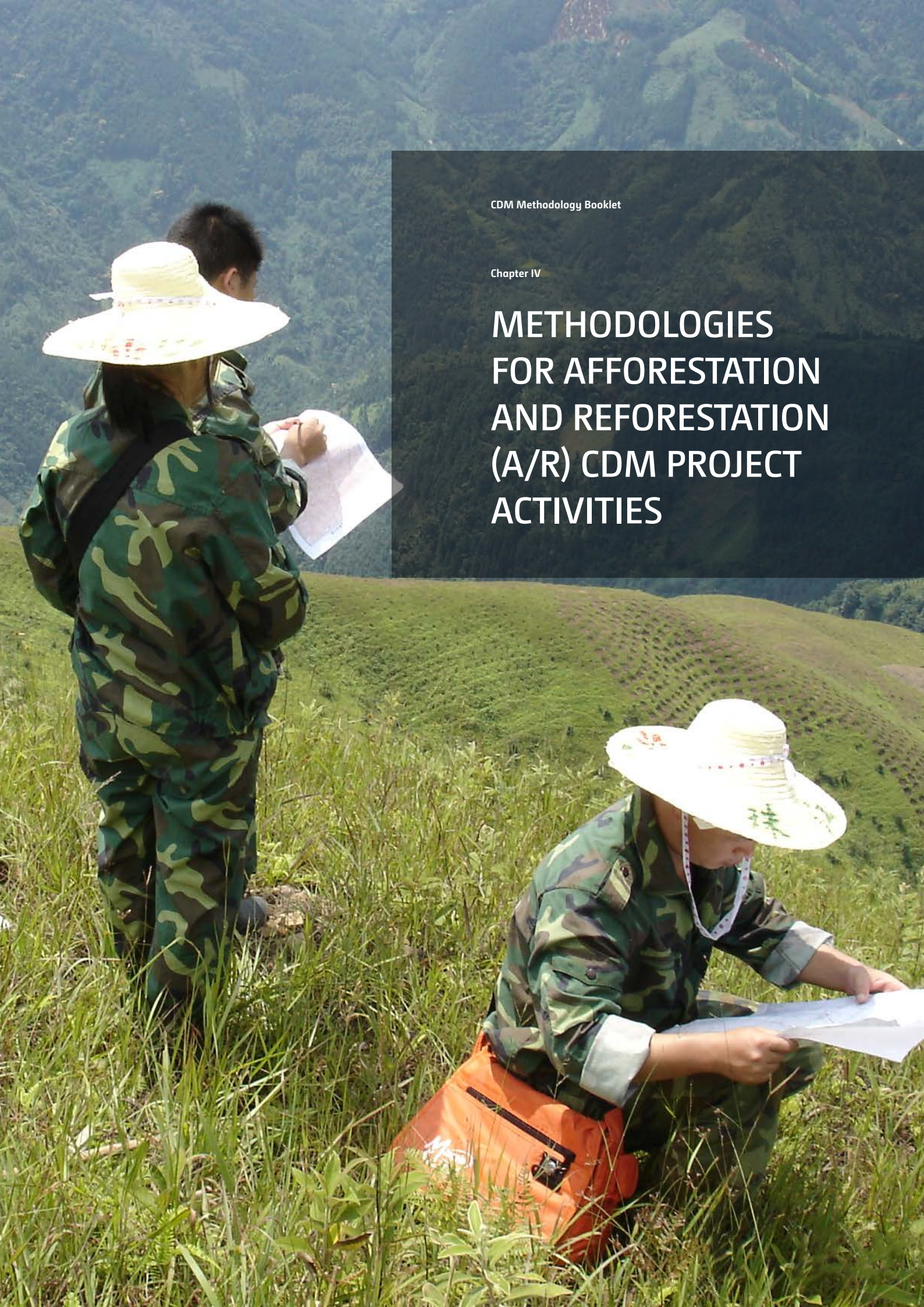


CDM Methodology Booklet

Chapter IV

METHODOLOGIES FOR AFFORESTATION AND REFORESTATION (A/R) CDM PROJECT ACTIVITIES

4.1. INTRODUCTION TO METHODOLOGIES FOR A/R CDM PROJECT ACTIVITIES

The following conditions and information are relevant for all A/R methodologies and are applicable in addition to the conditions listed in the methodology summaries:

- Vegetation cover on the land eligible for project activities must have been below the forest threshold[7] on 31 December 1989. This needs to be proven (e.g. using satellite image or participatory rural appraisal (PRA));
- No tree vegetation is expected to emerge without human intervention to form a forest on the project land;
- Project start date must be January 1, 2000 or later.
- In absence of the project activity, carbon stocks of the carbon pools not considered in the project activity are expected to decrease or increase less relative to the project scenario.

A/R CDM project activities result in t-CERs and l-CERs.

A/R methodologies can be distinguished as large-scale and small-scale. Small-scale A/R methodologies provide simplified approaches for project design and monitoring. Small-scale A/R project activities must fulfil the following conditions:

(1) Net anthropogenic GHG removals by sinks must be less than 16,000 tons of CO_2 per year; and
(2) The project activities must be developed or implemented by low-income communities and individuals as determined by the host Party.

If an A/R CDM project activity does not meet these criteria an A/R large-scale methodology has to be applied.

[7] The host country determines the forest definition which lies within the following thresholds: A single minimum tree crown cover value between 10 and 30%; and a single minimum land area value between 0.05 and 1 hectare; and a single minimum tree height value between 2 and 5 metres

4.2. METHODOLOGICAL TOOLS FOR A/R CDM PROJECT ACTIVITIES

A short description of methodological tools relevant to A/R methodologies can be found below.

AR-TOOL02: COMBINED TOOL TO IDENTIFY THE BASELINE SCENARIO AND DEMONSTRATE ADDITIONALITY IN A/R CDM PROJECT ACTIVITIES

This tool provides a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality. These steps include:

Step 0 Preliminary screening based on the starting date of the A/R project activity;
Step 1 Identification of alternative land use scenarios;
Step 2 Barrier analysis;
Step 3 Investment analysis (if needed);
Step 4 Identification of the baseline scenario;
Step 5 Common practice analysis.

AR-TOOL03: CALCULATION OF THE NUMBER OF SAMPLE PLOTS FOR MEASUREMENTS WITHIN A/R CDM PROJECT ACTIVITIES

This tool can be used for calculation of number of sample plots required for estimation of biomass stocks from sampling based measurements in the baseline and project scenarios of an A/R CDM project activity.

The tool calculates the number of required sample plots on the basis of the specified targeted precision for biomass stocks to be estimated.

The tool applies the following assumptions:

(a) Approximate value of the area of each stratum within the project boundary is known;
(b) Approximate value of the variance of biomass stocks in each stratum is known from a preliminary sample, existing data related to the project area, or existing data related to a similar area;
(c) The project area is stratified into one or more strata.

AR-TOOL08: ESTIMATION OF NON-CO_2 GHG EMISSIONS RESULTING FROM BURNING OF BIOMASS ATTRIBUTABLE TO AN A/R CDM PROJECT ACTIVITY

This tool can be used for estimation of non-CO_2 GHG emissions resulting from all occurrence of fire within the project boundary, i.e. burning of biomass when fire is used for site preparation and/or to clear the land of harvest residue prior to replanting of the land, or when a forest fire occurs within the boundary of an A/R CDM project activity.

For burned areas exceeding a minimum area described in the tool, it provides separate step-by-step calculations and parameter estimation for non-CO_2 GHG emissions from site preparation and from forest fires.

AR-TOOL12: ESTIMATION OF CARBON STOCKS AND CHANGE IN CARBON STOCKS IN DEAD WOOD AND LITTER IN A/R CDM PROJECT ACTIVITIES

This tool can be used for ex post estimation of carbon stocks and change in carbon stocks in dead wood and/or litter in the baseline and project scenarios of an A/R CDM project activity. This tool has no internal applicability conditions.

AR-TOOL14: ESTIMATION OF CARBON STOCKS AND CHANGE IN CARBON STOCKS OF TREES AND SHRUBS IN A/R CDM PROJECT ACTIVITIES

This tool can be used for estimation of carbon stocks and change in carbon stocks of trees and shrubs in the baseline and project scenarios of an A/R CDM project activity. This tool has no specific internal applicability conditions.

AR-TOOL15: ESTIMATION OF THE INCREASE IN GHG EMISSIONS ATTRIBUTABLE TO DISPLACEMENT OF PRE-PROJECT AGRICULTURAL ACTIVITIES IN A/R CDM PROJECT ACTIVITY

This tool provides a step-by-step method for estimating increase in GHG emissions resulting from displacement of pre-project agricultural activities from the project boundary of an A/R project activity under the CDM. The tool estimates the increase in emissions on the basis of changes in carbon stocks in the affected carbon pools in the land receiving the displaced activities.

AR-TOOL16: TOOL FOR ESTIMATION OF CHANGE IN SOIL ORGANIC CARBON STOCKS DUE TO THE IMPLEMENTATION OF A/R CDM PROJECT ACTIVITIES

This tool estimates the change, occurring in a given year, in soil organic carbon (SOC) stocks of land within the boundary of an A/R CDM project activity. The tool is only applicable if litter remains on site during the A/R CDM project activity and soil disturbance for site preparation and project activity is limited. It is not applicable on land containing organic soils or wetlands, and if specific land management practices with inputs are applied. Specific management practices limitations are listed in the tool for each temperature/moisture regime.

AR-TOOL17: DEMONSTRATING APPROPRIATENESS OF ALLOMETRIC EQUATIONS FOR ESTIMATION OF ABOVEGROUND TREE BIOMASS IN A/R CDM PROJECT ACTIVITIES

This tool allows demonstration whether an allometric equation is appropriate for estimation of aboveground tree biomass in an A/R CDM project activity. It provides criteria for direct applicability of an equation for ex ante and ex post calculations, and – if these criteria are not met – describes the process required for verification of an allometric equation. This tool has no internal applicability conditions.

AR-TOOL18: DEMONSTRATING APPROPRIATENESS OF VOLUME EQUATIONS FOR ESTIMATION OF ABOVEGROUND TREE BIOMASS IN A/R CDM PROJECT ACTIVITIES

This tool allows demonstration whether a volume table or volume equation, in combination with selected biomass expansion factors (BEFs) and basic wood density, is appropriate for estimation of aboveground tree biomass in an A/R CDM project activity. It provides criteria for direct applicability of an equation for ex post calculations, and – if these criteria are not met – describes the process required for verification of a volume equation. This tool has no internal applicability conditions.

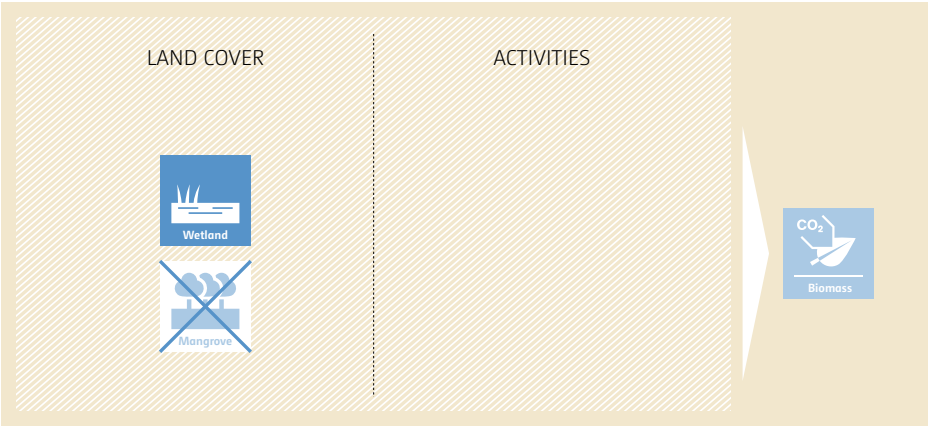
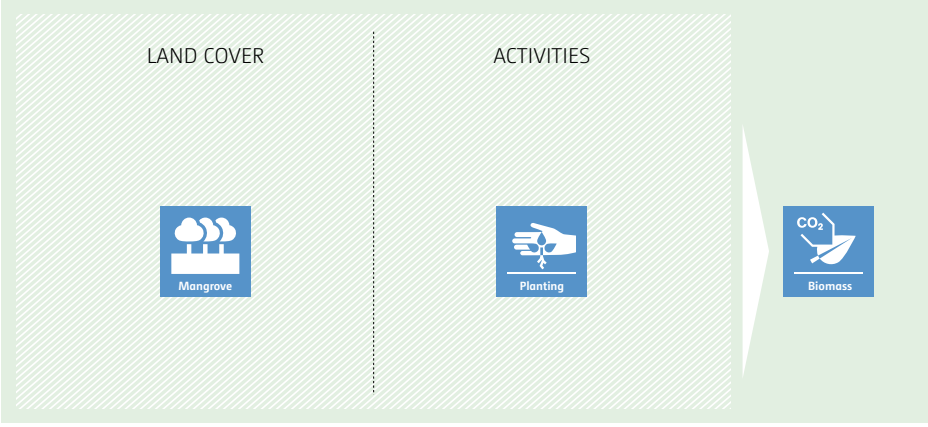
AR-TOOL19: DEMONSTRATION OF ELIGIBILITY OF LANDS FOR A/R CDM PROJECT ACTIVITIES

This tool provides a step-by-step method for demonstrating eligibility of land for an A/R CDM project activity. The tool also specifies the types of information and data that are required to be furnished for demonstration of eligibility of land. Aerial photographs or satellite imagery complemented by ground reference data, land-use or land-cover information from maps or digital spatial datasets, and data from ground-based surveys or existing records (e.g. permits or plans, cadaster or owner registers) are allowed to be used for demonstrating land eligibility. The tool also allows use of a written testimony resulting from participatory rural appraisal (PRA) where other form of data is either not available or is inadequate.

Chapter IV

4.3. METHODOLOGIES FOR LARGE-SCALE A/R CDM PROJECT ACTIVITIES

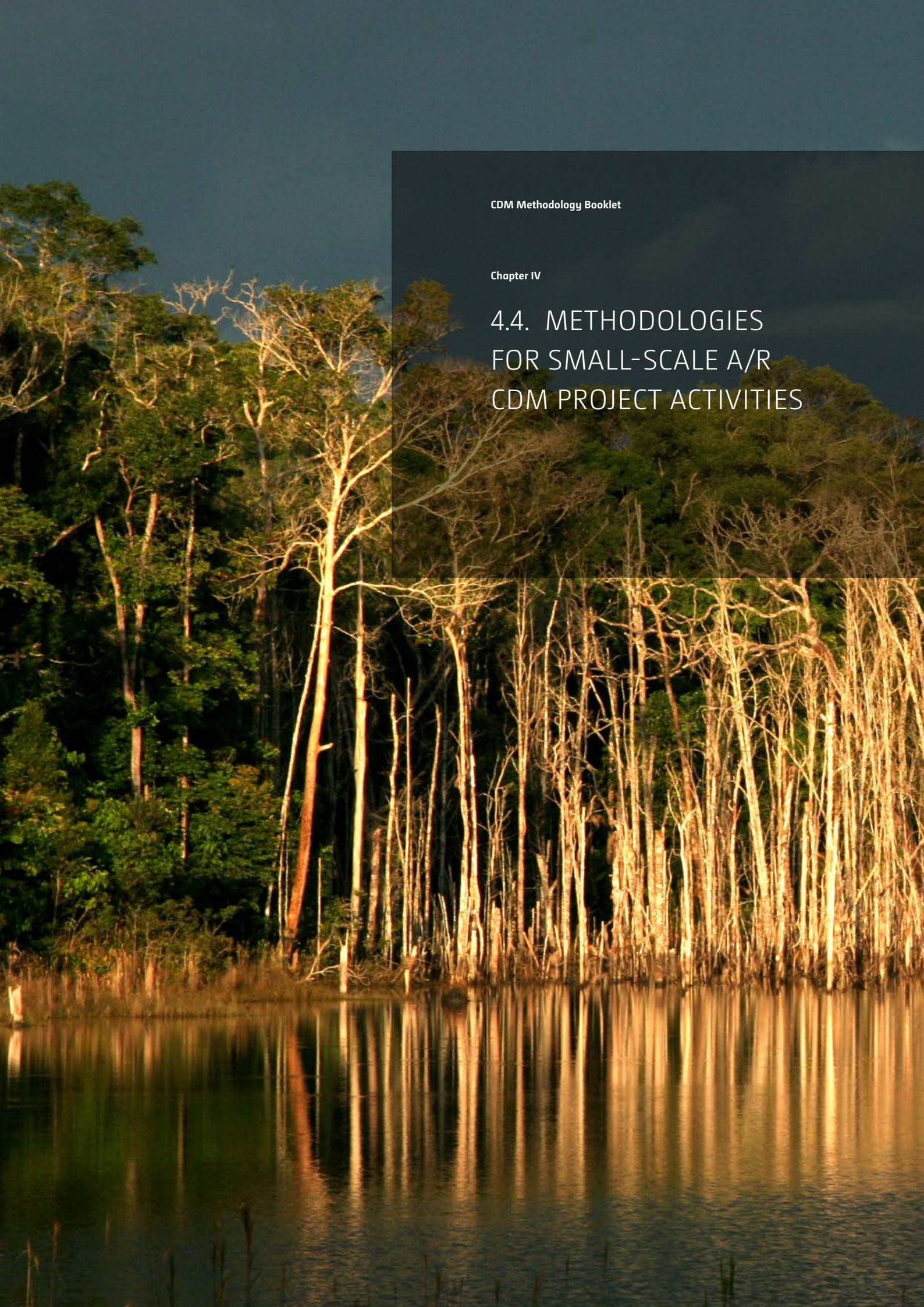
AR-AM0014 Afforestation and reforestation of degraded mangrove habitats

Typical project(s)	Afforestation/reforestation of degraded mangrove habitats.
Type of GHG emissions mitigation action	• GHG removal by sinks. GHG removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and optionally: deadwood and soil organic carbon.
Important conditions under which the methodology is applicable	• The land subject to the project activity is degraded mangrove habitat; • More than 90 % of the project area is planted with mangrove species. If more than 10 % of the project area is planted with non-mangrove species then the project activity does not lead to alteration of hydrology of the project area and hydrology of connected up-gradient and down-gradient wetland area; • Soil disturbance attributable to the A/R CDM project activity does not cover more than 10 % of area.
Important parameters	At validation: • Tree diameter increments, allometric equations or biomass expansion factors, root-shoot ratios and basic wood densities; • Pre-project crown cover of trees and shrubs.
	Monitored: • Area forested, stratum-wise areas, area of sample plots; • Diameter, and possibly height, of trees in sample plots; • Optionally: Diameters of pieces of dead wood, shrub crown cover by strata; area under agricultural activities displaced by the project activity, area subjected to burning of biomass for site preparation and clearing of harvest residue; area affected by forest fires.
BASELINE SCENARIO Mangrove habitat (wetland) is degraded but may contain a few mangrove trees of very poor quality, some signs of human activities are visible, e.g. fuel wood collection.	
PROJECT SCENARIO Mangrove forests are standing on lands.	

AR-ACM0003 Afforestation and reforestation of lands except wetlands

Women and children

Typical project(s)	Afforestation/reforestation of lands other than wetlands.
Type of GHG emissions mitigation action	• GHG removal by sinks. GHG removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and optionally: deadwood, litter, and soil organic carbon.
Important conditions under which the methodology is applicable	• The land subject to the project activity does not fall in wetland category; • Soil disturbance attributable to the 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; (ii) Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in the appendix of the methodology.
Important parameters	At validation: • Tree diameter increments, allometric equations or biomass expansion factors, root-shoot ratios and basic wood densities; • Pre-project crown cover of trees and shrubs. Monitored: • Area forested, stratum-wise areas, area of sample plots; • Diameters, and possibly heights, of trees in sample plots; • Optionally: Diameters of pieces of dead wood, shrub crown cover by strata, weights of litter bags; area under agricultural activities displaced by the project activity, area subjected to burning of biomass for site preparation and clearing of harvest residue; area affected by forest fires.
BASELINE SCENARIO Any lands other than wetlands and no forest stands on the lands.	
PROJECT SCENARIO Forests are planted on lands.	



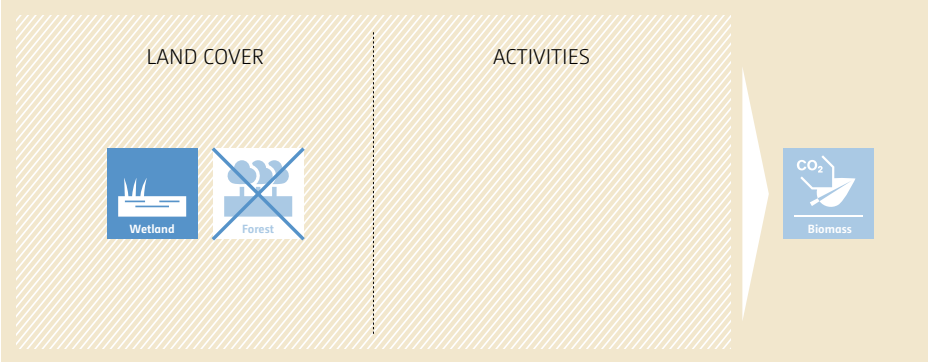
CDM Methodology Booklet

Chapter IV

4.4. METHODOLOGIES FOR SMALL-SCALE A/R CDM PROJECT ACTIVITIES

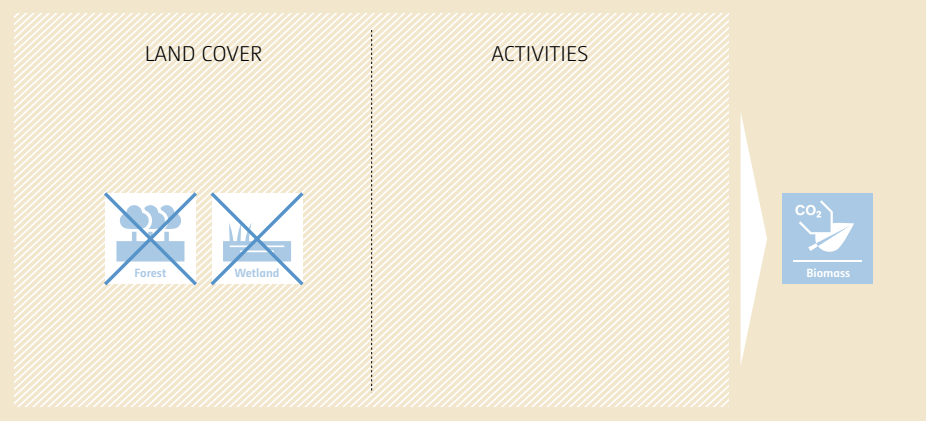
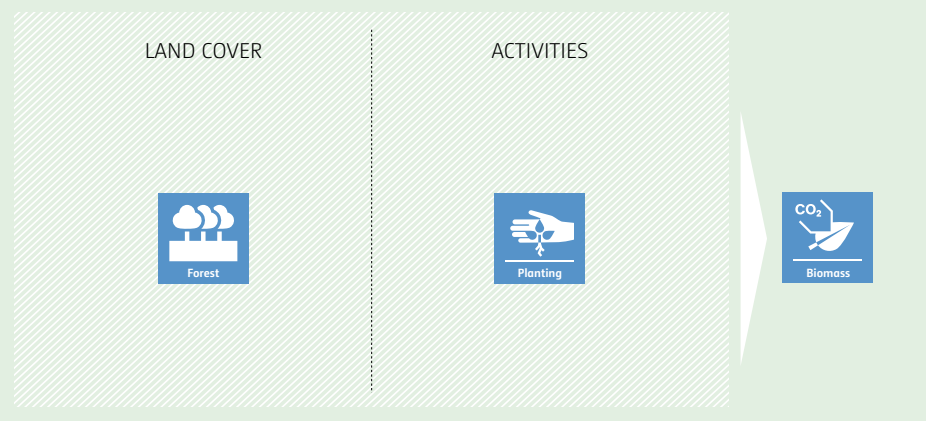
AR-AMS0003 Afforestation and reforestation project activities implemented on wetlands

Women and children

Typical project(s)	Afforestation/reforestation of wetlands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, dead wood and soil organic carbon.
Important conditions under which the methodology is applicable	• 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; • The project activity does not lead to alteration of the water regime of the project area or areas hydrologically connected to the project area; • Soil disturbance attributable to the project activity does not exceed 10% of the project area; • The land subject to the project activity does not contain peat soils (histosols).
Important parameters	At validation: • Tree diameter increments, allometric equations or biomass expansion factors, root-shoot ratios and basic wood densities; • Pre-project crown cover of trees and shrubs.
	Monitored: • Area forested, stratum-wise areas, area of sample plots; • Diameter, and possibly height, of trees in sample plots; • Optionally: Diameters of pieces of dead wood, shrub crown cover by strata; area under agricultural activities displaced by the project activity, area subjected to burning of biomass for site preparation and clearing of harvest residue; area affected by forest fires.
BASELINE SCENARIO Lands are degraded wetlands.	
PROJECT SCENARIO Forests are planted on the wetlands.	

AR-AMS0007 Afforestation and reforestation project activities implemented on lands other than wetlands

Women and children

Typical project(s)	Afforestation/reforestation of lands other than wetlands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, optionally deadwood, litter and soil organic carbon.
Important conditions under which the methodology is applicable	• The land subject to the project activity does not fall into wetland category; • 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; (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 of the methodology.
Important parameters	At validation: • Tree diameter increments, allometric equations or biomass expansion factors, root-shoot ratios and basic wood densities; • Pre-project crown cover of trees and shrubs. Monitored: • Area forested, stratum-wise areas, area of sample plots; • Diameters, and possibly heights, of trees in sample plots; • Optionally: Diameters of pieces of dead wood, shrub crown cover by strata, weights of litter bags; area under agricultural activities displaced by the project activity, area subjected to burning of biomass for site preparation and clearing of harvest residue; area affected by forest fires.
BASELINE SCENARIO Any lands other than wetlands and no forest stands on the lands.	
PROJECT SCENARIO Forests are planted on lands.	

ACKNOWLEDGEMENT

First edition: November 2010
Second edition: November 2011
Third edition: May 2012
Fourth edition: November 2012
Fifth edition: November 2013
Sixth edition: November 2014
Seventh edition: November 2015
Eighth: November 2016
Ninth: November 2017
Tenth edition: November 2018
Eleventh edition: November 2019
Twelfth and current edition: December 2020

Available online: **<https://cdm.unfccc.int/methodologies/>**

The production of this booklet benefited from the suggestions of secretariat staff and thoughtful comments from several experts on the content that would be most helpful to people wishing to find and understand methodologies and methodological tools of interest to them. In order to enhance its utility and respond to the needs of stakeholders the secretariat welcomes comments and suggestions, which can be emailed to: CDM-info@unfccc.int.

This booklet will also be updated regularly in order to reflect changes in approved methodologies and methodological tools. The latest version of the booklet is available on the UNFCCC website.

© 2021 UNFCCC
United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement

All rights reserved.

This publication is issued solely for public information purposes, including any references to the Convention, the Kyoto Protocol and the Paris Agreement, and any relevant decisions with respect thereto. No liability is assumed for the accuracy or uses of information provided.

Creative Commons License
This publication is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. Excerpts from this publication may be freely quoted and reproduced provided that i) the source is acknowledged, ii) the material is not used for commercial purposes, and iii) any adaptations of the material are distributed under the same license.

All images remain the sole property of their source and may not be used for any purpose without written permission of the source.

UNFCCC Logo
Use and display of the UNFCCC logo, including its emblem, is highly restricted and essentially limited to the organization's activities. You may not use any official emblem, flag or logo of the UNFCCC, or any of its other means of promotion or publicity, to represent or imply an association or affiliation with the UNFCCC or its secretariat without the UNFCCC secretariat's prior written consent.

For further information contact:

Main office
UNFCCC secretariat
UN Campus
Platz der Vereinten Nationen 1
53113 Bonn
Germany

Telephone +49. 228. 815-10 00
Telefax +49. 228. 815-19 99

Email secretariat@unfccc.int
Website: https://unfccc.int

ISBN 978-92-9219-193-1

Photos:
Cover **Li Jia** CDM Project: 8787: Guohua Yulin Jingbian 20MWp Solar PV grid connected power generation project
Page 3 **Julio Alberto Pavese** CDM Project: 0268: Lages Methane Avoidance Project
Page 31 **Elena de Sojo** CDM Project: 0191: Monte Rosa Bagasse Cogeneration Project
Page 42 **Ignacio Fuertes** CDM Project 5721: Tacna Solar 20TS: 20 MW Solar Photovoltaic Power Plant
Page 50 **Moises Alvarez** CDM Project: 2595 Bionersis Project on La Duquesa Landfill
Page 167 **Jaydip Bhattacharya** CDM Project: 0711: Mysore Cements Limited Portland Slag Cement project
Page 268 **Meng Zhenbiao** CDM Project: 3561 Reforestation on Degraded Lands in Northwest Guangxi
Page 272 **Eiji Matsubara** CDM Project: 2694 Reforestation of Croplands and Grasslands in Low Income Communities of Paraguarì Department
Page 275 **Pedro Guinle** CDM project 0968: Incomex Hydroelectric Project

Art direction and design: Phoenix Design Aid A/S