) or other factors (e.g. soil type) significantly alter the pattern of carbon stock distribution in the project area, then the ex post stratification is revised accordingly.

Remotely sensed data reflecting the situation close to the time of project start and/or the occurrence of natural or anthropogenic impacts may be used for ex ante and ex post stratification.

4. Baseline net GHG removals by sinks

The baseline net GHG removals by sinks is calculated as follows:

$$\Delta C_{BSL,t} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} \quad (1)$$

where:

$\Delta C_{BSL,t}$	Baseline net GHG removals by sinks in year *t*; tCO_2-e
$\Delta C_{TREE\_BSL,t}$	Change in carbon stock in baseline tree biomass within the project boundary in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e
$\Delta C_{SHRUB\_BSL,t}$	Change in carbon stock in baseline shrub biomass within the project boundary in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities; tCO_2-e

5. Actual net GHG removals by sinks

The actual net GHG removals by sinks is calculated as follows:

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t} \quad \textbf{(2)}$$

where:

$\Delta C_{ACTUAL,t}$	Actual net GHG removals by sinks, in year *t*; tCO_2-e
$\Delta C_{P,t}$	Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; tCO_2-e
$GHG_{E,t}$	Non-CO_2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year *t*, as calculated in the tool "Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"; tCO_2-e

Change in the carbon stocks in project, occurring in the selected carbon pools, is calculated as follows:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{SOC\_PROJ,t} \quad \textbf{(3)}$$

where:

$\Delta C_{P,t}$	Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; tCO_2-e
$\Delta C_{TREE\_PROJ,t}$	Change in carbon stock in tree biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e
$\Delta C_{SHRUB\_PROJ,t}$	Change in carbon stock in shrub biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e

$\Delta C_{DW\_PROJ,t}$ Change in carbon stock in dead wood in project in year *t*, estimated as 5% of the change in above-ground living tree biomass in project in year *t* as calculated using Equation (13) or Equation (26) of the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; tCO_2-e

$\Delta C_{SOC\_PROJ,t}$ Change in carbon stock in the soil organic carbon (SOC) pool within the project boundary, in year *t*; tCO_2-e

The change in carbon stock in the SOC pool within the project boundary, in year *t*, is estimated as:

$$\Delta SOC_{PROJ,t} = \frac{44}{12} * \sum_{t=1}^{t} A_{PLANT,t} * dSOC_t * 1 year \quad \textbf{(4)}$$

where:

$\Delta SOC_{PROJ,t}$ Change in SOC stock within the project boundary, in year *t*; tCO_2-e

$A_{PLANT,t}$ Area planted in year *t*; ha

$dSOC_t$ The rate of change in SOC stocks within the project boundary, in year *t*; t C ha^{-1} $yr^{-}1$

The following default value of $dSOC_t$ is used, unless transparent and verifiable information can be provided to justify a different value:

(i) $dSOC_t$ = 0.50 t C ha^{-1} yr^{-1} for $t = t_{PLANT}$ to $t = t_{PLANT}$ + 20 years, where t_{PLANT} is the year in which planting takes place;

(ii) $dSOC_t$ = 0 t C ha^{-1} yr^{-1} for t > t_{PLANT} +20

6. Leakage

Under applicability conditions of this methodology the only leakage emissions that can occur are the GHG emissions due to displacement of pre-project activities.

Leakage emissions are therefore estimated as follows:

$$LK_t = LK_{AGRIC,t} \quad \textbf{(5)}$$

where:

LK_t GHG emissions due to leakage, in year *t*; tCO_2-e

$LK_{AGRIC,t}$ Leakage due to the displacement of agricultural activities in year *t*, as calculated in the tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity"; tCO_2-e

7. Net anthropogenic GHG removals by sinks

The net anthropogenic GHG removals by sinks is calculated as follows:

$$\Delta C_{AR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t \quad (6)$$

where:

$\Delta C_{AR-CDM,t}$	Net anthropogenic GHG removals by sinks, in year *t*; tCO_2-e
$\Delta C_{ACTUAL,t}$	Actual net GHG removals by sinks, in year *t*; tCO_2-e
$\Delta C_{BSL,t}$	Baseline net GHG removals by sinks, in year *t*; tCO_2-e
LK_t	GHG emissions due to leakage, in year *t* ; tCO_2-e

7.1 Calculation of tCERs and lCERs

The *tCERs* and *lCERs* for a verification period $T = t_2 - t_1$, (where t_1 and t_2 are the years of the start and the end, respectively, of the verification period) are calculated as follows:

$$tCER_{t_2} = \sum_{1}^{t_2} \Delta C_{AR-CDM,t} \quad (7)$$

$$lCER_{t_2} = \sum_{t_1+1}^{t_2} \Delta C_{AR-CDM,t} \quad (8)$$

where:

$tCER_{t_2}$	Number of units of temporary certified emission reductions (tCERs) issuable in year t_2
$lCER_{t_2}$	Number of units of long-term certified emission reductions (lCERs) issuable in year t_2
$\Delta C_{AR-CDM,t}$	Net anthropogenic GHG removals by sinks, in year *t*; tCO_2-e
t_1, t_2	The years of the start and the end, respectively, of the verification period

If $lCER_{t_2} < 0$ then $lCER_{t_2}$ represents the number of *lCERs* that are replaced because of a reversal of net anthropogenic greenhouse gas removals by sinks since the previous issuance.

III. MONITORING PROCEDURE

1. Monitoring plan

The monitoring plan shall provide for collection of all relevant data necessary for baseline determination, monitoring of changes in carbon stocks, monitoring of project emissions and leakage emissions, and archival of such data up to two years after the end of the last crediting period. All measurements should be conducted according to relevant standards. In addition, the monitoring requirements contained in the tools applied shall be met.

2. Monitoring of project implementation

Information shall be provided, and recorded in the project design document (PDD), to establish that commonly accepted principles and practices of forest inventory and forest management in the host country are implemented. In the 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.

3. Sampling design and stratification

An ex ante stratification, if needed, should be presented in the PDD. Further considerations relating to stratification and sampling are included in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities".

4. Precision requirements

Maximum allowable relative margin of error of the mean for estimation of tree biomass is ± 10% at 90% confidence level.

5. Data requirements under the methodology

Description of data and parameters can be found in the tools used in this methodology.

All the data and parameters obtained from measurement shall be monitored every five years from the date of the initial verification.

IV. REFERENCES

IPCC, 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories,* prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan. URL: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

IPCC, 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, prepared by the National Greenhouse Gas Inventories Programme, Jim Penman, Michael Gytarsky, Taka Hiraishi, Thelma Krug, Dina Kruger, Riitta Pipatti, Leandro Buendia, Kyoko Miwa, Todd Ngara (eds). Published: IGES, Japan. URL: <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html>.

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Appendix 1

Assessment of additionality

1. Project participants shall demonstrate that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barriers, other than economic/financial barriers, inter alia:

(i) Debt funding not available for this type of project activity;

(ii) No access to international capital markets due to real or perceived risks associated with domestic or foreign direct investment in the country where the project activity is to be implemented;

(b) Institutional barriers, inter alia:

(i) Risk relating to changes in government policies or laws;

(ii) Lack of enforcement of legislation relating to forest or land-use;

(c) Technological barriers, inter alia:

(i) Lack of access to planting materials;

(ii) Lack of infrastructure for implementation of the technology;

(d) Barriers relating to local tradition, inter alia:

(i) Traditional knowledge or lack thereof, of laws and customs, market conditions, practices;

(ii) Traditional equipment and technology;

(e) Barriers due to prevailing practice, inter alia:

(i) The project activity is the "first of its kind". No project activity of this type is currently operational in the host country or region;

(f) Barriers due to local ecological conditions, inter alia:

(i) Degraded soil (e.g. water/wind erosion, salinization);

(ii) Catastrophic natural and/or human-induced events (e.g. land slides, fire);

(iii) Unfavourable meteorological conditions (e.g. early/late frost, drought);

(iv) Pervasive opportunistic species or group of species preventing regeneration of trees (e.g. grasses, weeds);

(v) Unfavourable course of ecological succession;

(vi) Biotic pressure in terms of grazing, fodder collection, etc.

(g) Barriers due to social conditions, inter alia:

(i) Demographic pressure on the land (e.g. increased demand on land due to population growth);

(ii) Social conflict among interest groups in the region where the project activity takes place;

(iii) Widespread illegal practices (e.g. illegal grazing, non-timber product extraction and tree felling);

(iv) Lack of skilled and/or properly trained labour force;

(v) Lack of organization of local communities.

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