FORESTS AND CLIMATE CHANGE WORKING PAPER 3

FORESTRY PROJECTS UNDER THE CDM

PROCEDURES, EXPERIENCES AND LESSONS LEARNED

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Basel and Rome, 23.11.2005

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List of Abbreviations

A/R	Afforestation / Reforestation
ARNM	Afforestation Reforestation New Methodology
A&R WG	Afforestation and Reforestation Working Group
AE	Applicant Entity
CDM	Clean Development Mechanism
CDM-AT	CDM Assessment Team
CER	Certified Emission Reduction
DNA	Designated National Authority
DOEs	Designated Operational Entities
COP	Conference of the Parties
EB	(CDM) Executive Board
ET	Emissions Trading
GHG	Greenhouse Gas
GPG LULUCF	Good Practice Guidance for Land Use, Land-Use Change and Forestry
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
lCER	long-term Certified Emission Reduction
LULUCF	Land Use, Land-Use Change and Forestry
NMB	New Baseline Methodology
NMM	New Monitoring Methodology
ODA	Official Development Assistance
PDD	Project Design Document
tCER	temporary Certified Emission Reduction
UNFCCC	United Nations Framework Convention on Climate Change
WB BCF	World Bank BioCarbon Fund

1. Introduction

This paper provides guidance on how to formulate new baseline and monitoring methodologies for CDM A/R (Clean Development Mechanism, Afforestation and Reforestation) projects. The analysis puts together lessons learned from baseline and monitoring methodologies which were submitted for approval so far and helps project developers to avoid mistakes made in those earlier methodologies.

Under the Kyoto Protocol, industrialised countries and countries with economies in transition (Annex I countries) have committed themselves to greenhouse gas (GHG) emission targets. The goal can be achieved either by activities within the country or by purchasing emission credits. As a consequence, an international market for GHG credits has been developed.

In non-Annex I countries (which are mostly developing countries), emission credits can be produced via the CDM: activities which reduce GHG emissions or sequester CO2 produce Certified Emission Reductions (CERs). Firms and governments which have taken on a GHG emission reduction goal demand such credits.

CDM projects must be registered with the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) to generate CERs. While dozens of CDM projects have been registered by now, not one single forestry project has been accepted by the CDM Executive Board (EB). One reason is the fact that for some time it was unclear whether forestry projects would qualify at all. Only in the year 2001 it was decided, that A/R activities qualify under the CDM, while forest protection projects were excluded for the first commitment period of the Kyoto Protocol. Secondly, the forestry sector also appears to be technically especially challenging in terms of CDM project formulation and project developers have found it difficult to produce documents acceptable to the EB. A first prerequisite for the approval of CDM A/R project would be that baseline methodologies and monitoring methodologies" are accepted by the EB. However, as of today, not a single *methodology* for CDM A/R has been approved.

The paper is structured as follows: first the general rules of the development and acceptance of CDM baseline methodologies and CDM A/R projects are lined out and thereby the most important terms are explained. Secondly, an overview on CDM A/R projects and baseline methodologies which have been submitted so far is given. Thirdly, the reasons for the rejection of baseline and monitoring

methodologies are analysed. This will then lead to the final part of the paper with lessons learned.

The paper thereby draws on the following sources of information: the procedure of CDM methodology formulation and approval as well as project formulation and approval is taken from the information provided by the UNFCCC. Also, methodologies sent to the UNFCCC for approval and project description of projects which requested UNFCCC approval are made public by the UNFCCC. The same is true for the decisions on the approval or non-approval of methodologies. The decision is thereby explained in detail by the A&R working group. The paper thus draws heavily on this information. Finally, the paper benefits from work on the issue done by other organisations, most notably Joanneum Research in Graz, Winrock International and Igino Emmer, who authors a checklist on CDM A/R project approval for Winrock International. Finally, the EB has recently provided some additional guidance on how to fill in the various documents for CDM A/R methodologies and projects.

2. Background, Concepts, Methodologies and Procedures

In the following a very brief background of international climate policy with respect to CDM A/R projects is given and relevant methodologies and steps needed to be carried out to get a CDM A/R project registered (i.e. accepted) by the Executive Board are lined out. Key terms and concepts necessary to formulate CDM A/R project activities are introduced.

2.1. International Negotiations

In 1997 at the 3rd COP[1] to the UNFCCC, Parties agreed on a Protocol that sets targets for industrialised countries and countries with economies in transition to reduce their emissions by an average of 5% below 1990 levels in the period 2008-2012, known as the first Commitment Period. The Protocol was given the name of the city in which it was negotiated – Kyoto. To help reduce the cost of meeting these reduction commitments three market-based "flexible mechanisms" were

[1] The Conference of the Parties (COP) is the supreme body of the UN Framework Convention on Climate Change (UNFCCC). The conference takes place every year. Its first session was held in Berlin in 1995. The COP's role is to promote and review the implementation of the UNFCCC. It reviews existing commitments in light of the conventions's objective, new scientific findings, and the effectiveness of national climate change programs (see Michaelowa and Koch, 2001, "Glossary of International Climate Policy Terms").

designed: Emissions Trading (ET), Joint Implementation (JI) and the CDM. While different in operation, the three mechanisms are based on the same principle: industrialised countries are allowed to reduce emissions outside their territory and then count those reductions towards their national target.

JI and CDM are called "project-based" mechanisms because they fund actual projects: JI funds projects in Annex I countries, while CDM projects can only be realised in non-Annex I countries (mostly developing countries). As such, the CDM is the only part of the Kyoto Protocol which directly involves developing countries in reducing greenhouse gas emissions.

2.2. Important Decisions and Key Documents

Years of discussions were necessary to frame the rules for CDM projects. In 2001 the parties agreed on the *Marrakech Accords*. The Marrakech Accords set out the *rules for CDM projects*, with the exception of those involving forestry projects, although they did determine that forestry projects are restricted to afforestation and reforestation projects and set a limit on their use (decision 17/CP.7)[2]. Finally in 2003, the parties adopted a decision in *Milan at COP 9* setting forth the modalities and procedures for CDM A/R projects in the first commitment period (decision 19/CP.9: Modalities and procedures for afforestation and reforestation project activities under the clean development mechanism in the first commitment period of the Kyoto Protocol, short: *CDM Modalities and Procedures*).[3]

As for technical guidance, especially for the monitoring methodology, the Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF) of the Intergovernmental Panel on Climate Change (IPCC) should be consulted. The document is the response to the invitation by the UNFCCC to develop good practice guidance for LULUCF. The GPG-LULUCF provides supplementary methods and good practice guidance for estimating, measuring, monitoring and reporting on carbon stock changes and greenhouse gas emissions from LULUCF activities under Article 3, paragraphs 3 and 4, and Articles 6 and 12 of the Kyoto Protocol.[4]

[2] "…assigned amount resulting from eligible land use, land-use change and forestry project activities under the clean development mechanism shall not exceed one per cent of base year emissions of that Party, times five"; http://cdm.unfccc.int/Reference/Documents/cdmmp/English/mpeng.pdf, p. 22.

[3] http://cdm.unfccc.int/Reference/Documents/dec19_CP9/English/decisions_18_19_CP.9.pdf

[4] http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm

2.3. Important Concepts and Key Terms

This chapter introduces important concepts and key terms of the international climate negotiations with respect to CDM A/R projects[5].

2.3.1. Baseline- / Project Scenario

The *baseline scenario* describes the situation without the CDM project. According to the decision taken in Milan (CDM modalities and procedures, paragraph 22), three different approaches can be applied to calculate the baseline:

a) existing or historical changes in carbon stocks in the carbon pools within the project boundary,

b) changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, or

c) changes in carbon stocks in the carbon pools within the project boundary from the most likely land use at the time the project starts.

The first option indicates a continuation of the current land use, the second approach a change in land use motivated by economic considerations, the third option indicates a change that is not motivated by economic considerations (e.g. changing legal requirements). According to the agreement of COP 9 project developers have to select the most appropriate approach and to justify their selection.

The *project scenario* estimates the GHG effect in the case that the CDM project is realised. Note: at its 21st meeting the EB has clarified that CDM A/R projects descriptions must *estimate* the project scenario.

The difference between the baseline and the project *scenario* is the *expected* net GHG effect of the project, while the actual net GHG effect of the project is the difference between the baseline scenario and the monitored GHG effect of the

[5] The information derives from the following sources: CDM Watch (2003), "The Clean Development Mechanism (CDM) Toolkit – A resource for stakeholders, activists and NGOs", Winrock International (2005), "Source Book for LULUCF Projects", UNFCCC "Clean Development Mechanism Guidelines for Completing the Project Design Document for A/R (CDM-AR-PDD), the Proposed New Methodology for A/R: Baseline (CDM-AR-NMB), and the Proposed New Methodology for A/R: Monitoring (CDM-AR-NMM)" and PEW Center (http://www.pewclimate.org/what_s_being_done/in_the_world/cop9/index.cfm).

project. Finally, leakage effects must be deducted from the net GHG effect of the project (see 2.3.3. below).

2.3.2. Additionality

Additionality asks whether the CDM project would have happened anyway or whether it needed the CDM A/R to go ahead. Additionality is a critical issue. Registering a non-additional CDM project will result in no additional benefit for the climate and generate fake carbon credits that an Annex I country could use to avoid making real emission reductions domestically. Additionality is therefore a necessary condition to get the CDM A/R project accepted.

The EB developed a tool for demonstrating and assessing additionality of prospective project activities.[6] Although using of the additionality tool is not mandatory, it is highly recommended to do so.

Consideration on official development assistance (ODA) eligibility: potential public funding for the A/R CDM project activity from Annex I Parties shall not be a diversion of official development assistance (MA Decision 17/CP.7). Thus, it needs to be assured that CDM projects are not being financed with aid money which would have been dispersed anyway.

2.3.3. Leakage

Leakage means that a project causes GHG effects outside its project boundaries. An example: an area is being reforested. As a consequence, cattle ranging no longer can take place on this land. Now the owners of the cattle burn forest in another area to gain pastures for their cattle. The associated GHG effect needs to be taken into account. Note: negative GHG effects have to be accounted for, while "positive leakage" may not be attributed to the project[7].

2.3.4. Carbon Pools

There are six carbon pools applicable to A/R CDM project activities:

[6] For detailed information on the additionality tool see Executive Board 21 Report Annex 16 “Tool for the Demonstration and Assessment of Additionality in A/R CDM Project Activities”, http://cdm.unfccc.int/Panels/ar/ARWG05_repan2_Additionality_Tool_final.pdf.

[7] Positive leakage could take place, for example, if a reforestation project initiates reforestation in other parts of the country (perhaps because the project has opened up marketing channels for timber.

- aboveground tree biomass,
- aboveground non-tree biomass,
- belowground biomass,
- litter,
- dead wood,
- soil organic matter.

However, not all six pools will be significantly impacted in a given project. Project participants may choose not to account for one or more carbon pools, subject to the provision of transparent and verifiable information that the choice will not increase the expected net anthropogenic greenhouse gas removals by sinks. Therefore pools can be excluded as long as it can reasonably be shown that the pool will not decrease as part of the project activity or will not increase as part of the baseline. For example: in many cases it can be safely assumed that soil carbon will not increase in the baseline scenario, if the baseline scenario is continued degradation.

2.3.5. Non-CO2 GHG Gases

Two other gases that are related to land use change activities are methane and nitrous oxide. Although these gases are produced in smaller quantities than carbon dioxide, their effect for a given mass on global warming is greater (21 and 296 times that of CO2, respectively). Methane and nitrous oxide are produced mainly as the result of anthropogenic activities, for example the use of machinery, fires, the draining of wetland regions, and the fertilization of land. Methods for estimating these non-CO2 GHG emissions are to be taken from the IPCC Good Practice Guidance.[8]

2.3.6. Land Eligibility

CDM A/R projects can not be carried out on any area; the land has to fulfil the "land eligibility" criteria that on this land there was no forest since December 31st 1989. According to the additionality tool, the eligibility of land for A/R CDM project activity may be demonstrated using archives and/or maps of land-use/cover and satellite image if available, or other type of verifiable information, relating to

[8] Also, the ARNM0010 gives a good example on how to treat non-CO2 GHG Gases (see discussion on new methodologies below, the current version of the ARNM0010 is to be found at http://cdm.unfccc.int/Panels/ar/ARWG06_repan1_ARMN0010_Approved_meth.pdf.

the situation before 1990. This evidence shall be supplemented by a survey of posterior land-use in cases where land cover before 1990 alone is not sufficient to distinguish between forests and non-forests (e.g., bare lands that may have been forests due to forest regeneration under way).

Thereby the adequate forest definition needs to be applied. CDM host countries are free to set the definition within a range of thresholds determined at the 9th Conference of the Parties to the UNFCCC:

- minimum tree crown cover value between 10 and 30 percent,
- minimum land area value between 0.05 and 1 hectare,
- minimum tree height value between 2 and 5 metres.

Once decided (and reported to the EB through its Designated National Authority DNA), the thresholds are binding for the whole country and during the first commitment period.

2.3.7. Carbon Credits (tCERs, lCERs)

While CDM projects other than A/R produce CERs, A/R projects result in tCERs or lCERs. These credits expire after a certain period - that means that they will have to be replaced by other credits in the future. This arrangement was made during the COP in Milan to address the problem that forests, if they should be destroyed, release the carbon they had absorbed previously, into the atmosphere again.

A temporary certified emission reduction *tCER* expires at the end of the *commitment period*[9] *following* the one during which it was issued. A *long-term certified emission reduction lCER* expires at the end of the *crediting period* of the CDM A/R project. Thereby CDM A/R projects can have a crediting period of either 20 years, with the possibility of two renewals up to 60 years total, or 30 years with no renewal. tCERs and lCERs must be used for the commitment period for which they were issued (i.e., they cannot be banked). Project owners can choose to issue tCERs or lCERs.

[9] The first commitment period lasts from 2008-2012, the second is expected to be 2013-2017. It is expected that the following commitment periods will show the same pattern of five years.

2.3.8. Small Scale CDM Project Activities

For small-scale CDM projects simplified rules apply; for each project type it is clearly defined which projects fall under this category. In the case of A/R CDM project activities, small-scale projects may not generate more than a maximum 8000 t CO2equivalent[10] per annum on average over 5 years. Example: assuming an average net carbon sequestration of 10 tC/ha, this implies a maximum area of 218 ha of forest.

A main requirement for small-scale A/R projects is that they may be carried out only by low income individuals or low-income communities, as defined by the host countries. Small-scale A/R CDM project activities may not be the result of a de-bundled larger scale activity. The only criterion to be met to demonstrate this in case of a set of small-scale A/R CDM project activities is that these must be at least 1 km apart.

For these activities only carbon stock changes in above- and below-ground biomass need to be quantified. A dedicated CDM-SSC-AR-PDD form (for details on forms and documents see 2.5. below) must be used. The A&R WG (for a description of this working group see 2.4.3. below) has now made available simplified baseline and monitoring methodologies for selected small-scale A/R CDM Project Activities.[11]

2.4. Relevant Institutions

2.4.1. EB

The CDM Executive Board (EB) supervises the CDM and makes the final decision about project registration and the issuing of carbon credits. The Board also makes the final decision whether to approve new baseline and monitoring methodologies and must approve new Designated Operational Entities (DOEs). The Board has 10 members from Parties to the Protocol.[12] The Board must meet no less than three times a year. Members are elected for a term of two years.

[10] The emission of CO2 and non-CO2 GHG gases have different effects in terms of global warming. Therefore emissions of non-CO2 gases need to be translated into CO2 equivalents (CO2e).

[11] See http://cdm.unfccc.int/Panels/ar/ARWG06_repan2_AR_SSC_Meth.pdf.

[12] Current board members are Mr. John W. Ashe, Mr. Jean-Jacques Becker, Mr. Martin Enderlin, Ms. Sushma Gera (Chair), Mr. John Shaibu Kilani, Mr. Xuedu Lu (Vice-Chair), Mr. José Miguez, Mr. Richard Muyungi, Mr. Rajesh Kumar Sethi, Ms. Marina Shvangiradze.

2.4.2. DOE / AE

DOEs are accredited by the Executive Board and perform two functions: validating CDM projects, and verifying and certifying emissions reductions from projects. A designated operational entity shall not perform validation or verification and certification on the same CDM A/R project activity. Upon request, the Executive Board may however allow a single DOE to perform all these functions within a single CDM A/R project activity. DOEs are typically certification firms such as SGS or the German TÜV Süd.[13]

An applicant entity (AE) may submit a new methodology to the Executive Board only if the following conditions are met:

1. a CDM assessment team (CDM-AT) has been assigned to the AE (i.e. the CDM accreditation panel has undertaken a preliminary consideration of the AE) and the AE has agreed to the composition of the CDM-AT), and

2. the AE maintains documentary evidence (e.g. a procedural report) for each new methodology submitted to the EB.

2.4.3. A&R WG

According to the paragraph 18 of decision 17/CP.7, the Executive Board may establish committees, panels or working groups to assist it in the performance of its functions. The Executive Board shall draw on the expertise necessary to perform its functions, including from the UNFCCC roster of experts.[14]

The A&R working group shall[15]

- prepare recommendations on submitted proposals for new baseline and monitoring methodologies for CDM A/R project activities,
- prepare draft reformatted versions of proposed new baseline and monitoring methodologies for CDM A/R project activities approved by the Board,

[13] For a full list of accredited DOEs see http://cdm.unfccc.int/DOE/list.

[14] Current A&R Working Group members are Mr. Martin Enderlin (Chair), Mr. José Miguez (Vice-Chair), Mr. Hilton Thadeu Zarate do Couto, Mr. Nagmeldin G. Elhassan, Mr. Wojtek Seweryn Galinski, Ms. Carmenza Robledo, Mr. Lambert Schneider, Mr. Shailendra Kumar Singh, Mr. Frank Werner.

[15] See EB 14 Report, Annex 8.

- prepare recommendations on options for expanding the applicability of methodologies for CDM A/R project activities, if applicable, and develop tools to facilitate the selection of one approved methodology from among those of a similar nature by project participants.

2.5. Relevant Project Documents

2.5.1. Project Design Document

CDM A/R project activities need to be described, using a specific form. The document which is then produced is the Project Design Document (PDD). Note: for A/R projects a specific form has been created, so the standard CDM PDD may not be used. The document can be found on the UNFCCC homepage.[16]

2.5.2. Baseline and Monitoring Methodology

A baseline methodology includes a number of issues (and in fact not just the baseline - the name is thus somewhat misleading):

- land eligibility,
- baseline scenario,
- estimation of project scenario,
- additionality,
- leakage and
- estimation of net GHG benefits generated by the project.

A monitoring methodology describes how the GHG effects of the project are to be measured / monitored. Both, baseline- and monitoring methodologies are to be generic in a sense that they can be applied to different projects, but they are specific in a sense that they may be applied to a certain type of project only.

If a new baseline methodology is developed, one refers to a NMB (New Baseline Methodology), a NMM refers to a New Monitoring Methodology.

[16] http://cdm.unfccc.int/Reference/Documents/cdm_ar_pdd/English/CDM_AR_PDD.pdf and: http://cdm.unfccc.int/Reference/Documents/SSC_PDD/English/SSCPDD_en.pdf (for small-scale projects).

2.6. Steps towards CDM Registration

A CDM project has to go through the following steps in order to finally produce Certified Emission Reductions (CERs):

- The project has to be described using the CDM-A/R-PDD (project design document for afforestation and reforestation project activities).
- The PDD has to be submitted to a DOE.
- The DOE checks the PDD against the CDM requirements.
- The project proponent also has to obtain the project approval from the host country. Approval can be obtained from the DNA of the country where the project will be carried out.
- If the DOE determines the proposed project to be valid, it submits to the EB a request for registration of the project. This request takes the form of a validation report. In addition, the PDD and the host country approval have to be handed in. The EB charges a registration fee.
- The registration by the EB is deemed final eight weeks after the date of receipt by the EB, unless a review of the proposed project is requested. In case a review is to be done, the EB has to conduct and conclude the review within two meetings.

2.7. Steps towards New Baseline and Monitoring Methodologies

The PDD asks project developers to use an approved A/R Methodology. Where no approved Methodology exists which could be applied to the project in question, a new Methodology has to be formulated and submitted. Thereby one needs to know: the development of baseline and monitoring methodologies under the CDM is very much a bottom-up process: they are being developed by project developers and handed in for approval by the EB. Once they are approved, other project developers can use them as well.

For a New Methodology to be approved, the following steps need to be taken:

- The project participant shall propose a new A/R methodology, through a DOE or an AE (applicant entity). The following documents are needed: PDD, CDM-AR-NMB (CDM AR new baseline methodology) and CDM-AR-NMM (CDM AR new monitoring methodology). A Methodology can be submitted only in combination with a concrete project, which applies the methodology.

- The DOE / AE checks if the documents are complete and forwards them without further analysis to the secretariat.
- The secretariat forwards the documentation to the EB and the A&R WG after having checked whether the DOE documentation is complete.
- The secretariat makes the new methodology publicly available and allows and invites public inputs for a period of 15 days.

- The A&R WG does a first quick check of the documents.
- Two external experts review the documents, using review forms provided by the secretariat.
- 2 A&R WG members compile reviews by the experts and their own opinions and give a recommendation.
- The EB attributes a final rating to the methodology (A: approval, B: resubmit, C: non-approval).

3. Methodologies and Projects Submitted

Up to now, 13 methodologies have been submitted to the UNFCCC Secretariat. None of the methodologies has been accepted as of now (mid-October 2005), 8 methodologies were rejected, 4 are still under consideration by the EB, 1 has been withdrawn. Along with the 13 methodologies, CDM project proposals (PDDs) have been sent. It has to be stressed that none of the projects itself has been rejected so far. The project validation and approval process, however, can start only once Methodologies have been accepted. Yet, in the following, we also make reference to the projects themselves, because the methodologies can not be understood well without some basic knowledge on the projects they refer to.

3.1. Project Overview

The following table gives an overview on the projects submitted along with a new Methodology so far.

Table 1: List of Projects

Number	Name	Country	Approval
ARNM0002	Reforestation Project Using Native Species Around AES-Tiete Reservoirs	Brazil	C
ARNM0003	The International Small Group & Tree Planting Program (TIST)	Tanzania	C
ARNM0004 :	'Treinta y Tres' Afforestation combined with Livestock Intensification	Uruguay	C
ARNM0005	The Mountain Pine Ridge Reforestation Project (MPR Project)	Belize	C
ARNM0006	Bagepalli CDM Afforestation Programme	India	C
ARNM0007	Moldova Soil Conservation Project	Republic of Moldova	N/A
ARNM0008	Kikonda Forest Reserve Reforestation Project	Uganda	C
ARNM0009	Rio Aquidaban Reforestation Project (RA)	Paraquay	C
ARNM0010	Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin, China	China	N/A
ARNM0011	Chocó-Manabí Corridor Reforestation and Conservation Carbon Project	Ecuador	C
ARNM0012	Afforestation or Reforestation Project Activity implemented on unmanaged Grassland	Brazil	N/A
ARNM0013	The Mountain Pine Ridge Reforestation Project (MPR Project)	Belize	N/A

Note: the Mountain Pine Ridge Reforestation Project has been submitted first as ARNM0001, and then withdrawn, submitted again under ARNM0005, been rejected and resubmitted under ARNM0013 (still under consideration). ARNM0012 is a new version of ARNM0002, although the project seems to have been modified somewhat. Therefore, 13 methodologies have been submitted, 12 can be found on the UNFCCC web site, whereby 2 refer to the Mountain Pine Ridge Reforestation Project (MPR Project) and 2 methodologies refer to the same project in Brazil. Thus, in total there are only 10 different projects on the list.

3.2. Project Summaries

In the following the projects associated with the new methodologies are described briefly[17]. For more details please refer to the UNFCCC web site.

3.2.1. ARNM0001

Reforestation of a portion of the Mountain Pine Ridge Forest Reserve in Belize with native Pinus caribaea var. hondurensis. The purpose of the Mountain Pine Ridge Forest Project is to create a sustainable forest resource for carbon sequestration, timber production, habitat protection and socio-economic stability in Belize. The project targets discrete areas which were not forested in the year 1989 and have not become a forest since. These discrete areas are spread throughout the forest reserve and total about 7,900 ha in a forest reserve of about 50,000 ha.

3.2.2. ARNM0002

Reforestation project using native species around AES-Tiete reservoirs. Reforestation of approximately 4.188 ha, located around the reservoirs of hydroelectric plants. The project envisions a medium- and long-term strategy to preserve hydraulic resources, securing the biodiversity of the regions in which it will be implemented. The project will reforest around 500 ha per year, finalizing the reforestation process around the year 2014.

3.2.3. ARNM0003

A project carried out by TIST (International Small Group & Tree Planting Programme) in Tanzania. Small farmers carry out restoration activities on deforested lands. Over 20,000 TIST participants in over 2,500 small groups are working to break their local cycle of deforestation, slash-and-burn agriculture, and famine. TIST has already a track-record of planting trees. The project will sequester 3.5 million tons CO2 through 2012 by continuing, expanding, and replicating the GHG component of the TIST program.

3.2.4. ARNM0004

The project consists in a combination of reduction of greenhouse gas emissions by livestock and carbon sequestration by forest and seeded pastures. Background:

[17] The text of the summaries is largely taken from the PDDs of the projects. However, the text has been shortened and somewhat edited.

Beef and sheep industries constitute one of the main economic activities in Uruguay. Project description and proposed activities: The project will comprise a total of 18,973 ha of land currently under extensive grazing by beef cattle, producing a total of less than 900 t of meat or its equivalent per year. A fraction of the land, including the most fertile soils, will be used to implement a semi-intensive animal production system, which would result in a reduction of methane emissions per unit of animal product. The land released from livestock production will be used to establish forest plantations.

3.2.5. ARNM0005

Same as ARNM0001 (methodology was being resubmitted).

3.2.6. ARNM0006

This Small Scale CDM A/R project activity (in India) consists of community forestry and farm forestry. The aim of the project is to enable marginal farmers and local government bodies to take up afforestation on small plots of between ¼ ha to 1 ha each making a total of 1383 ha, using a variety of tree species, including a number of fruit trees. The project is designed to create a long-term secure income for marginal farmers and landless labourers. The project is located in villages in Bagepalli, Gudibanda and Siddlaghatta talukas of Kolar District, Karnataka. Kolar District is in the south-eastern Dry Zone of South India, where a complete collapse of the ground water table, lack of soil cover, and desertification is observed.

3.2.7. ARNM0007

Soil erosion and landslides have major economic and environmental implications for land use in the Republic of Moldova. Degraded lands can only permit low intensity grazing. If the current land use trends continue, these lands may degrade further and cause adverse impacts on the productivity of adjoining lands. The project proposes to achieve multiple objectives in terms of the restoration of degraded lands, improvement of forest product supplies to local communities, and contribution to the GHG removals through improvement of carbon pools in the degraded lands. The project area (14,494 ha) is distributed throughout the country. About 27% of project sites are partially degraded and 73 % of the sites are significantly degraded, and more than 60% of the sites are located on territories that have steep slopes.

3.2.8. ARNM0008

Reforestation of bush, grassland and degraded woodland in the Kikonda Forest Reserve (FR) / Uganda. The total reforestation area is 8.354 ha. Kikonda is one of the woodland reserves of North Singo Forest Reserves which was reserved to fulfil the forest policy objectives in the 1950s. There has been charcoal burning and cattle grazing all over the FR since various decades steadily reducing the woodland and the natural forest. The project is to set up a forest plantation in the reserve and "to bring an end to cattle grazing and illegal charcoal burning", as the project proponent puts it. To address the needs of the local population the project runs programs that promote the sustainable production of charcoal and sustainable ways of cattle keeping. Reforestation was started by the project proponent in 2002 with the planting of Pinus Caribaea and the native specie Maesopsis Eminii on areas that have not been covered by forest for the last twenty years.

3.2.9. ARNM0009

Afforestation of bush and grassland in the ranch “Rio Aquidaban” / Paraguay. The total afforestation area included in the project is 580 ha out of a total surface of 650 ha. The 580 project ha corresponds to degraded lands which have been used for cattle grazing since various decades. The remaining 70 ha corresponds to 60 ha degraded natural forests and 10 ha swamp. The project aims to stop cattle grazing on the project territory. The exotic eucalyptus specie Eucalyptus Camadulensis and the exotic specie Paraiso (Melia Azedarach Giganteum) are the main species to be planted for production of sawn timber. A rotation of about 20 years is planned. With conservation and enrichment planting of 60 ha of degraded natural forest and of 10 ha swamps a contribution to the conservation of biodiversity is to be made.

3.2.10. ARNM0010

The project "Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin, China" will be implemented within the confines of the larger umbrella Guangxi Integrated Forestry Development and Conservation Project (GIFDCP). The proposed A/R CDM project activity aims to reduce threats to local forests and generate the income to the poor farmers by enabling the carbon sequestered by plantations to act like a “virtual” cash crop for the local project beneficiaries who will gain direct benefits from harvesting the plantation as well as from the sale of carbon credits, which will in turn reduce the threats to natural forests. The project will establish 2,000 ha of multiple-use forests in Huanjiang

County of Guangxi and 2,000 ha of multiple-use forests on sites with severe soil and water erosion in Cangwu County of Guangxi.

3.2.11. ARNM0011

Reforestation will take place on two sites within the Chocó-Manabí ecoregion of Ecuador. A total of 523 ha will be reforested at sites on the western foothills and coastal plains of Ecuador. Of these, 345 hectares will be reforested on properties of the Maquipucuna Foundation (1000-1500 m.a.s.l.), principally on pasture lands. An additional 178 ha of reforestation will be established on lands of the La Perla Reserve (250 m.a.s.l.), again primarily on pasture lands. The project sites are situated at the intersection of the Andes and Chocó bioregions and are extraordinarily rich in biodiversity. At the Maquipucuna site up to 15 native species will be used. At the La Perla site, 35 native species will be used to establish mixed-species plantations adjacent to the La Perla Protective Forest (Bosque Protector), one of the last remaining fragments of lowland forest remaining after 40 years of intensive deforestation.

3.2.12. ARNM0012

Resubmission of ARNM0002, whereby the project (PDD) appears to be somewhat modified. The objective of this project activity is the afforestation or reforestation, using native species, of approximately 8,790 hectares of unmanaged grassland riparian areas, situated along the banks of five hydroelectric plant reservoirs in the State of São Paulo / Brazil. From these total, 496 hectares were reforested from 2004 to 2005, and the remaining 8,294 hectares will be reforested over the course of the next 5 years. All the areas are owned, controlled and operated by the project proponent, AES-Tiete S.A. AES-Tiete is part of the AES Corporation, a leading global energy company. Prior to the onset of the reservoirs, nearly 100 percent of the areas within the project boundaries were covered with aggressive grass species, which prohibit woody species from taking root, and which, for more than 30 years, have not naturally regenerated. In 1985, the grassland areas around the reservoirs were legally designated Permanent Preservation Areas (APPs or Áreas de Preservação Permanente). The forest legislation and resolutions do not include the obligation to afforest or reforest APPs.

3.2.13. ARNM0013

Same as ARNM0001 (methodology was being resubmitted).

3.3. Detailed Project Example: ARNM0003

In the following a detailed project example is given. The text in the paragraphs below is taken from the various project documents (PDD, NMB, NMM, Desk Review, A&R WG Recommendation). The example gives a flavour on the kind of information which has been provided by project developers - and the reasons for rejecting the methodologies. Thereby it may also be of interest to recognize the volume of documentation which has been produced in the process of preparing projects. In the case of the TIST project the following documents are available on the UNFCCC website: PDD: 60 pages, NMB: 14 pages, NMM: 27 pages, baseline study: 27 pages, monitoring plan: 26 pages, field manual: 61 pages, maps and satellite pictures, 3 public comments: totalling 26 pages, 2 desk reviews: 16 and 12 pages, A&R WG recommendation: 21 pages.

The methodology presented here refers to a reforestation project in Tanzania. The project aims to support farmers to plant trees in an area where significant deforestation has been going on and arguably continues. The project very much focuses on the inclusion of farmers who plant single trees or small woodlots. It is thus not a programme to establish large forest plantations.

3.3.1. PDD

The PDD gives the following summary information: The TIST Program empowers groups of subsistence farmers in Tanzania to restore local deforested areas and to adopt sustainable agricultural practices. TIST responds to their goals of eliminating famine, reducing poverty, and developing stronger local economies through sustainable agriculture. Since its inception in 1999, TIST groups have successfully planted over five million trees in Tanzania in order to accomplish GHG sequestration, create a potential long-term income stream, and to develop sustainable environments and livelihoods. Over 20,000 TIST participants in over 2,500 small groups are working to break their local cycle of deforestation, slash-and-burn agriculture, and famine. The trees are already reducing erosion, stabilizing and enriching the soil, and providing shade. In the future, they will provide other benefits including edible fruits and nuts, medicines, windbreaks, firewood, and timber. TIST will sequester 3.5 million tons (CO2 equivalent tons) through 2012 by continuing, expanding, and replicating the GhG component of the TIST program.

3.3.2. New Baseline Methodology (NMB)

Title

Simplified baseline methodology for smallholder A/R projects in areas undergoing continued deforestation

Conditions under which the methodology should be applied:

- Sustainable development activities wherein trees are planted by many individual smallholders or groups of smallholders.
- Smallholders own or have customary rights to the land where the trees are planted, or have been granted use of the land for the purpose of planting trees by a government entity or other entity.
- Trees are being planted in areas already cleared by human activity.
- Smallholders are planting the trees voluntarily and are not under any regulation or government mandate to do so.
- The country, area, or region where the planting is taking place has been undergoing deforestation and such can be documented using official government information or information developed by third parties of recognised authority.
- Linkage to a monitoring plan that requires identifying each individual grove and counting each tree that is part of the activity to which this methodology applies.
- Linkage to a monitoring plan that documents when the trees are planted so that their inclusion in the CDM activity is justified.
- Linkage to a monitoring plan that requires obtaining statistically valid diameter measurements from tree cohorts of similar ages for determining carbon sequestered (NMB).

Summary of Methodology

This baseline methodology allows sequestered carbon by smallholders to be determined by calculating the biomass of trees they have specifically planted for a CDM project. In doing so, there is an implicit assumption that the baseline is one of no change in baseline carbon stocks. Since this methodology is restricted to smallholder farmers in areas of recognised deforestation, the baseline carbon stock

is actually one of decline, making the assumption conservative. Since it is impractical for a single smallholder to apply for CDM credits and enter the international carbon market, this methodology assumes that there will be a project participant that will aggregate the smallholders and manage the A/R CRM project activities. This proposed baseline methodology has three steps.

The first is to demonstrate that the baseline assumption of no change in carbon stocks is a conservative assumption. This is done using a combination of stakeholder consultation, research, and field reconnaissance to determine if the trees will be planted in a country, region, or area that is currently being deforested, if the project will involve smallholder farmers, and if the area under consideration for an A/R CDM project would be eligible for this methodology.

The second step involves self-reporting by the smallholders. They must provide a report that indicates they have joined the project, that they have planted trees for the project, and an estimate of the number of trees planted.

The third is a site visit by a trained quantifier that will record the location of each new grove, when the trees were planted, and the number of trees planted, by species. This visit establishes the baseline within the project boundary, i.e. that the trees did not exist before the CDM project activity. In some cases, the baseline visit will take place prior to the trees being planted. However, because of the potential for thousands of smallholders to be involved, because of the poor transportation infrastructure in the areas where the smallholders reside, and because new smallholders will continually join the project, the baseline visit may not take place until after the trees have already been planted. This should not be a problem in that it will be obvious to the quantifiers that the trees were planted recently. Only trees that have been planted after January 1, 2000 are eligible for this methodology. The baseline quantifier visit must be linked to a monitoring plan that calls for regular quantification visits over the operational lifetime the A/R CDM project.

In order to prevent counting carbon that already exists in the soil, as litter or dead wood, only above- and below-ground biomass is counted. Since the addition of trees to an area adds carbon to all three of these pools, the assumption that they are unchanged is conservative. To prevent the inclusion of carbon that is being sequestered by existing trees or ones incidental to the activity, this baseline methodology can only be used with a monitoring plan that specifically monitors, counts, and measures trees planted as part of the CDM project activity. By using such a monitoring plan, the carbon calculated from these trees becomes the total

carbon attributed to the activity. When considered with the ongoing deforestation and exclusion of the increased carbon in the soil, litter, and dead wood, this baseline methodology is simple yet very conservative.

Summary by an external expert (desk review):

The baseline methodology is an assertion, based on documented evidence of deforestation and land degradation: that a change in carbon stock of zero represents a conservative assessment of the baseline for a parcel within the project boundary, when parcels are located in regions where the business-as-usual scenario is demonstrable on-going deforestation in conjunction with subsistence slash-and-burn agriculture.

3.3.3. New Monitoring Methodology (NMM)

Summary

A project participant organizes stakeholders to perform afforestation or reforestation by planting trees in groves. The project participant organizes quantifier representatives to visit the groves. The project participant's quantifier representatives carry hand-held computers and global positioning system (GPS) equipment to identify the project boundary of each grove, count the trees within its boundary, identify the species of the trees by age cohort, and note other information related to the health, height, spacing, and circumference of the trees. The information collected during grove visits by quantifier representatives is electronically transmitted to the project participant for application of quality assurance and quality control measures (e.g. comparing grove results to previous results, or comparing one grove's cohort growth rates to growth rates of the same cohorts in other groves). The project participant applies allometric equations to convert cohort data from each grove into biomass for above-ground and below-ground carbon pools. The project participant uses calculations from grove data to determine which groves meet Host Party definitional requirements for forest. Historical growth ratios are applied by the project participant to discount total tree biomass by the percent of biomass that has come from trees not yet of minimum height for inclusion of CDM biomass calculations, (or excludes undersize trees from tree counts). All resulting discounted cohort data are summed for all CDM-eligible groves (i.e. those that meet the definition of forest) to obtain the cumulative carbon sequestration that represents the actual GhG removals by sinks for the project – by individual carbon pools and in total. In this case, it would

include aboveground biomass and below-ground biomass. This is the actual net GhG removals by sinks for the A/R CDM project activity.

3.3.4. Reasons for Rejection

Reasons for Rejection of the NMB

The A&R WG gives the following summary:

- The proposed methodology does not identify a baseline scenario that represents the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the proposed CDM reforestation project activity. The applied scenario is: a zero change in carbon stocks on average over the total project area while, the correct baseline scenario for a reforestation project should be the gross reforestation that would likely occur in the absence of a proposed project activity.
- The treatment of additionality is not adequate and appears to be based on an incomplete understanding of what is meant by additionality. A more formal methodology must be specified for the additionality test, such that all likely circumstances pertaining to the A/R activities at the individual parcel level are included. A test for pre-screening should be included, if the CDM-AR-NMB is to allow a starting date going back to 2000. An appropriate additionality tool should be provided to address these issues.
- The treatment of leakage is incomplete or erroneous. First, all references to "positive leakage" should be removed as this is not eligible under CDM (thus simplifying the existing CDM-ARNMB). Second, potential leakage from displacement of agricultural activities should be covered.
- Several assumptions are inadequate or likely inadequate. For example, it is not possible to visually discern in a reliable and consistent manner the vegetation cover of a piece of land over 15 years ago, as assumed in the methodology. The method offers no independent mechanism to determine land eligibility. This places doubt on the definition of the project boundary.
- Section G provides a superficial, qualitative description of the uncertainty of the baseline assumption. It provides no quantitative range of error of this assumption.

Based on the comments and recommendations of the A&R WG two conclusions can be drawn: firstly, the main problem with the project was the baseline

estimation. It is not sufficient to show that there is a general trend of land degradation and reforestation in the region in question. What is needed is a demonstration that on the project area itself there would be such a trend without the project. This is, of course, a much more difficult task, especially when designing a project on a large number of different parcels of land.

Secondly it appears that the authors of the methodology were not aware of all the (technical) details of CDM A/R and relevant decisions made. An example is the inclusion of the concept of "positive leakage" which has been ruled out. The difficulty of dealing adequately with all the requirements for CDM A/R projects in an adequate manner and being up to date with the CDM at all times will be taken up in the recommendations given under 4.4. below.

Reasons for Rejection of the NMM

The A&R WG gives the following summary

- The monitoring methodology can not be approved if the related baseline methodology is not approved. The methodology presents several problems that are rather specific and not of a general nature. Some of these are given below (from section B II 6 b) of the A/R working group recommendation).
- There is considerable confusion and repetition between aspects of monitoring methodology, baseline methodology, and project eligibility, all included within the CDM-AR-NMM: much simplification could be achieved by retaining only those elements relating strictly to monitoring methodology.
- The basis for calculating mean carbon stocks - calculating a mean diameter by age and species cohort and using that mean diameter in an allometric equation - is incorrect. The correct method is to apply the allometric equation to each tree, and average the individual estimates of tree biomass by age and species cohort, thus correctly weighting biomass estimation.
- It is strongly recommended the core methodology (section B) of the CDM-AR-NMM be completely redeveloped according to the well-specified sequence of bulleted steps given in the GPG, Ch. 4, section 4.3.3, p. 4.98 beginning with the crucial step of landscape stratification into climo-edaphic zones (which otherwise appears much later and almost coincidentally in the existing CDM-AR-NMM, and repetitiously at that). The sequence of steps given in the present CDM-AR-NMM is sometimes not logical, and should be critically reviewed.

- Section A.3. should begin with a clear and complete statement of the applicability, limitations, and assumptions that must be satisfied for the CDM-AR-NMM to be applicable. What is presently given includes conditions that are (and need only be) specified later as part of the monitoring methodology, and the section is also missing many key elements. Critical statements appear inappropriately or elsewhere.
- A number of statements in section B.2.1 of the CDM-AR-NMM are imprecise, or unclear.
- There is very little information on uncertainty, quality control, or quality assurance. Statements such as "Direct measurement reduces uncertainty," (section B.6.) are most concerning, and do nothing to create confidence in reviewers that the proponents understand these critical issues. 95% confidence intervals must be calculated for carbon gains/losses associated with CDM projects, if good practice is to be adhered to.
- Further specifics need to be provided as to how total project-level carbon gain/loss will be calculated, as this affects how errors are to be estimated. It appears, though it is not entirely clear, that losses/gains will not be attributed at the individual parcel level. Rather, mean gains/losses across the entire project will be estimated - which will provide for a standard, simple statistical error analysis provided individual parcels are systematically sampled across their spatial extent (the parcels then become equivalent to independent variable-area plots, as used in some forms of standard forest inventory). All of this needs to be better specified, preferably in a non-prescriptive manner.

Based on the A&R WG comments on the NMM the following conclusions are drawn: the reviewer found a number of technical deficiencies in the methodology. Obviously, the requirements on the professional level are high and the authors of NMM need to have a sound knowledge of forest inventory. Secondly, it appeared to be difficult to structure the NMM in a consistent manner and to differentiate between elements to be included into the NMM and the NMB. While some of the topics could have been treated in a more adequate fashion by the authors of the methodology, a part of the difficulty is also due to the quality of the forms and recommendations provided by the EB. The latter issue has been recognized by now and improved forms and guidelines are available (see 4.2. below).

3.4. Methodology Features

The following table gives an overview on key features of the NMB and NMM sent for approval to the EB so far.

Table 2: Methodology Features[18]

Number	Baseline Approach	Additionality Tool	Carbon Pools
ARNM0002	C*	Modified from energy projects	all
ARNM0003	A*	no	AGB, BGB**
ARNM0004 :	C	own tool	all
ARNM0005	B*	yes (adapted)	all
ARNM0006	C	no	all except dead wood
ARNM0007	A	yes (adapted)	all
ARNM0008	A	yes (adapted)	all
ARNM0009	A	yes (adapted)	all
ARNM0010	A	yes	AGB, BGB
ARNM0011	B	yes (adapted)	all
ARNM0012	C	yes (self developed)	AGB, BGB
ARNM0013	B	yes (adapted)	all

* A, B, C. refer to the baseline approach chosen as detailed in chapter 2.3.1. above)

**AGB: Above Ground Biomass, BGB: Below Ground Biomass.

[18] Information from Schlamadinger (2005), "Baseline Methodologies for LULUCF: Overview", Presentation at Training Seminar for BioCarbon Fund Projects, Washington, 12-14 September 2005, http://carbonfinance.org/biocarbon/router.cfm?Page=biocfplus.

3.5. Main Reasons for Methodology Rejection

In the following the main reasons for project rejection are compiled. In order to avoid stating the same problems numerous times, the issues are not described project by project, but in a summary fashion and structured according to problem areas.[19] Detailed explanations of the reasons for rejection for each of the methodologies rejected so far are given in the Annex.

On a general level the finding is that methodology authors and project developers did not follow the rules set out in decision 19 of the COP 9 and its Annex. In the Annex, issues such as the question which carbon pools may be chosen, the inclusion of non-CO2 gases into the baseline and project scenario and the definition of a "project boundary" are covered. In particular, authors of methodologies did not apply definitions exactly in the way they should be used according to decision 19 / CP.9. For details on the different aspects see points made in the following sub-chapters.

3.5.1. Land Eligibility

Land eligibility (1990 forest rule) was not or improperly assessed - the methodology does not ask for the required documentation. This is particularly relevant for project areas which may well contain woodland and shrubland vegetation (see for example reasons for rejecting NMB0009).

3.5.2. Scope and Applicability / Project-specific Data

- The scope and applicability of the methodology was either too broad or too narrow.
- Often conditions for application of the methodologies were not spelled out or not well defined.
- No methodology is provided to evidence applicability of the methodology (for example: a methodology requires that no leakage takes place, but it is not spelled out, how one can prove that no leakage takes place in the specific project).
- Project-specific data was used, while the NMB / NMM should be generic.

[19] Some of the information stated here is from Schlamadinger (2005).

3.5.3. Project Boundary and Stratification

- Project boundary not defined or applied correctly.
- Stratification not done in an adequate fashion.

3.5.4. Baseline and Additionality

A large number of problems are associated with the concept, understanding and application of a) the baseline and b) the additionality. Problems with the baseline concept were for example the following:

- Improper baseline definition, the definition did not follow one of the 3 approaches lined out in the Decision 19/C.P. 9 (Annex, paragraph 22), see chapter 2.3.1. above.
- Baseline scenario is based on activities occurring outside the project area (for example in the TIST project). However, this is not sufficient. It needs to be shown what would happen within the project area if there was no project.
- Baseline not differentiated by strata.
- The NMB does not ask to collect socio-economic data for baseline determination.
- It was unclear how the baseline is to be predicted.
- It was unclear how the baseline is to be chosen out of different alternatives.
- Reference to economic model is made, but tool / model is not provided.
- Baseline is not estimated ex ante, but reference was made to sample plots (implying that the baseline is to be measured ex post).
- Non-forest land uses were not included in the baseline modelling.

Problems with additionality:

- Additionality tool proposed by the EB was not used.
- Additionality tool proposed by the EB was not used adequately. One of the important issues here: the additionality tool asks to choose the most plausible baseline scenario; this has often not been done in an adequate way, for example the choice made was not substantiated / it was not clearly explained how the economically most attractive option is to be chosen.

- Additionality was understood as difference between project and baseline. This is wrong, however. For an explanation of additionality see chapter 2.3.2. above.
- Self developed additionality tool was not adequate,

Finally, baseline determination and additionality test were in some cases not clearly separated. Although the two concepts are somewhat related, the difference needs to be understood: the baseline describes (and quantifies) what would happen without the project activity, while the additionality demonstrates that the project would not be carried out without the CDM.

3.5.5. Project Scenario

- Direct measurement of pre-project carbon stocks on the project area is not done.
- No prediction of project carbon stock changes.

Note: at its 21st meeting the EB has clarified that CDM A/R projects descriptions must estimate not only the baseline scenario, but also the project scenario. Both estimates are necessary in order to calculate the expected GHG effect of the project.

- Carbon pools not estimated separately (see also 3.5.8. below).
- GHG emissions estimation from project not complete (e.g., omitted N2O from fertilizers) (see also 3.5.7.).

3.5.6. Leakage

- Leakage was not treated at all.
- Leakage from displacing activities is not addressed.
- Positive leakage was included, although only negative leakage is relevant.
- The NMM does not include parameters which would allow monitoring leakage.

3.5.7. Non-CO2 Gases

Non-CO2 GHGs were not included.

3.5.8. Choice of Carbon Pools

- If it is decided that certain carbon pools (for example litter) are not taken into account, then it needs to be substantiated that such an omission will not lead to an overestimation of the overall net GHG effect of the project. This was not always done.
- Changes in carbon stocks are not differentiated for different carbon pools.

3.5.9. Quality Assurance and Conflicts of Interest

- Quality assurance and quality control procedures were not sufficient and not transparent.
- Conflict of interest when project participants manage control plots (which are used for baseline estimation). An example: a project owner might decide not to plant trees on the control plots, although tree planting is carried out elsewhere in the area for economic reasons. So the control plots would show that the baseline is, for example, degraded pasture, although it is in fact reforestation.

3.5.10. Transparency and Conservativeness

- Lack of adequate level of transparency. For example: unclear what kind of software was being used. Also insufficient referencing leads to lack of transparency.
- Formulae and data used were not considered to allow a conservative estimate of the net GHG effects of the project.
- Uncertainties not assessed and no conservative assumptions (at least one of the two is necessary).
- Error-analysis missing.

3.5.11. Errors and technical Problems

A number of issues can all be summarised as technical problems:

- Documents were not structured in a logical order.
- Incomplete documents,
- errors in equations and
- equations are not well described.
- Language (drafting) problems, incorrect use of terminology.

- Data quality was not sufficient.
- Data was not possible to monitor.
- Assumptions, parameters and models were not adequately substantiated.
- References were missing.

3.5.12. Problems with Monitoring

Some of the aspects listed above refer to the NMM. In addition, the following problems with the NMM were detected:

- Uncertainty analysis missing.
- Baseline monitoring procedures were not described.
- No sampling procedures were provided in the NMM or did not reflect good practice.
- No monitoring of the use of fertilizers as project emissions.

4. Lessons Learned - Requirements for A/R Methodologies

4.1. Lessons Learned

Having analysed PDDs, NMBs, NMMs, desk-top reviews and recommendations by the A&R WG, it is obvious that the standards expected from the CDM A/R documentation are high. CDM A/R project developers need a very sound understanding of the CDM, have know-how on techniques in carbon estimation and monitoring and furthermore an economic and institutional understanding when it comes to baseline design, additionality and leakage issues. Reviewers have shown to very critically analyse the documentation provided to them; often they have asked for clarification and more detail.

For authors of methodologies the following general recommendations are made:

- Use the new guideline provided by the EB (see below) and follow the steps in detail.
- Use the most recent version of the EB's A/R additionality tool.

- Go through the list of problems lined out in chapter 3.5. above and make sure to avoid them.
- In addition: take into account advice given by various experts who have experience with CDM A/R methodologies. For example, take into account advice put together by the World Bank team (see 4.3. below).
- Take into account the A&R WG check list (see 4.3. below)
- Most importantly: it is strongly recommended to use methodologies which are already accepted - or at least use as many elements as possible from those methodologies. By the time this paper will be published, the revised ARNM0010[20] should have been approved by the EB. Also, methodologies for small-scale projects are now available (to be found UNFCCC web page, see above).
- As for the structure of the NMB and NMM, ARNM0010 also gives a very good example.

Summarising the issues tackled above, it is recommended to ensure that the NMB and NMM include the following elements[21]:

1. Summary and Applicability

- Which baseline approach is applied?
- What are the *exact* conditions of applicability for the methodology? How can applicability be evidenced?
- Which carbon pools are selected including justification
- Summary of baseline and monitoring methodology

2. Baseline Methodology

- Eligibility of land (here the additionality tool can be used / referred to)
- Project boundary
- Ex ante stratification
- Procedure for selection of most plausible baseline scenario
- Ex ante estimation of baseline net GHG removals

[20] http://cdm.unfccc.int/Panels/ar/ARWG06_repan1_ARMN0010_Approved_meth.pdf

[21] The list follows the structure of the revised ARNM0010 "Reforestation of Degraded Lands".

- Additionality (here reference to the EB's additionality tool can be made)
- Ex ante estimation of actual net GHG removals by sinks (project scenario) - taking into account also emissions from on-site fossil fuel use and emissions of non-CO2 gases
- Leakage (including GHG effects of possible activity displacement)
- Ex ante estimation of anthropogenic GHG removals by sinks (including leakage)
- Uncertainties
- Data requirements

3. Monitoring Methodology

- Monitoring project boundary and project implementation
- Stratification and sampling for ex post calculations
- If required: calculation of ex post baseline net GHG removals by sinks and data to be collected and archived for baseline net GHG removals by sinks.
- Calculation of ex post actual net GHG removals by sinks (changes in carbon pools and taking into account GHG emissions by sources)
- List of data to be collected and archived for calculation of actual net GHG removals by sinks
- Leakage
- Data to be collected and archived for leakage
- Ex post net anthropogenic GHG removals by sinks (including leakage)
- Uncertainties - uncertainty assessment

Generally it needs to be ensured that all formulae are clearly described and reference is given where needed. Also, it has to be ensured that no project specific data is given in the NMB and NMM.

4.2. EB Information - New Guideline

In September 2005, the CDM EB has published the second version of a guideline on how to formulate A/R PDD, NMB and NMM: *Clean Development Mechanism Guidelines for Completing the Project Design Document for A/R (CDM-AR-PDD),*

the proposed new Methodology for A/R: Baseline (CDM-AR-NMB), and the proposed new Methodology for A/R: Monitoring (CDM-AR-NMM)[22]. The guideline is very specific and gives relatively clear instructions. It is strongly recommended to go through this document when writing a A/R PDD, NMB and NMM. The document also includes a glossary. Furthermore, it is recommended to check and take into account information and clarifications published by the EB.

4.3. Additional Information

A&R WG Checklist

The A/R WG is working on a checklist which helps them to do a first screening of methodologies. The check-list is not public, but a list which can be found on a World Bank web page[23] seems to be a draft version. Therefore it might be worthwhile to be aware of the following issues, which have been taken from that list:

- Definitions – baseline removal by sinks, net removals, leakage, positive and negative,
- Eligibility of land,
- Determination of baseline (one of the three approaches),
- Non-CO2 gases correctly calculated,
- Project boundary,
- Compliance national policies,
- Additionality checked, quantitative and qualitative,
- Leakage properly treated/all sources covered,
- Conservative approach/assessment of uncertainties,
- Monitoring methodology follows the baseline methodology?

[22] http://cdm.unfccc.int/Reference/Documents/Guidel_Pdd_AR/English/Guidelines_CDM-AR-PDD_AR-NMB_AR-NMM.pdf

[23] http://carbonfinance.org/biocarbon/router.cfm?Page=biocfplus, Presentation with "Baseline Methodologies for LULUCF: Overview", slides 6 and 7.

Recommendation of WB BCF Workshop

A workshop held by the World Bank BioCarbonFund (WB BCF) recently came up with a list of useful suggestions on issues to think about when writing a new methodology[24]. The most important issues are:

- Keep it as simple as possible – but no simpler.
- Deal with every element – even if it is a one sentence statement that (e.g.) the section does not apply.
- Keep it concise and do not duplicate either your own or other's material (refer to the sections in other methodologies or quote it directly).
- Be systematic (write a cook-book).
- Check; check; check, consult; seek review, try to shoot holes in your own methodology before submitting.
- Methodology should be generic:
  - do not provide data specific to your project (e.g. yield tables),
  - think beyond your own project to a generic methodology,
  - you may need to provide detail that is not necessary for your own project,
  - the PDD acts as a demonstration that it is feasible and how the detail will be fleshed out.
- Conservativeness may be easier to achieve than a detailed uncertainty analysis.
- Use the EB's Additionality Tool if at all possible.
- Omitting Pools: Must show that omission does not increase carbon credits.
- If there is national legislation or other compliance regulations that require some of the activities in your project, check recent EB guidance (do they pre-date CDM rules? If they post-date then you do not have to consider them).

4.4. Who should write a PDD / NMB / NMM

NMBs and NMMs have proven to be difficult to write at a quality which is acceptable to the EB. For this reason it is recommended to seek help from an

[24] The whole documentation of the workshop can be found at http://carbonfinance.org/biocarbon/router.cfm?Page=biocfplus. The information provided in this section are taken from the presentation: "Synthesis - What makes an accepted Methodology"

expert who is very well aware of the CDM A/R-related issues. When applying an approved NMB and NMM, well-qualified experts with know-how in forestry, economics and institutions should be able to write a PDD at sufficient quality, although an understanding of CDM will be required.

5. Further Reading

For information on CDM-related terms and technical questions a number of guidelines can be consulted. These are, for example:

CDM Watch (2003): The Clean Development Mechanism (CDM) Toolkit: not up to date on forestry issues, but a good "beginners' guide" on the CDM.

Emmer, Igino and Kägi, Wolfram (2005), Check-list for CDM A/R - a brief checklist on issues relevant for CDM A/R projects. The document will be published shortly on http://www.joanneum.at/encofor/.

IPCC (2003): IPCC Good Practice Guidance for Land Use, Land Use Change and Forestry, a must for methodological and technical issues. To be found at: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm

Pearson, Walker and Brown (2005), Source Book for LULUCF Projects, Winrock International: a very good summary of key technical issues. A first version has been put on the World Bank Web (to be found at: http://carbonfinance.org/biocarbon/util/DocItemDisp.cfm?CatalogID=1838).

Appendix

This Appendix provides summaries of NMBs, NMMs, and the reasons for rejection of the methodologies. Note: the summaries of the methodologies have been taken from the A/R WG summary and are not a pure description, but include some elements of critique.

ARNM0002

A summary of the NMB: Reforestation of grasslands with native species

Historical and current land-use and land-cover have been analysed to identify areas eligible for A/R CDM project activities. Further, using Geographical Information System (GIS) layers & Landsat-5 Thermal Mapper (LTM data) TM data, preliminary strata & project boundary are defined. This is further substantiated through field inventory. During the field inventories, the methodology for ex-post determination of different parameters of the vegetation and the soil are provided. Using different equations for different carbon pools in each stratum, carbon stock changes are calculated for each stratum. Finally, the data are aggregated and a project baseline is calculated for the selected crediting period. However, the methodology do not addresses the ex-ante estimation of baseline and project GHG emissions and removals. The methodology covers the selected baseline scenario. But a steps-wise approach justifying the selection and determination of the most plausible baseline scenario is not provided. The additionality test provided is derived from the "Tool for the demonstration and assessment of additionality".

Approach

The proponent has selected approach as per paragraph 22 (c) of the modalities and procedures for CDM A/R project activities: "Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time the project starts". But as per modalities and procedures for CDM A/R project activities (decision 19/ CP.9) and Guidelines (Glossary of Terms) for A/R CDM-AR- PDD, NMB & NMM, the justification is not provided for, how different baseline alternative scenarios have been identified and analysed, and how the most likely scenario has been selected. Rather, it appears that historical land-use change has been analysed and that changes in carbon stocks in the carbon pools within the project boundary were derived from this analysis.

A summary of the NMM: Reforestation of grasslands with native species

The proposed new monitoring methodology is a repetition of the baseline methodology. It consists of nested sample plots randomly located in the predefined strata. Then foresees measurements at rectangular plots for biomass, herbaceous biomass, litter, dead trees, dead fallen trees, and SOC. The number of plots is calculated using an equation that optimises level of accuracy and costs. Carbon stocks in all eligible carbon pools (according to decision 19/CP.9) are estimated using data gathered from the sample plots and the equations. The methodology provides a host of equations for different carbon pools, but the pools differ in terminology from those used in the Marrakech Accords. Field data collection starts at year five and is carried out every fifth year. Monitoring of project activity is described but monitoring of baseline is not adequately explained during the project period (which, as per modalities and procedures for CDM A/R project activities (decision 19/CP. 9), is required to estimate net anthropogenic GHG removal by sinks). It is not clear whether the baseline will be monitored in a similar fashion as the project activity.

Reasons for Rejection the NMB

In its current form the proposed new baseline methodology is not workable for A/R project activities under the CDM. The main reasons are the following:

1) Major requirements of the CDM A/R modalities and procedures are not fulfilled and poorly integrated into the methodology.

2) The methodology cannot estimate the Net Anthropogenic GHG Removals by Sinks in a complete, transparent, conservative and verifiable manner. This is due to:

- A step-wise approach justifying the selection and determination of the most plausible baseline scenario is not provided (which is required as per modalities and procedures for CDM A/R project activities (decision 19/CP. 9).
- Methods (formulae, algorithms or models) to *ex-ante* estimate the carbon sequestration is not provided and thus it is not possible to estimate the net anthropogenic GHG removal by the project activity.
- Formulae / algorithms and data sources used to estimate bio-mass vis-a-vis carbon pools are non-conservative, ill-defined, contains errors, non-substantiated and without references.

- Definition and consideration of actual Net GHG Removals by Sinks and net anthropogenic GHG removal by sinks is not as per modalities and procedures for CDM A/R project activities (decision 19/CP. 9).
- Definition and consideration of Carbon pools is not as per modalities and procedures for CDM A/R project activities (decision 19/CP. 9).
- Leakage is not addressed, renders the estimation of net anthropogenic GHG removal by sinks non-conservative.

Reasons for Rejection the NMM

The problems encountered in the NMB are reflected in the NMM, the major requirements of the modalities and procedures for CDM A/R project activities are not fulfilled and poorly integrated into the methodology.

As the proposed new baseline methodology needs to be re-written, the new monitoring methodology will have to be adapted and completed accordingly. However, other main short comings are :

1) Formulae / algorithms and data sources used to estimate bio-mass vis-a-vis carbon pools are nonconservative, ill-defined, contains errors, non-substantiated and without references.

2) Definition and consideration of actual Net GHG Removals by Sinks is not as per modalities and procedures for CDM A/R project activities (decision 19/CP. 9).

3) Definition and consideration of carbon pools is not as per modalities and procedures for CDM A/R project activities (decision 19/CP. 9).

4) No transparent and verifiable information is provided to demonstrate that the soil carbon omission will not inflate net GHG removal by sinks (as per paragraph 21 of the modalities and procedures for CDM A/R project activities (decision 19/CP. 9)).

5) Monitoring of leakage is not addressed and an appropriate justification for the same is also not provided.

6) Conditions for application of the monitoring methodology are not well defined so as to make it generally applicable.

ARNM0004

A summary of the NMB: Methodology for estimating changes in carbon stocks in the baseline scenario of proposed activities of afforestation on grassland sites, combined with livestock intensification.

The methodology proposes a procedure to evaluate C sequestration potential of a timber plantation combined with life stock intensification, on land currently used as grassland under extensive livestock grazing. The methodology proposes steps to integrate international, national and local policies and proposes steps to integrate economic rational to evaluate the most likely land use alternatives. The methodology integrates two basic assumptions:

1. That under extensive livestock grazing there are no changes in carbon stocks, the assumption is made conservative by discounting the area available for forest planting by a factor that is equal to the average rate of afforestation in the country / region. The assumption is well justified given the long history of extensive grazing in the country (ca. 300 years), together with the thorough analysis of both the IRR for various alternative land use options and the barrier analysis.

2. GHG emissions associated with livestock under an extensive grazing regime will be less than those for the project, which involves grazing intensification on a small part of the total project area. The assumption is met in the methodology directly through management action, in the project scenario.

Approach

The approach selected is as per paragraph 22 (c) of the CDM AR modalities and procedures. "Changes in carbon stocks in the pool within the project boundary from the most likely land use at the time the project starts".

A summary of the NMM: Monitoring carbon stock changes and green house gas emissions in project activities of afforestation of grassland sites, combined with livestock intensification and conservation of native forests. Short Title ' Ibira ' Monitoring Methodology

The methodology monitors carbon stock changes and GHG emissions in project activities of afforestation of grassland sites combined with livestock intensification. The methodology covers all 5 carbon pools for forest and grassland, and covers estimation of carbon stocks through a permanent sample plot (PSP) network, using a stratified sampling approach. Above and below ground tree

and shrub biomass, litter, dead wood, and soil carbon are sampled using purpose-developed standard operating procedures, with repeat-inventory of selected PSPs. A range of QA/QC procedures ensures overall data quality, with training of personnel to provide consistency and reproducibility of data collection. Tree stemwood mass is estimated using mass-based allometric equations. The validity of the allometric equations is suggested to be checked through destructive harvesting is included.

CDM-AR-NMM considers two potential leakages based on the assumption that:

1. There is no net increase in livestock trace gas emissions within the project area beyond that for the baseline scenario of extensive livestock grazing. The methodology provided to monitor estimated leakage on the above assumption is technically sound using IPCC default emission factors. However, the assumption needs a reconsideration as suggested in B.I.(5) and thus the methodology to monitoring leakage is to be reconsidered.

2. Carbon emissions associated with displacement of timber usage from native forest inside, to outside of, the project area. The monitoring of estimated leakage is based on average bio-mass stocks in native forests for any forest clearance, seems to be adequate. But the monitoring of estimation of wood harvesting in the nearby natural forest by satellite images are not enough and needs to be re-considered.

Reasons for Rejection the NMB

In its current form the methodology is not workable for A/R project activities under the CDM. The main reasons for non approval are the following:

1. The methodology cannot estimate the net anthropogenic GHG removals by sinks in a complete, transparent, conservative and verifiable manner. This is due to:

- The changes in carbon stocks (for the baseline and the project scenario) are not considered for separate individual carbon pools (above ground biomass, below ground biomass, litter, deadwood and soil organic carbon), which is required as per the modalities and procedures for CDM A/R project activities (decision 19CP 9).
- All non-tree carbon pools in the project scenario are considered only in qualitative terms, without either direct estimations or a direct justification of magnitude, which is required to make the methodology transparent and

conservative (required as per modalities and procedures for CDM A/R project activities (decision 19CP 9).

- The criteria and procedures to assess magnitude of the identified potential leakages are incomplete. Two sources of leakages are considered:

  a) Leakage associated with non CO2 GHG emissions from displaced livestock from inside, to outside of, the project area.

  b) Leakage associated with the displacement of timber usage from native forest from the inside to the outside of the project area.

However, the equations provided are for total bio-mass stock in native forest (Mg.ha-1) and annual animal weight gain in the baseline (kg product. ha-1.yr-1), which are not sufficient to estimate / ascertain leakage.

- GHG emissions from sources within project boundary is incomplete, e.g. no equations have been provided for estimating, N2O emission from the use of fertilisers in the project activity, which is required as per modalities and procedures for CDM A/R project activities (decision 19CP 9) to estimation of actual net GHG removals by sinks.

2. Referencing of different algorithms and data sources is inadequate, thus making the document nontransparent. For example, equations given in section E.2.1 have no reference; similarly a complete reference to *Damodaran* (NMB, section E.2.8.ii) is missing.

3. Methods to assess the eligibility of land, e.g. to specify the project is an afforestation or a reforestation a project activity, are not provided, which is required as per the modalities and procedures for CDM A/R project activities (decision 19CP 9.

Reasons for Rejection the NMM

As the proposed new baseline methodology needs to be re-written, the new monitoring methodology needs to be adapted and completed accordingly. In addition, other major short comings are:

Leakage: The basis for the assumptions, criteria and procedures to monitor the magnitude of the identified leakages is not clear, thus making the methodology non-transparent and non-conservative.

- For monitoring of leakage associated with non CO2 GHG emissions from displaced livestock from the inside to the outside of the project area, it is considered that if total animal production in the project area is less than that in the baseline, then the difference will be leakage. The basis for this assertion is neither transparent and nor clear. Number of livestock displaced in conjunction with animal trace gas emissions in the baseline and project scenario is a direct and transparent approach to ascertain leakage.
- The methodology suggests for the monitoring of leakage associated with the displacement of timber from native forest to the outside of the project area, to monitor the estimation of increase in harvesting of the native forest area adjacent to the project area by remote sensing. This is not possible as considerable volumes of wood could be extracted without the clear felling to the extent to be detectable by remote sensing.
- In monitoring the estimation of GHG emission by sources: CDM-AR-NMM section B.2.2.2.4, "Changes in carbon stocks due to conversion of grasslands to roads", accounts only for decay of existing vegetation, while changes in carbon stock due oxidation of soil carbon are not considered, thus making the monitoring approach non-conservative.
- Strategy for error analysis to monitor standard errors in estimations of carbon stock / GHGs is not provided, which is required in the methodology for being conservative and transparent.

ARNM0005

A summary of the NMB: Plantation forestry with baseline control

The project participants propose the following steps (ARNM0005-NMB, Section E):

1. Identify the location of the project;

2. Determine the eligibility of project areas;

3. Determine the additionality of the proposed project;

4. Define the baseline scenario(s);

5. Stratify and sample project area(s) and baseline control area(s);

6. Establish systematic permanent sample plots in the baseline control and project treatment areas prior to commencement of management, and gather all required data from these plots. Resample these plots with the specified frequency thereafter;

7. Establish a systematic program to fine-tune variables to local conditions, as required

8. For each vegetation layer in the baseline control and treatment areas of stratum, calculate the total biomass per hectare;

9. Calculate the total biomass carbon stock for all layers for each stratum under both the project and baseline scenarios;

10. Calculate the actual net anthropogenic greenhouse gas (GHG) removals by sinks;

11. Calculate leakage directly attributable to the project activity for each time period;

12. Calculate the net anthropogenic GHG removals by sinks for each time period.

Approach

The selected approach is as paragraph 22 (b) of the CDM A/R modalities and procedures. “Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment.”

A summary of the NMM: Plantation forestry with baseline control

The proposed monitoring method consists of standard periodic forest inventories stratified by land use. Monitoring includes biomass in 5 pools and shrub / grasses both for project and baseline. The proposed monitoring method also periodically recalculates baseline net greenhouse gas removals by evaluating economic returns of forest management alternatives for each land use area. Leakage and fossil-fuel emissions are also subject to monitoring, but for leakage only energy leakage.

Reasons for Rejection the NMB

The methodology has greatly improved since it was first submitted as ARM0001. Nevertheless, there are still major problems:

Major reasons:

1. Incorrect use of the term “project boundary” as defined by the UNFCCC CDM Guidelines for completing CDM-AR-PDD, CDM-AR-NMB, and CDM-AR-NMM.

2. Relate baseline control areas are not related to the project boundary.

3. A procedure to quantitatively weight and combine the factors for land use classification and stratification needs to be developed.

4. The economic model for the determination of the monitored baseline land use per stratum needs to be submitted as part of the methodology.

5. There is a potential conflict of interest in managing baseline control areas.

Minor problems:

1. Site preparation should be addressed in the project scenario.

2. Substantiate and transparently derive the cut-off threshold for the application of market leakage assessment

3. If market leakage for avoided baseline production is quantified, so should be the one for forestry products

4. Market leakage model does not take into consideration demand elasticities.

5. Disaggregated data for the leakage model will be hard to obtain.

6. Procedures to quantify uncertainty and error should be developed.

7. Physical units should be attached to all variables in the equations, and all equations be checked so that the units are correct.

8. It is suggested not to circumscribe official definitions, as in the explanation to Equation 1: “The baseline scenario is the sum of ‘the changes’ in carbon stocks in the carbon pools.

9. While baseline is updated regularly, potential land use alternatives are only determined upfront according to steps 2 and 3 (not 4 “Common Practice”) in the Consolidated Additionality Tool.

10. While baseline is updated regularly, market leakage is only calculated once.

11. Adapt indicators used in the Additionality Tool specific to the project type.

Reasons for Rejection the NMM

Major reasons:

1. Monitoring of leakage is incomplete due to a lack of conceptual understanding (e.g. fuel emissions in and outside project area are not differentiated and Baseline Control Areas not attributed).

2. No socio-economic data for baseline determination has been collected

3. Lack of monitoring of Baseline fire occurrence.

4. Data for the model to estimate leakage is not covered by the monitoring.

5. Site preparation is not monitored.

Minor problems:

1. The concept of large measurement plots, of which "up to ten trees are measured", is questionable, because nothing is said about how the actual number is chosen, and how the individual trees are selected.

2. Market leakage only estimated ex-ante, but not monitored

3. Physical units should be attached to all variables in the equations, and all equations be checked that the dimensions are correct

ARNM0006

A summary of the NMB: Simplified baseline methodology for small scale CDM afforestation/reforestation on degraded lands, grasslands and fallow croplands.

A land use change analysis in combination with a Participatory Rural Appraisal (PRA) is used for the definition of the baseline scenario according to approach as per paragraph 22 (c) of the CDM modalities and procedures: "Existing historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary". The *ex ante* estimation of the baseline is described not very consistently and ex ante estimation procedures are not provided. The same is true for the ex ante estimation of the actual net GHG removals by sinks, including project related non-GHG emissions by sources. Displacement of cattle grazing as leakage is not addressed. Given the above, data sources and the handling of uncertainties is not adequate.

Approach

The approach selected is as per paragraph 22 (c) of the CDM A/R modalities and procedures:

"Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time the project starts". However, the description of the selection of the baseline scenario is not consistent as in Section B land changes area analysed and extrapolated (rather approach a) whereas PRA is proposed to verify the information used to establish a land use change matrix (in Section E2).

A summary of the NMM: Monitoring methodology for afforestation/ reforestation on degraded lands, grasslands and fallow croplands

Stratified random sampling with nested permanent plots is used to monitor baseline and actual GHG emissions by sources; however, neither the step-wise description nor the mathematical formulation are internally consistent and complete. Calculation routines for some emissions by sources are provided but no sampling procedure to obtain the respective data is described. Leakage is assumed to be irrelevant.

Reasons for Rejection the NMB

The effort undertaken by the proponents of this methodology to address the required changes of a previous version of this CDM-AR-NMB (rated b) is acknowledged. Unfortunately, further critical major issues have been discovered during the second consideration of this CDM-ARNMB, leading to the non-approval of this CDM-AR-NMB.

For the following reason, this CDM-AR-NMB cannot be approved:

- The CDM-AR-NMB outlines sampling strategies for both the quantification of the baseline and the actual GHG removals by sinks. Given that the baseline methodology should model the verifiable net removals of a project *ex ante*, the current methodology is not applicable;
- The baseline methodology should be described in an internally consistent and unambiguous way following a logical order; short descriptions of methodological steps should contain all relevant steps, which are described in more detail later in the text; terminology should be unambiguous. This is not the case (see required major changes) and a thorough revision of the entire

document is needed to set users in a position to use the CDM-NMB in a 'cookbook' manner.

Further required major changes

- For the quantification (and monitoring) of the baseline scenario 'sample plots' and 'control plots' proposed (C.2). The difference is not clear. Further, it is not clear how the data from these plots should be integrated into the estimation of the baseline net GHG removals by sinks *ex ante*(!). Before the beginning of the project, different land use types can be sampled to determine initial carbon stocks and possibly time-series can be constructed (on which methodological guidance should be provided). Nothing else can be done within the baseline methodology (but in the monitoring methodology) (see also below);
- The CDM-AR-NMB proposes the monitoring of the baseline scenario with sample plots. The distribution of these sample plots to catch carbon dynamics without a project activity is far from trivial as the land use change of these plots cannot be predicted. For example, plots in grassland can be degrade, undergo natural regeneration or many other changes. The plot distribution to catch a specific and representative land use change and the respective calculation routines have to be explained in the CDM-AR-NMB and in detail in the CDM-AR-NMM (see also there);
- The determination of the baseline scenario is not clear: are trends of land use change analyzed and include the analysis of socio-economic, political and legal circumstances for the extrapolation of land use chances as a separate step for the baseline definition (not only as part of "Tool for the demonstration and assessment of additionality"). It does not make sense to make such an analysis before the project area has been defined (as stipulated in Section E1).
- Section B is inadequate as actual GHG removals can not be monitored for the baseline methodology; the methodological steps of the baseline definition should include a consistent description of what will be explained in related Sections B, E.1 and E.2.
- The calculation of the land use change matrix and its further use should be described in more detail, particularly related to the determination of the baseline changes of carbon pools (plot distribution; see below).
- Some part of the methodology is project-specific, which should be avoided.
- If the baseline scenario is not monitored, evidence should be provided as a methodological step that carbon pools can be expected to be declining.

- Use of forest inventory terminology is often inadequate.
- In Section E.4 the methodology describes two options; a) the sampling in areas with land changes expected to occur in the project area, and b) modeling. For b) no guidance is provided.
- Add the non-occurrence of leakage as precondition of the applicability of the methodology and include a methodological step that provides evidence on this conditionality.
- Displacement of cattle and carbon effects of fencing should be addressed as potential leakage (not only fuelwood collection).
- Section F.1 refers to monitored data not to data that is needed to estimate the net anthropogenic GHG removals by sinks of a project *ex ante*.
- Procedures to deal with the different types of uncertainty are not adequately described and precision targets are not clear ("uncertainties are estimated at the 95% confidence limit…").

Required minor changes

- Clarify Section A2: land with crown cover which is defined as forests is not eligible!
- Units are lacking for Li in equation 3;
- For the additionality test, reference could be made to the draft "A/R tool for the demonstration and assessment of additionality" (so Section E.3 could be shortened and be made more adequate (e.g. deleting Step 4);
- It is not the time limit but methodological requirements (Decision 19/CP.9, para. 21) that dictate the selection of pools, not necessarily resource and time limitation.
- Equation 2 and its description is erroneous as it describes the baseline GHG stocks at the end of the crediting period, not the net removals during the crediting period.
- The title of the CDM-AR-NMB is misleading as no simplified methodology is provided.

Reasons for Rejection the NMM

- Detailed methodological guidance should be provided for both the monitoring of the baseline net GHG removals by sinks (if samples are taken; see the

CDM-AR-NMB) and the actual GHG removals by sinks should be provided as data collection and processing could differ for the two.

- The description of the monitoring method does not follow the logical order of steps to be taken (e.g. biomass estimation is followed by sampling strategy and plot distribution (in Section B.2) and in itself is sometimes contradicting (e.g. in the case of plot allocation).

Required major changes:

- Imprecise terminology is often used leading to ambiguous description of the methodology.
- Project-specific information should be deleted; methodological steps or sources of information should be described in a generic way (e.g. in Section B.2).
- The implementation of the planes vivos should be monitored before each verification, i.e. the size of the implemented area, the conditions of the plants, etc. Methodological guidance is lacking and should be provided in this respect.
- Sometimes, the described procedures to not reflect good practice.
- Logical order for the planning and implementation of the monitoring methodology is not followed (Section B.2). For example, biomass estimation is described before the measurements are made, plots are sampled before they are distributed, the stratification and sample distribution procedure is described after the biomass estimation and no reference is made in the stepwise description of the sampling strategy just above this section, stratification and sample distribution is described at the very end of this Section although it should stand at the very beginning.
- Equations should be provided for all the carbon pool estimates and for the summing up baseline (Section B.2.4) and actual (Section B.2.2) GHG removals by sinks (see e.g. IPCC good practice guidance for LULUCF); a list of variables should be provided to guarantee a consistent mathematical description throughout the CDM-AR-NMM.
- Much of the methodology is written as conditional: “It is suggested…, it could be used”. However, clear methodological instruction is expected in a CDM-AR-NMM.
- Monitoring procedures to estimate actual GHG removals are not described (Section B2.1; see also comment on Section B.2.2). It seems that the baseline monitoring procedures are more suited to monitor actual GHG removals that

the baseline GHG removals. For the description of the baseline monitoring, emphasis should be put on the different possible baseline land use types, which might require different sample design and on the plot distribution. The latter is complex as the land use change of baseline plots in time cannot be predicted. Either a 'regional' baseline is calculated (not distinguishing different land use change options) or the carbon changes in different land use changes are monitored. The equations indicate the second; thus, methodological guidance is necessary to distribute plots in a way which allows for the determination of the Ci (as used in the equations in the CDM-AR-NMB).

- Adequate formulas to estimate actual GHG emissions *ex post* are not provided (B.2.2); instead, some baseline related formulas are provided.
- Adequate formulas to estimate verifiable GHG emissions *ex post* are not provided (B.2.2.1); instead, criteria for eligibility and formulas for biomass estimation are provided.
- No sampling procedures are provided that allow for the estimation of GHG emissions by sources; only calculation routines are described.

ARNM0008

A summary of the NMB: Baseline methodology for afforestation and reforestation of degraded bush and woodlands in forest reserve areas.

The baseline scenario as per paragraph 22 (a) of CDM A/R modalities and procedures has been selected: "Existing or historical, as applicable, changes in carbon stocks in the carbon pools with the project boundary". The "Tool for the demonstration and assessment of additionality" has been used for proving the additionality of the proposed A/R activity. Use of the tool expects to prove that, illegal activities are widespread in the host country and the past and present land-use on non-forested areas within the forest reserves is to be taken as the baseline scenario. Under the conditions that, carbon stocks continue to decline under the baseline scenario the baseline net GHG removals by sinks is set to zero, which simplifies monitoring and accounting. Three forms of possible leakages associated with travel activities, transport of products to market and activity shifting outside project boundary have been identified and addressed. The methodology provides for the estimation of the initial carbon stocks (through expert judgement on comparable sites) and for the actual net GHG removals by sinks, while all this is further detailed in the CDM-AR-NMM.

Approach

Approach as per paragraph 22 (a) of the CDM A/R modalities and procedures has been selected: “Existing or historical, as applicable, changes in carbon stocks in the carbon pools with the project boundary”.

A summary of the NMM: Monitoring reforestation of degraded bush and woodland in forest reserve areas.

It is assumed that the baseline net GHG removal by sinks are zero. As all other pools are expected to decline in the baseline and to increase during the project-crediting period, only aboveground and below ground bio-mass is monitored. The baseline is not being monitored. Sampling is conducted in permanent sample plots based on a previous stratification. No direct measurement of pre-project carbon stocks is done. Instead, expert judgement is collected for comparable sites outside the project boundaries.

Reasons for Rejection the NMB

The AR WG acknowledged the importance of an A/R methodology which addresses afforestation / reforestation of degraded forest reserves (which is frequent situation in developing countries). However, the methodology needs further development before being submitted again. The main reasons are as follows:

- A stepwise approach justifying the selection and determination of the most possible baseline scenario is not provided (required as per CDM A/R modalities and procedures).
- No procedure is provided for transparent justification of the key hypothesis on which the methodology relies

  i) The key condition for the CDM-AR-NMB is “the C stocks in the baseline scenario are declining and thus, the net baseline GHG removals by sinks are considered negative”. But no tool is provided for checking this key applicability condition

  ii) Pre-project carbon stocks are determined through data sources from scientific research on comparable site, selected on basis of expert judgement. But no tools have been provided - how to select the comparable site.

- Use of the methodology is basically dependent on conditions of applicability and thus the conditions for use of the methodology should be reflected in the

additionality test. But the CDM-AR-NMB fails to do so due to following reasons:

i) The "Tool for the demonstration and assessment of additionality" is not adapted to the specific conditions for application of the CDM-AR-NMB.

ii) The conditions, which exclude applicability of this methodology, are not provided.

iii) Establishment of baseline scenario is not adequately presented (CDM-AR-NMB presents what should be done but provides no guidance how to do it).

iv) The methodology offers no test for land eligibility, which is crucial for afforestation of a forest reserve.

- Net anthropogenic GHG removals by sinks can not be estimated in a verifiable, transparent and accurate manner as per decision 19/CP.9, due to the following:

  i) Formula used to estimate actual net GHG removal by sinks is wrong, as it does not deal with changes in carbon stocks (instead refers carbon stored & sequestered). Similarly there are errors in other formulae.

  ii) Non-CO2 emissions from the project activity are not considered (eg. for use of fertilisers, etc). Nor they are covered in conditions for applicability.

  iii) Leakages for potential activity shifting (even illegal activity) out of the project area is not addressed.

  iv) Direct measurement of pre-project carbon stocks on the project area is not done, nor a verification procedure for expert judgement is provided.

  v) No information is provided on possible differentiation of the baseline scenario by strata. The composition and weighing of stratification criteria is not properly addressed.

- The methodology does not use the terms defined in UNFCCC decisions and CDM Glossary, for example, wording like "carbon stored" and "carbon sequestration" causes confusion between stocks and flows.
- No tools for uncertainty assessment or other way of securing the conservative approach.

Reasons for Rejection the NMM

As the associated CDM-AR-NMB is not approved thus the CDM-AR-NMM is also recommended for non-approval. Other reasons for non-approval are given below:

Using the monitoring methodology the net anthropogenic GHG removal by sinks can not be monitored in a in a complete, transparent and accurate manner due to following reasons:

- No procedure provided for how it will be ascertained that the comparable site selected on the basis of "Expert judgement" for assessing the pre-project carbon stocks is a true representative of baseline scenario or will lead to conservative estimates of carbon stocks.
- Leakage from potential activity shifting is not monitored.
- No tool provided for monitoring of measures used to prevent leakage by people/activity displacement.
- Possible sources of non-CO2 GHG like use of agrochemicals or fire from the project activity is not addressed and the omission of the same is not justified.
- The exclusion of soil organic carbon in a case of short rotation management is not justified to be conservative approach rule.
- There is little explicit guidance on data collection protocols (tree height).
- Some of the equations and formulae are not correct.
- Though the CDM-AR- basically depends on yield tables for monitoring of estimations but there is no explanation what should be done if proper yield table is not available, nor condition of applicability based on availability of yield tables is set forth.

ARNM0009

A summary of the NMB: Baseline methodology for reforestation of degraded bush and grassland.

For the baseline scenario, the methodology simply assumes declining carbon pools and thus considers constant carbon pools as the baseline scenario to be a conservative approach. No guidance is provided to estimate the carbon effects of

the project scenario ex ante. Eligibility of land is addressed in an insufficient way, an aspect that might be relevant in the case of this methodology, as grassland can contain woodland and shrubland vegetation. Additionality of the baseline scenario is tested with the Executive Board's tool for the demonstration and assessment of additionality. Guidance on how to address uncertainty is missing. Leakage from activity shifting (e.g. cattle grazing) is insufficiently addressed. All in all, constituting elements of a baseline methodology are lacking and/or are described in an insufficient way

Approach

Approach a) as per paragraph 22 (b) of the CDM A/R modalities and procedures was selected: "Existing, or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary".

A summary of the NMM: Monitoring methodology for reforestation of degraded bush and grassland.

The CDM-AR-NMM uses grid-based, stratified random sampling of above-ground live tree merchantable stem volume using permanent sample plots, with pre-sampling to determine the number of sample plots required to estimate this stem volume to +/- 10% at 95% confidence for each stratum. Merchantable stem volume is converted to biomass using wood density data, with the biomass of other tree components estimated using expansion factors.

Soil carbon, litter and dead wood are not monitored as they are excluded from the calculations. Carbon stock changes in these pools are assumed to increase in the project scenario and to decrease in the baseline scenario. The exclusion of these pools thus represents a conservative approach. Sampling of the stem volume is carried out every 5 years. Carbon effects of forest interventions such as site preparation and thinnings are disregarded. Only very generalized equations are provided for the estimation of total tree biomass.

Project-activity related transportation is considered as leakage; leakage due to activity shifting (cattle grazing) and due to fencing with wooden posts is disregarded. GHG effects of fertilizers are disregarded.

Monitoring related to the evidence for the applicability of the methodology, e.g. that soils are not carbon sources, is not foreseen; monitoring of the project

implementation, the underperformance of plantations (also ex-post stratification), and project area is not foreseen.

Guidance on how to address the different types of uncertainty is not provided.

Reasons for Rejection the NMB

- A constituting element of a baseline methodology is lacking. No guidance is provided to estimate actual GHG removals by sinks (the 'project scenario') *ex ante*. Instead, monitoring procedures for the verification *ex post* are described.
- Further elements of a baseline methodology are described in an insufficient way or are lacking:
- The applicability of the methodology and the conditions under which it can be applied is insufficiently assessed in relation to:

  (i) Definition of "degraded" as a key part to test the validity of the methodology,

  (ii) Methodological guidance on how to determine this,

  (iii) Evidence that continued grazing can be assumed (no respective leakage is occurring),

  (iv) Possibly decreasing soil carbon in afforested / reforested area under relatively temperate conditions,

  (v) Exclusion of leguminous species as respective N2O emissions.

- Methodological guidance on how to determine the baseline scenario is insufficient (particularly Step 2 to 4 in Section E2 where only headlines are provided).
- No methodological guidance is provided on how to determine the baseline scenario out of the set of baseline alternatives defined with the analysis of past land use changes (Step 4 in Chapter E2).
- Expert judgements on initial carbon pools limits this methodology to areas where sound scientific data is available, or project developers run a considerable risk in the quantification of the net GHG removals by sinks. Therefore, include a sampling procedure for the initial carbon stocks (including shrubland vegetation and woodland that do not meet the country's and/or the CDM definition of forest) and the option to use expert judgement if

sufficient scientific data is available. Refer to the CDM-AR-NMM to avoid needless repetition. Eventually, the size of A/R projects, which rely on expert judgement of the initial carbon stock estimation, should be limited (to small-scale A/R projects).

- Additionality test is insufficiently described (only headlines of chapter titles of the Board"s "Tool for the demonstration and assessment of additionality"). Refer to the draft A/R tool for the demonstration and assessment of additionality recommended by the AR WG for the consideration of the Executive Board at its twenty-first meeting. Or make sure that cattle farming and A/R activities without the revenues of the CDM as baseline alternatives are included as scenarios to be tested with the tool for the demonstration and assessment of additionality.
- Eligibility of land - and as such the definition of the project area - is addressed in an insufficient way, an aspect that might be particularly relevant for this methodology as grassland can contain woodland and shrubland vegetation.
- Guidance on how to address the different types of uncertainty for the baseline methodology are not provided.
- Leakage from activity shifting (e.g. cattle grazing, fencing) is not addressed.
- The methodology is streamlined based on many assumptions (which is good), on which evidence should be provided as part of the methodology.
- Referencing has to be improved. Detailed references for parts taken out of the IPCC Good Practice Guidance for LULUCF (2003) should be given.

The assessment of the CDM-AR-PDD is outside the scope of this document. Project proponents are invited to consult the external reviews for hints on this subject.

Reasons for Rejection the NMM

- Key elements of a CDM-AR-NMM are lacking or are insufficiently described:
- Equation(s) for the determination of the actual net GHG removals by sinks is/are lacking.
- Conditions for the applicability of the CDM-AR-NMM are not sufficiently described (refer to CDM-AR-NMB).
- Monitoring of the use of fertilizers as project emissions is lacking.

- Monitoring of leakage due to the displacement of cattle grazing and fencing is lacking.
- Monitoring of project area, i.e. measurement of the implemented area, implementation of project activities according to management plans, possible underperformance of planted sites and eventual post-stratification are lacking as methodological steps.
- Sampling does not reflect good practice: within a plot, all trees above a certain DAB to be defined should be measured, not up to 10. Plot size should be chosen accordingly. Furthermore, the practical part of the sampling is not sufficiently described (measurement of DAB, biomass taken off the site during forest interventions).
- Check of default values used for the calculation of biomass carbon should be foreseen, e.g. for expansion factors, root-shoot ratio, etc. If no regional data is available, some destructive sampling should be foreseen to verify the default values (see also IPCC Good Practice Guidance for LULUCF (2003).

Some aspects require major changes:

- The equation used for plot allocation leads to the same level of precision for all strata, independently of their contribution to the total. This is not cost effective.
- Available equations are poorly described and contain errors (Eq. 3: totally unclear formulation; Eq.4: parameter for area is not described; Eq. 7: EmG ?), some units and description of parameters are lacking or are erroneous (Eq. 4;).
- Quality assurance procedures should also contain tolerable deviations of sampling values.
- Guidance on how to address the different types of uncertainty in the CDM-AR-NMM.
- Carbon effects of forest interventions such as site preparation, thinnings and harvestings are not monitored (no such procedure is described although a very general equation is available (Eq. 7)). Possibly, the monitoring interval of 5 years should be adapted for these effects.

Some aspects require minor changes:

- Default values are partly project-specific, e.g. the wood density of *Pinus caribaea*. Project - specific information should be deleted; instead references for wood density could be provided.

- Quality assurance procedures should also contain tolerable deviations of sampling values.
- The equation used for plot allocation leads to the same level of precision for all strata, independently of their contribution to the total. This is not cost effective.

ARNM0011

A summary of the NMB: Baseline methodology for afforestation or reforestation project activities that are additional due to financial barriers to their implementation.

The A/R methodology proposes several economic indicators used for investment analysis that are provided in a modified additionality tool to define, assess and select a baseline scenario on land to be afforested/reforested and to demonstrate the additionality of the project scenario. The GHG dynamics of the baseline scenario and the project scenario are calculated based on a set of equations that are used in computer-based spreadsheet models and which are widely documented in literature. No onsite calibration is foreseen. All relevant carbon pools are covered; project emissions include fossil fuel emissions and N2O but not methane; leakage due to activity shifting is excluded as a precondition of the applicability of the methodology.

Approach

Approach b as per paragraph 22(b) of the CDM A/R modalities and procedures was selected: “Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment.”

A summary of the NMM: Monitoring methodology for afforestation or reforestation project activities.

This very superficially described monitoring methodology relies on the measurement of carbon pools with standard carbon inventory procedures, referring mainly to the IPCC Good Practice Guidance for LULUCF (2003), to be filled in a flux-based carbon model. The monitoring of flux-related parameters is not described; the monitoring of baseline carbon pools as foreseen in the baseline methodology remains unclear.

Reasons for Rejection the NMB

The main reason for not approving the baseline methodology is because of its strong link to the monitoring methodology that needs significant changes and would therefore require additional desk reviews if resubmitted. In addition, the following changes in the baseline methodology would be required.

- Precise the conditions for the applicability of the methodology.
- Include a description of the economic assessment (including the case where economic parameters such as the NPV and the IRR provide contradicting results.
- Include a leakage assessment, i.e. address activity displacement and possible effects of fencing.
- Include an uncertainty analysis.
- Include also non-forest land uses for the modelling of the baseline, such as cropping, grazing, manure application, and other effects on the carbon pools.
- Include on site calibration of the model with field measurements (before the first validation of the project).
- Minor changes related to equations and wording (see below).
- On fertilizers, the draft CDM-AR-PDD includes a detailed equation (Eq. 4). This equation should be integrated into the methodology.
- Name the software(s) where this model is implemented.
- The methodology should describe how a project developer will derive the input requirements of the model (data sources).
- The selection and justification of baseline scenario and justification for additionality of the project activity should be described separately in their respective sections, clearly separating the two issues.
- Detailed algorithms and formula for determining financial aspects of baseline determination are not described. The same should be addressed in step 4 of section E2).
- A clear separation between baseline determination and additionality test is to be maintained in the CDM-AR-NMB (section E2 & E3).

The assessment of the draft CDM-AR-PDD is beyond the scope of this assessment (see external reviews).

Reasons for Rejection the NMM

The methodology relies on the measurement of carbon pools (as described in the annex) whereas the formulae of the monitoring methodology for the baseline - the formulae for the project scenario are missing - are based on an initial carbon content of all pools and flow-based extrapolations (Section B.2.4). It is therefore not clear:

- How the pool-based measurements should be integrated into the flow-based model outlined in the monitoring methodology;
- How flow-related measurements should be made (if any);
- How discrepancies between the flow-based baseline methodology and the pool-based and/or flowbased monitoring methodology should be handled (particularly for the adjustment of the ex ante estimations of the baseline methodology).

Most of the monitoring methodology is described in an annex, which provides some general information on carbon and biomass data collection and analysis. Detailed description of methodological steps (including stratification, building age cohorts, plot distribution over time, ex-post stratification, etc.) and formulae for all carbon pools and other GHG emissions by sources in a “cookbook” way are missing. The CDM-AR-NMM sometimes provides different methodological options but there is no guidance as to when to use which option. Further requested major changes:

- Leakage monitoring, i.e. the provision of evidence of the absence of leakages as a precondition for the applicability of the baseline methodology is missing;
- No guidance is given on how the planted area is monitored, i.e. the implementation of activities, the existence of older plantations, etc;
- Uncertainty analysis is missing;
- Quality control and assurance procedures as well as quality targets should be described in more detail;
- Baseline monitoring procedures (sample design, plot allocation) are not described, although foreseen in the baseline methodology;
- Parameters to monitor the baseline are suited for forested areas; they are not necessarily suited to monitor carbon effects related to agricultural activities (i.e. carbon effects from grazing, cropping, manure application);

- Some errors in formulae in section B.2.4;
- Formula for plot allocation is not suitable as it implies that all strata are measured with the same level of precision, which is not efficient;
- The target level of precision should be stated.