AR-AMS0007

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

I. SOURCE, DEFINITIONS AND APPLICABILITY

1. Source

This methodology consolidates the following simplified baseline and monitoring methodologies for small-scale A/R CDM project activities:

- AR-AMS0001 "Simplified baseline and monitoring methodologies for small-scale A/R CDM project activities implemented on grasslands or croplands with limited displacement of pre-project activities";
- AR-AMS0002 "Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the CDM implemented on settlements";
- AR-AMS0004 "Approved simplified baseline and monitoring methodology for small-scale agroforestry afforestation and reforestation project activities under the clean development mechanism";
- AR-AMS0005 "Approved simplified baseline and monitoring methodology for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on lands having low inherent potential to support living biomass";
- AR-AMS0006 "Approved simplified baseline and monitoring methodology for small-scale silvopastoral afforestation and reforestation project activities under the clean development mechanism".

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 carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities;
- Tool for estimation of change in soil organic carbon stocks due to the implementation of 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 specific definitions:

> "Soil disturbance" is any activity that results in release of soil organic carbon (SOC) into the atmosphere, e.g. ploughing, ripping, scarification, digging of pits and trenches, stump removal, drainage of soil, etc.

For definition of all other terms used in this methodology the project participants (PPs) should refer to the following sources:

(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 conditions

This methodology is applicable under the following conditions:

(a) The land subject to the project activity does not fall into wetland[2] category;

(b) Soil disturbance attributable to the A/R CDM project activity does not cover more than 10% of area in each of the following types of land, when these lands are included within the project boundary:

(i) Land containing organic soils as defined in "Annex A: Glossary" of the IPCC GPG LULUCF 2003;

(ii) Land which, in the baseline, is subjected to land-use and management practices and receives inputs as listed in appendix 2 and appendix 3 to this methodology.

In addition to the above applicability conditions, the conditions contained in the procedures, tools, guidelines and guidances shall apply when these are used along with the methodology.

[1] Available at <http://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf>.
[2] "Wetlands" as defined in "Annex A: Glossary" of the IPCC GPG LULUCF 2003.

4. 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 annex to decision 6/CMP.1, paragraph 4:

(a) Grassland to forested land;

(b) Cropland to forested land;

(d) Settlement to forested land.

This simplified baseline and monitoring methodology also applies to small-scale afforestation or reforestation project activities implemented on any other type of land except wetland.

Small-scale afforestation or reforestation project activities implemented on wetlands, as provided under paragraph 4(c) of appendix B, are covered by the simplified baseline and monitoring methodology AR-AMS0003 "Small-scale A/R CDM project activities implemented on 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 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 Litter Soil organic carbon (SOC)	Yes (alternatively No)	Carbon stock in these pools may increase due to implementation of the project activity. The methodology also provides the conservative choice of not accounting for carbon stock changes in any of these pools if such choice is identical for both the baseline and the project scenarios

Changes in carbon stock in pools not selected by the PPs shall be set to zero while applying this methodology.

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

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 biomass distribution over the project area is not homogeneous, stratification should be carried out to improve the precision of biomass estimation. Different stratifications may be required for the baseline and the project scenarios. In particular:

(a) For baseline net greenhouse gas (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 types;

(b) For actual net GHG removals by sinks the stratification for ex ante estimations is based on the project planting/management plan and the stratification for ex post estimations is 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) significantly alter the pattern of biomass 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:

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

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
$\Delta C_{DW\_BSL,t}$	Change in carbon stock in baseline dead-wood biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e
$\Delta C_{LI\_BSL,t}$	Change in carbon stock in baseline litter biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter 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
$GHG_{E,t}$	Increase in 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, in year *t* is calculated as follows:

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

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 biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e
$\Delta C_{LI\_PROJ,t}$	Change in carbon stock in litter biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; tCO_2-e
$\Delta SOC_{AL,t}$	Change in carbon stock in SOC in project, in year *t*, 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"; tCO_2-e

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:

$$LK_t = LK_{AGRIC,t} \quad \textbf{(4)}$$

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:

$$\Delta C_{AR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t \quad \textbf{(5)}\#$$

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:

$$tCER_{t_2} = \sum_{1}^{t_2} \Delta C_{AR-CDM,t} \quad \textbf{(6)}\#$$

$$lCER_{t_2} = \sum_{t_1+1}^{t_2} \Delta C_{AR-CDM,t} \quad \textbf{(7)}\#$$

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 shall be replaced because of a reversal of net anthropogenic GHG removals by sinks since the previous certification. #

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 above-ground 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 AND ANY OTHER INFORMATION

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 (PPs) 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.

Appendix 2: Croplands in which soil disturbance is restricted[3] (see paragraph I.3(b)(ii))

Region	Land use	Management	Inputs
Boreal	Long-term cultivated cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High without manure
			High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High without manure
			High with manure
Temperate, cold, dry	Long-term cultivated cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	Medium
			High without manure
Temperate, cold, moist	Long-term cultivated cropland	Reduced tillage	High with manure
		No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High without manure
			High with manure
Temperate, warm, dry	Long-term cultivated cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	Medium
			High without manure
Temperate, warm, moist	Long-term cultivated cropland	Reduced tillage	High with manure
		No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High with manure
		No-till	High without manure
			High with manure

[3] Adapted from *2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

Region	Land use	Management	Inputs
Tropical, dry	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	Medium
			High without manure
			High with manure
		No-till	All
Tropical, moist	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High without manure
			High with manure
		No-till	High without manure
			High with manure
Tropical, montane	Long-term cultivated cropland	No-till	High with manure
	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High without manure
			High with manure
		No-till	Medium
			High without manure
			High with manure
Tropical, wet	Short-term or set aside cropland	Full tillage	High with manure
		Reduced tillage	High without manure
			High with manure
		No-till	High without manure
			High with manure

Appendix 3: Grasslands in which soil disturbance is restricted[4] (see paragraph I.3 (b)(ii))

Temperature/Moisture Regime	Management
Boreal	Improved
	Non-degraded
	Moderately degraded
Temperate, cold, dry	Improved
	Non-degraded
	Moderately degraded
Temperate, cold, moist	Improved
	Non-degraded
	Moderately degraded
Temperate, warm, dry	Improved
	Non-degraded
	Moderately degraded
Temperate, warm, moist	Improved
	Non-degraded
	Moderately degraded
Tropical, dry	Improved
	Non-degraded
Tropical, moist	Improved
	Non-degraded
	Moderately degraded
Tropical, montane	Improved
	Non-degraded
	Moderately degraded
Tropical, wet	Improved
	Non-degraded
	Moderately degraded

[4] *Ibid.*

History of the document

Version	Date	Nature of revision(s)
02.0.0	20 July 2012	EB 68, Annex 29 The revision: (i) consolidates the small-scale A/R CDM methodologies: • AR-AMS0001 "Simplified baseline and monitoring methodologies for small-scale A/R CDM project activities implemented on grasslands or croplands with limited displacement of pre-project activities"; • AR-AMS0002 "Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the CDM implemented on settlements"; • AR-AMS0004 "Approved simplified baseline and monitoring methodology for small-scale agroforestry afforestation and reforestation project activities under the clean development mechanism"; • AR-AMS0005 "Approved simplified baseline and monitoring methodology for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on lands having low inherent potential to support living biomass"; • AR-AMS0006 "Approved simplified baseline and monitoring methodology for small-scale silvopastoral afforestation and reforestation project activities under the clean development mechanism"; (ii) incorporates the use of the approved tools to broaden the choice of carbon pools and to allow alternative approaches, including simplified approaches based on default values of parameters, for estimation of changes in carbon stocks in the pools; (iii) and changes the title from AR-AMS0007 "Simplified baseline and monitoring methodology for small-scale A/R CDM project activities implemented on grasslands or croplands" to AR-AMS0007 "Simplified baseline and monitoring methodology for small scale CDM afforestation and reforestation project activities implemented on lands other than wetlands". Due to overall modification of the document, no highlights of the changes are provided.
01	EB 56, Annex 10 17 September 2010	Initial adoption.
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