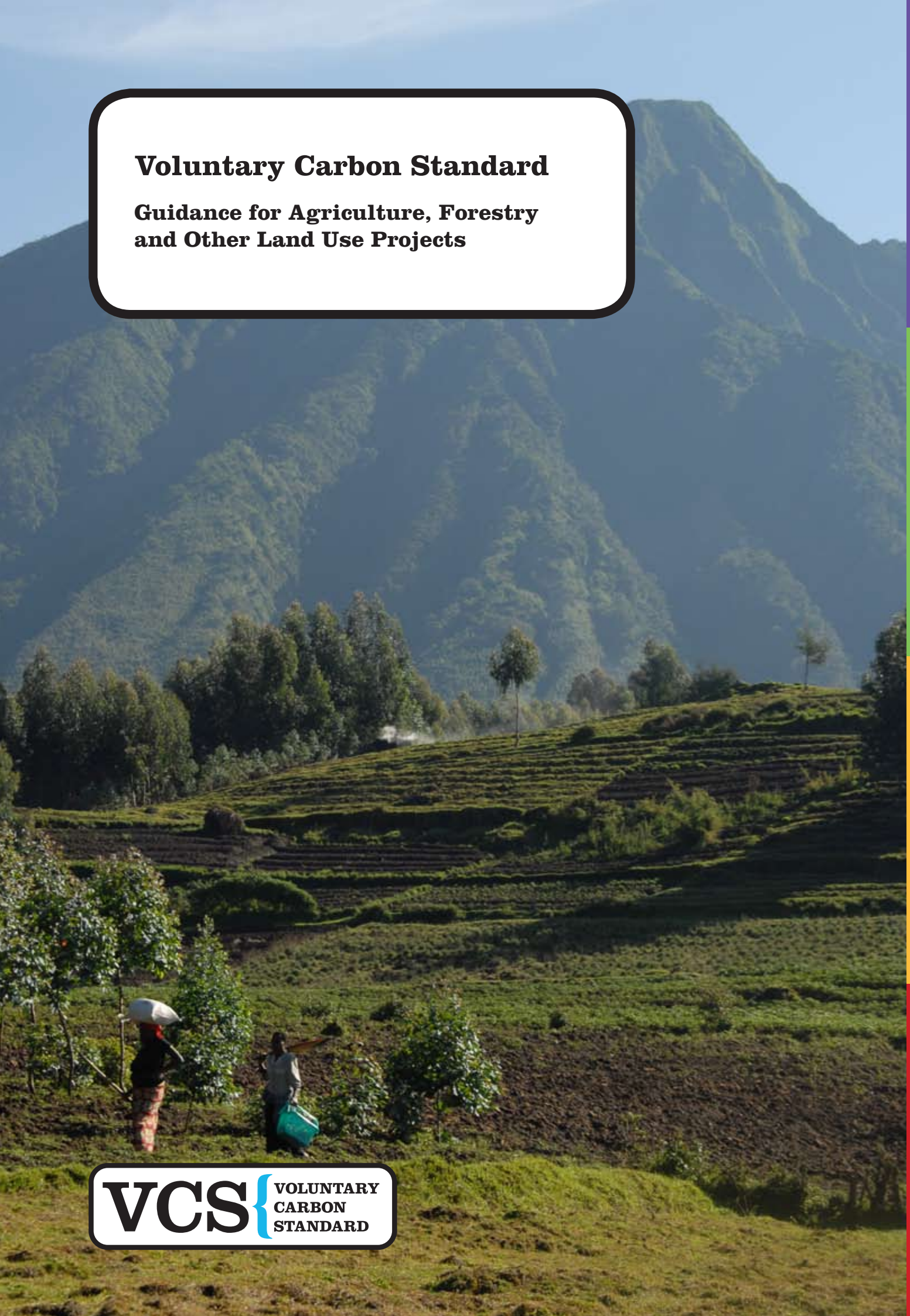
Voluntary Carbon Standard

Guidance for Agriculture, Forestry and Other Land Use Projects



VCS VOLUNTARY CARBON STANDARD

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18 November 2008

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Using this Document

This document provides guidance and additional context for users of the Voluntary Carbon Standard (VCS), the VCS Program Guidelines, and the VCS Agriculture, Forestry and Other Land Use (AFOLU) project tools. At the beginning of each section, relevant content from the respective VCS document (VCS, the VCS Program Guidelines, and the VCS AFOLU project tools) is presented verbatim in a box after which the relevant guidance is provided. In case of any discrepancies between: a.) this guidance document; and b.) the most up-to-date versions of the VCS, the VCS Program Guidelines, or VCS AFOLU project tools documents, information contained in the documents mentioned under b.) is considered binding. This document should be cited as: "Voluntary Carbon Standard – Guidance for Agriculture, Forestry and Other Land Use Projects (VCS 2007.1, 2008)." VCS Association. Available at: **www.v-c-s.org**

Foreword

The rules contained in the VCS 2007.1, VCS Program Guidelines, and the AFOLU project tools have been developed to enable high-quality AFOLU projects from around the world to generate Voluntary Carbon Units (VCUs) that are credible, robust, permanent and fungible.

The result of an intensive eighteen-month development process managed by the VCS AFOLU Advisory Group and overseen by the VCS Steering Committee, these guidelines employ innovative and best-practice thinking in order to create standards that are at once rigorous and workable. After considerable public input, working groups composed of leading experts in each of the four AFOLU project categories authored this guidance and the associated AFOLU text found in the VCS, Program Guidelines and Tools. More than twenty independent reviewers, including preeminent risk experts, investors, NGO representatives and project developers supported these efforts and provided detailed feedback during the evolution of these AFOLU rules and guidance.

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The VCS AFOLU work is dedicated to Dr. Bernhard Schlamadinger, who passed away on 28 August 2008. Bernhard was a tireless champion for the world's forests, and was instrumental in developing the VCS Program's groundbreaking rules for Agriculture, Forestry and Other Land-Use Projects.

Introduction

As part of its drive for credibility and innovation (combined with the fact that forestry projects account for a large portion of offsets sold within the voluntary carbon market), the VCS includes Agriculture, Forestry and Other Land Uses (AFOLU) in the list of eligible project activities based on a new approach to manage non-permanence risks. To begin with, the following four categories of AFOLU project activities are covered under the VCS 2007.1:

- **Afforestation, Reforestation and Revegetation (ARR)**
- **Agricultural Land Management (ALM)**
- **Improved Forest Management (IFM)**
- **Reduced Emissions from Deforestation and Degradation (REDD)**

In the future, the VCS Board may consider adding new AFOLU project categories (e.g., avoided conversion of non-forest land) as best-practices become defined and robust methodological frameworks are established.

The major contribution of land-based activities to climate change is widely recognized by the scientific community. Dominated by deforestation in the tropics, land-use change generates about 20 percent of global GHG emissions, and if agriculture is included this rises to more than 30%. Deforestation is also the leading cause of species extinctions and a significant source of water pollution, air pollution, soil erosion and the impoverishment of rural communities. AFOLU projects are unique in that they have the potential to mitigate climate change, while at the same time addressing these other pressing social and environmental challenges.

Despite their clear potential, AFOLU projects can be quite challenging to design, implement and monitor. Fortunately, defined solutions for dealing with permanence, additionality, leakage, measurement, and monitoring have emerged in the last few years. The document that follows has been designed to reflect these latest solutions and to provide best-practice guidance for the different AFOLU project activities so that verifiers can credibly and robustly account for them under the VCS. In particular, this document delineates the recommended criteria for:

- Defining eligible AFOLU project activities;
- Identifying, assessing and mitigating project risks; and,
- Determining the acceptability of new AFOLU methodologies that might be proposed to the VCS.

In order to follow the structure of VCS Program and its documents, this guidance document is divided into four sections, providing specific AFOLU guidance on: (1) VCS Program Guidelines, (2) VCS, (3) Tool for AFOLU Methodological Issues, and (4) Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination.

In order to foster cost-effective integrated projects[1] under the VCS, project proponents may combine a variety of activities spanning the four general AFOLU categories (ARR, ALM, IFM, REDD) into a single VCS Project Description and verification event. However, separate methodologies and non-permanence risk assessments must be applied to each project category using the relevant guidance sections in this document.

1 For example, some agroforestry / enrichment planting (ARR) and community forestry (IFM) practices may be combined into a single project so as to avoid duplication, given that farmers often integrate these activities within a single landscape. Similarly, forest conservation (REDD) may be combined with forest management (IFM), or with fast-growing woodlots (ARR) and improved agricultural management practices (ALM), to maximize efficiencies/synergies within a single project.

1) Guidance to the Program Guidelines where Relevant to AFOLU Projects

Section 3.5.2 of the Program Guidelines: Validator and Verifier

Valuators and verifiers are accredited to:

- Validate and verify GHG Projects;
- Validate new GHG project methodologies, baseline and additionality performance standards and
- Perform gap analyses of other GHG Programs

Guidance:

VCS verifiers can only perform validations/verifications within the sectoral scopes for which they are accredited. There are two VCS AFOLU sectoral scopes: (1) Afforestation/reforestation, improved forest management, and reduced emissions from deforestation & degradation – covering ARR, IFM and REDD projects; and (2) Agricultural land management – covering ALM projects.

Validators & Verifiers are considered accredited for the AFOLU activities under the VCS if they are:

- Accredited for scope 14 (Afforestation & Reforestation) of the CDM
- Accredited for scopes 14.1 & 14.2 of the ISO 14065 by ANSI

Section 6.1.2 of the Program Guidelines: Registration steps, Step 2

1. An accredited VCS Program validator or verifier then assesses the claim against the VCS 2007.1 and produces:

- a validation report - validation of the VCS PD including an assessment of additionality;
- a verification report - report of a periodic formal independent review and ex-post determination of the monitored GHG emission reductions and removals, which includes a written assurance (verification statement) issued by the VCS Program verifier that the GHG emission reductions and removals have been achieved in accordance with the VCS. For AFOLU projects the verification report shall also confirm the project's non-permanence risk rating and the amount of credits that must be deposited in the AFOLU Pooled Buffer Account.

Guidance:

For a description of how the non-permanence risk rating is obtained, see the guidance provided with section 3.4 of the VCS 2007.1: "additional requirements for AFOLU".

2) Guidance to the VCS 2007.1 Requirements in Relation to AFOLU Projects

Section 3.4 of the VCS 2007.1: Additional Requirements for AFOLU, methodological issues

Project proponents shall use the "Tool for AFOLU Methodological Issues" for the determination of project type and land eligibility, project boundary, carbon pools, baseline, leakage and the net project GHG benefits (see www.v-c-s.org)

Guidance:

For guidance in relation to the "Tool for AFOLU Methodological Issues" see chapter 3 of this document covering Guidance to the "Tool for AFOLU Methodological Issues".

Section 3.4 of the VCS 2007.1: Additional Requirements for AFOLU, ancillary impacts

AFOLU projects shall identify potential negative environmental and socio-economic impacts and shall take steps to mitigate them prior to generating Voluntary Carbon Units (VCUs).

AFOLU projects that convert native ecosystems to generate carbon credits are not eligible under the VCS. Documented evidence shall be provided in the VCS PD that no ARR or ALM project areas were cleared of native ecosystems within the ten year period prior to the proposed Project Start Date.

Guidance:

It is important to recognize that AFOLU projects have the potential to generate both positive and negative socio-economic and environmental impacts. The positive socio-economic and environmental benefits of a project can increase its overall attractiveness. In contrast, poorly designed and/or poorly managed projects may negatively impact the environment and/or socio-economic system in which they take place, thus reducing their overall attractiveness and increasing project risk. Consequently, the VCS requires all AFOLU projects to identify potential negative environmental and socio-economic[2] impacts and take steps to mitigate them prior to generating Voluntary Carbon Units (VCUs).

The VCS encourages AFOLU projects to use relevant tools and best-practice standards to ensure that projects are appropriately designed, and where possible generate social and environmental benefits beyond climate change mitigation. For example, projects in their design or early implementation stage may choose to be independently validated under the Climate, Community & Biodiversity Standards (www.climate-standards.org) to demonstrate project quality across multiple dimensions in advance of VCS verification. Forestry projects may also find the EnCoFor (www.joanneum.at/encofor) CDM toolkit helpful for assessing environmental and social impacts. For forest management projects, Forest Stewardship Council (FSC: **www.fsc.org**) certification can provide assurance that the project is managed sustainably. The application of such multiple-benefit tools and standards can result in holistic projects with lower risk profiles in terms of carbon non-permanence and leakage than single-dimension projects focusing exclusively on carbon benefits.[3]

The VCS does not wish to provide potential perverse incentives for the clearing of native ecosystems in order to generate carbon credits from AFOLU activities. Therefore, in order to be eligible for crediting under the VCS, ARR and ALM project proponents must demonstrate that the project area was not cleared of native ecosystems, such as forests, grasslands, scrublands or wetlands, to create VCUs. Such proof is not required if such clearing or conversion took place at least ten years prior to the proposed VCS project start. The burden of proof rests with the project proponent.

2 The VCS encourages projects to undertake a stakeholder consultation process to help identify socio-economic impacts of the project.

3 Multiple-benefit AFOLU projects can mitigate project risks in a number of ways. First, by taking an holistic approach towards meeting the various resource needs of local communities (e.g., by generating sustainable livelihoods and incorporating agroforestry systems to meet local wood and agricultural needs), they can minimize leakage and non-permanence risks because local people are less likely to be driven to undertake resource-depleting activities on- or off-site. Second, the carbon from projects that restore or protect biodiverse ecosystems is less susceptible to loss because species richness increases resilience to natural threats such as pests and fire. Finally, projects that deliver tangible social and environmental benefits to the host country are generally preferred and less likely to face approval and implementation roadblocks from local communities and the government.

Section 3.4 of the VCS 2007.1: Additional Requirements for AFOLU, buffer and risk analysis

> AFOLU projects shall establish an adequate buffer of non-tradable AFOLU carbon credits using the "Tool for Non-Permanence Risk Analysis and Buffer Determination for AFOLU Projects" in order to address the risk of non-permanence.

Guidance:

For guidance in relation to the "Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination" see chapter 4: "Guidance to the Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination.

Section 3.5 of the VCS 2007.1: Double Approval Process

> Under the VCS Program, methodologies, the risk assessment to determine the buffer of non-tradable AFOLU carbon credits, IFM and REDD market leakage assessments, new tools and additionality performance standards shall be assessed by two independent parties. The first assessment shall be carried out by a validator or verifier accredited for the VCS Program and appointed by the project proponent. This assessment shall cover all relevant VCS Program requirements.
>
> The VCS Secretariat, acting on behalf of the VCS Board, shall choose a different VCS Program accredited validator or verifier to carry out a second assessment. This second assessment shall cover all relevant VCS Program requirements.

Guidance:

A number of elements of the VCS project cycle are subject to the Double Approval Process whereby two VCS verifiers assess the same element. These are:

1. **New Methodologies**: If no methodology exists for the project type, the project proponent must submit to the VCS Board a new methodology. New AFOLU project methodologies will be subject to the standard VCS double approval process.

2. The **Risk Assessment**: The outcome of the risk assessment at first VCU issuance will be subjected to the VCS double approval process, as will subsequent risk assessments where the project is classified as lower risk compared to the previous assessment. Risk assessments conducted at validation stage, and those conducted during verifications where the project is classified as the same or higher risk compared to the previous assessment are not required to undergo the double approval process.

3. **Market Leakage Assessment**: IFM and REDD market leakage assessments may be subject to differing interpretations, which could significantly impact the number of VCUs issued to projects. Therefore, the outcome of the market leakage assessment at first VCU issuance will be subjected to the VCS double approval process. This will be done at the same time and follow the same procedures (without additional cost to the project) as the second verifier review of the risk assessment. Market leakage assessments conducted at validation stage and at verification other than the first VCU issuance are not required to undergo the double approval process.

The double approval process is described in more detail in the guidance provided to Step 1 of the Risk Tool, found later in this document. Where double approvals are required for buffer or market leakage assessments, if no agreement can be reached by the two VCS verifiers on the percentage of credits the project must set aside, the project can opt to go with the more conservative of the determinations or appeal to the VCS Association.

Approval of modules and tools

In addition to approving complete methodologies, the VCS will support innovation by approving modules and tools that lower the cost and/or increase the transparency of project design, methodology approval, monitoring and verification.

New **modules** and **tools** approved under the VCS should satisfy three main criteria: They should: (1) be as simple as possible in order to facilitate their low-cost application; (2) use conservative and transparent approaches, and; (3) be as broadly applicable as possible (i.e., not single-project specific).

The VCS automatically accepts all tools approved by the Clean Development Mechanism (CDM) Executive Board and Joint Implementation Supervisory Committee. Tools and modules referenced in new methodologies may also be approved under the VCS, subject to the usual double approval process. All approved tools and modules will be posted on the VCS website to facilitate their use.

Section 5.7 of the VCS 2007.1: Content of the VCS PD

> In case of an AFOLU project, the VCS PD shall also be accompanied by a project risk analysis prepared in accordance with the "Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination".

Guidance:

For guidance in relation to the "Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination" see chapter 4: "Guidance to the Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination".

3) Guidance to the Tool for AFOLU Methodological Issues

Eligible AFOLU Activities

> For the sake of brevity, the Eligible AFOLU Activities text from the Methodological Tool has not been repeated here.

Guidance:

Afforestation, Reforestation, and Revegetation (ARR)

Eligible activities in the ARR project category consist of establishing, increasing or restoring vegetative cover through the planting, sowing or human-assisted natural regeneration of woody vegetation to increase carbon (C) stocks in woody biomass and, in certain cases, soils.

Forest management practices such as enrichment planting and liberation thinning should be considered using the criteria specified for Improved Forest Management (IFM) projects. Revegetation activities that primarily target woody biomass production should be considered using the ARR guidelines that follow. ARR project activities planning to harvest timber are not excluded because harvesting practices will simply be incorporated into the risk analysis process surrounding the issue of non-permanence and must account for the carbon losses due to harvesting. Examples of envisaged VCS ARR activities include: reforestation of forest reserves; reforestation or revegetation of protected areas and other high priority sites; reforestation or revegetation of degraded lands; and rotation forestry with long harvesting cycles.

Forest land converted to non-forest land within the ten year period preceding project start is eligible for ARR activities only to the extent that the ARR activity is a leakage prevention measure for a REDD or IFM project activity and this is independently verified.

Agricultural Land Management (ALM)

Land use and management activities that have been demonstrated to reduce net greenhouse gas (GHG) emissions on cropland and grassland (see IPCC 2006 GL for AFOLU[4]) by increasing carbon (C) stocks (in soils and woody biomass) and/or decreasing CO_2, N_2O and/or CH_4 emissions from soils are eligible for certification under the VCS as ALM projects. Three broad categories of activities are included: (A) improved cropland management; (B) improved grassland management and, (C) cropland and grassland land-use conversions. Land conversions of cropland or grassland to forest vegetation are considered ARR activities and are not discussed here. Biofuel crop production activities are eligible for crediting under VCS AFOLU only to the extent that they generate measurable increases in carbon stocks (above-ground, below-ground, and/or soil).

A. Improved cropland management activities

Improved cropland management activities include the adoption of practices that demonstrably reduce net GHG emissions from a defined land area by increasing soil C stocks, reducing soil N_2O emissions, and/or reducing CH_4 emissions.[5]

- Soil C stocks can be increased by practices that increase residue inputs to soils and/or reduce soil C mineralization rates. Such practices include, but are not limited to the: adoption of no-till; elimination of bare fallows; use of cover crops; creation of field buffers (e.g. windbreaks, riparian buffers); use of improved vegetated fallows; conversion from annual to perennial crops; and introduction of agroforestry practices on cropland. Where perennial woody species are introduced as part of cropland management (e.g. field buffers, agroforestry), C storage in perennial woody biomass may be included as part of emission reduction credits.

- Reducing soil N_2O emissions generally involves enhancing the N use efficiency of targeted crops to reduce the amount of N added as fertilizer or manure. Examples of specific practices that improve efficiency while reducing total N additions include: improved timing of application (e.g., split application), improved formulations (e.g., slow release fertilizers, nitrification inhibitors) and improved placement of N.

- Reducing soil CH_4 emissions is an applicable practice primarily in flooded rice cultivation. Practices that reduce CH_4 emissions include: improved water management; and the use of rice cultivars with reduced capacity for methane production and transport.

B. Improved grassland management activities

These activities include the adoption of practices that increase soil C stocks and/or reduce N_2O and CH_4 emissions.

- Soil C stocks can be enhanced by practices that increase belowground inputs or slow decomposition. Such practices include: increasing forage productivity (e.g. through improved fertility and water management); introducing species with deeper roots and/or more root growth; and reducing degradation from overgrazing.

- Reducing N_2O emissions involves N fertilizer management practices similar to those outlined above for cropland management.

- Reducing fire frequency and/or intensity can reduce N_2O and CH_4 emissions from burning.

- Reducing emissions of CH_4 and N_2O from grazing animals can be achieved, inter alia, by improved livestock genetics, improving the feed quality (e.g., by introducing new forage species, or by feed supplementation); and/or by reducing stocking rates. If these practices involve displacement of animals to outside the project area, leakage should be accounted for, particularly if displaced animals cause a reduction in carbon stocks outside the project area.

4 www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm

5 Guidance relating to manure management is provided elsewhere in the VCS (i.e., outside of AFOLU scope).

C. Cropland and grassland land-use conversions

Cropland conversion to perennial grass vegetation is likely to be the dominant land use conversion for ALM projects. However, some grassland conversions to cropland production (e.g., introducing orchard crops or agroforestry practices on degraded pastures) could increase soil and biomass C stocks (thereby reducing net GHG emissions). Under such conditions, these conversion practices would also be considered eligible for project certification. However, projects converting grasslands must demonstrate that they do not harm local ecosystems as outlined in the general AFOLU guidance (see section "B. Community and/or environmental impacts of projects").

- The conversion of cropland to perennial grasses can increase soil carbon by increasing belowground C inputs and eliminating/reducing soil disturbance. Reductions in N fertilizer and/or manure additions associated with conversion to grassland may also reduce N_2O emissions. However, special attention should be given to accounting for leakage associated with conversion of cropland (particularly to conservation set-asides), associated with both the displacement of crop production to previously uncropped lands (causing soil C losses) as well as the displacement of N fertilizer and/or manure additions to existing or new croplands (causing increases in N_2O emissions) to compensate for the loss of agricultural production.

- Conversion of drained, farmed organic (e.g., peat) soils[6] to perennial non-woody vegetation, along with reductions or elimination of drainage, can reduce emissions of CO_2 and N_2O from organic soils. However, potential increases in CH_4 emissions would need to be accounted for.

Biofuel crop production activities are eligible for crediting under VCS AFOLU only to the extent that they generate measurable increases in carbon stocks (above-ground, below-ground, and/or soil).

Improved Forest Management (IFM)

Activities related to improved forest management are those implemented on forest lands managed for wood products such as sawtimber, pulpwood, and fuelwood and are included in the IPCC category "forests remaining as forests" (see IPCC AFOLU 2006 Guidelines[7]). Only areas that have been designated, sanctioned or approved for such activities (e.g., as logging concessions or plantations) by the national or local regulatory bodies are eligible for crediting under the VCS Improved Forest Management (IFM) category. Activities to reduce emissions from unsanctioned forest degradation (e.g., illegal logging) is not eligible for crediting under the IFM category, but may be creditable as a Reduced Emissions from Deforestation and Degradation activity (REDD). Various sanctioned forest management activities can be changed that could increase carbon stocks and/or reduce GHG emissions, but only a subset of these activities make a measurable difference to the long-term increase in GHG benefits compared to business-as-usual practices. Improvements in forest management could lead to a potential reduction in the flow of timber off the site, thereby causing leakage through the displacement of logging activity to other forest areas. This leakage must be accounted for using the leakage table provided in the "Tool for AFOLU Methodological Issues".

The following improved forest management practices, in upland forests and wetland forests (e.g. peat-swamps, mangroves, etc.) and planted forests (plantations), qualify as eligible activities under the VCS:

1. Conversion from conventional logging to reduced impact logging (RIL) typically reduces carbon emissions during timber harvesting due to: reductions in damage to other trees (by implementing directional felling or vine cutting, etc.); improved selection of trees for harvesting based on inventoried knowledge concerning tree location and size; improved planning of skid trails (in peat swamp forests this could include avoiding the use of canals to extract the logs — the canals drain the peat and increase CO_2 emissions) and roads; and, the reduced size of logging roads.

6 Organic soils refers to peat- or muck-derived soils with high organic matter content, and not to 'organically farmed' soils

7 www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm

2. Conversion of logged forests to protected forests (LtPF) includes: (1) protecting currently logged or degraded forests and plantations from further logging and degradation; and, (2) protecting unlogged forests that would be logged in the absence of carbon finance. Generally speaking, converting logged forests to protected forests reduces emissions caused by harvesting (i.e., protects carbon stocks) and increases the carbon stock as the forest re-grows and/or continues to grow.

3. Extending the rotation age of evenly aged managed forests (ERA) (e.g., pine or teak plantations) also can increase carbon stocks. Trees are typically harvested at an economic or optimal rotation age; extending the age at which the trees are cut increases the average carbon stock on the land. There is no fixed period of years over which the extension should occur, but generally the longer the period (on the order of 5-20 years), the more the average carbon stock increases.

4. Conversion of low-productive forests to high-productive forests (LtHP), or improving the stocking of poorly stocked forests, can also increase the carbon stock. Low productivity forests usually satisfy one of the following conditions: they qualify as forest as defined by the host country, but do not contain much timber of commercial value; they are either degraded or in the process of degrading due to frequent disturbance (fire, animal grazing, fuelwood gathering, etc.); or they have a very slow growth rate or low crown cover. Project activities may include the introduction of other tree species with higher timber value or growth rate, the mitigation of disturbance events, the adoption of enrichment planting to increase the density of trees, and/or other forest management techniques (e.g., fertilization, liming) to increase carbon stocks.

Guidelines for other activities that could increase carbon onsite (e.g., actions to reduce forest fires) are not included in this document because of unresolved scientific and technical challenges (e.g., to establish a credible baseline is complex). However, work on these issues is ongoing and, as they are resolved, the VCS will consider covering such new activities in future versions of the VCS.

Reduced Emissions from Deforestation and Degradation (REDD)

Activities that reduce the conversion of native or natural[8] forests to non-forest land, which are often coupled with activities that reduce forest degradation[9] and enhance carbon stocks of degraded and/or secondary forests that would be deforested in absence of the REDD project activity, are creditable under the VCS according to the guidance provided in this Reduced Emissions from Deforestation and Degradation (REDD) section. Activities that protect or reduce the conversion of planted forests are covered under the Improved Forest Management (LtPF) section of the VCS.

Deforestation is generally considered to be the direct, human-induced conversion of forest land to non-forest land. Thus, the estimation of deforestation is affected by how 'forest' and 'non-forest' are defined. Forest definitions are myriad; however, common to most definitions are threshold parameters including minimum forest area, tree height and level of crown cover. Under the Kyoto Protocol, a "forest" is defined according to these three parameters as selected by the host country. To be eligible for VCS crediting, REDD project forests must meet internationally accepted definitions

8 The idea behind the REDD mechanism is to reduce emissions from the ongoing deforestation of native/natural forests—mostly tropical forests, where the vast majority of global deforestation is taking place—thus the focus of VCS REDD on native or natural forests as commonly accepted by the host country or using the FAO definition of natural forest: "A forest composed of indigenous trees not established by planting or/and seeding in the process of afforestation or reforestation."

9 Regarding degraded forests—the key question is whether the degradation is caused by the forest being legally sanctioned for logging or whether it is illegally being logged and degraded. If the forest was subject to legally sanctioned logging, then stopping the logging activity and protecting the forest is an eligible activity under VCS-IFM. If the logging activity is NOT sanctioned and is part of the cause of deforestation and degradation then it qualifies under VCS-REDD but guidance is provided for the degradation component in the section VCS-IFM

of what constitutes a forest, e.g., based on UNFCCC host-country thresholds or FAO definitions[10]. The definition of a forest may include mature forests, secondary forests[11], and degraded forests. Wetland forests (e.g., peat swamp forests or mangrove forests) are also eligible for crediting under VCS REDD, as long as they meet the forest definition requirements mentioned above.

Deforestation within a country can be planned (designated and sanctioned) or unplanned (unsanctioned). In both cases, the VCS REDD scheme provides for crediting if forest conversion rates are reduced. Planned deforestation can encompass a wide variety of activities such as: national resettlement programs from non-forested to forested regions; national land plans to reduce the forest estate and convert it to industrial-scale production of commodities such as soybeans, pulpwood[12], and oil palm; plans to convert well-managed community-owned forests to other non-forest uses; or planned forest conversion for urban, rural, and infrastructure development. Other forms of planned deforestation could include decisions by individual land owners or community groups, whose land is legally zoned for agriculture, to convert their forest(s) to crop production or biofuel plantations. These planned deforestation activities would be outlined in land planning or management documents, and could therefore be readily verified under the VCS.

Unplanned or unsanctioned deforestation generally occurs as a result of socio-economic forces that promote alternative uses of forested land, and the inability of institutions to control these activities. Population growth and the expansion of roads and other infrastructure often leads to subsistence food production and fuelwood gathering taking place on lands not designated for such activities. Meanwhile, poor law enforcement and a lack of property rights may allow the piecemeal conversion of forested lands. Unplanned activities include, for example, subsistence farming occurring on both public lands legally designated for timber production and on public or communal lands that are poorly managed or otherwise degraded.

Not only is deforestation planned or unplanned but it also occurs under different regional forest landscape configurations—termed here as frontier or mosaic[13]. The forest frontier configuration is where humans and their infrastructure are encroaching into areas with relatively little human activity (Figure 1 below). The forest mosaic configuration is where human populations and associated agricultural activities and infrastructure (roads, towns, etc.) are spread out across the landscape and most areas of forest within such a configured region or country are accessible (Figure 2 below).

In addition to presenting distinct management challenges, the two landscape types where deforestation occurs—frontier and mosaic—also are treated differently by the rules governing VCS REDD outlined below. For example, while historic forest conversion rates in mosaic landscapes may provide a reasonable indication of the threat of deforestation, frontier conversion rates are typically very low prior to the incursion of roads and populations, so alternative means for assessing future threats are needed.

Avoiding deforestation/degradation can affect emissions and removals of greenhouse gases in a number of ways, all of which are eligible for crediting under the VCS REDD category:

- The main effect is on CO_2 emissions that are reduced by preventing the conversion of forest lands with high carbon stocks to non-forested lands with lower carbon stocks. Moreover, if the forest is young or degraded, stopping its further degradation and deforestation allows

10 See FAO Global Forest Resources Assessment 2000 Appendix 2 Terms and Definitions: **http://www.fao.org/DOCREP/004/Y1997E/y1997e1m.htm#bm58**

11 For VCS purposes, secondary forests are forests that have been cleared and have recovered naturally or artificially, that are at least 10 years old and meet, or have the potential to meet, the lower bound of the forest threshold parameters at maturity.

12 Avoiding the conversion of natural forests to pulpwood plantations could qualify as reducing emissions from forest degradation, as pulpwood plantations generally contain much less carbon than natural forests, yet they may still meet the definition of a forest.

13 Brown, S., M. Hall, K. Andrasko, F. Ruiz, W. Marzoli, G. Guerrero, O. Masera, A. Dushku, B. DeJong, and J. Cornell, 2007. Baselines for land-use change in the tropics: application to avoided deforestation projects. Mitigation and Adaptation Strategies for Global Change, 12 (6):1001-1026.

for additional sequestration of carbon on the land as the forest regrows (with or without assisted regeneration).

- As deforestation is often accompanied by the use of fire to clear the land, avoiding deforestation can reduce non-CO_2 emissions by preventing the burning of biomass.

- Finally, avoiding conversion of forests to cropland or pasture can reduce emissions of N_2O and CH_4, which are associated with fertilizer use and other agricultural practices that would have occurred if the forests had been converted.

Activities covered under the REDD VCS project category are those that are designed to stop planned or unplanned deforestation/degradation in forest frontiers or forest mosaic configurations. For example, activities that stop unplanned deforestation/degradation on forest lands (whether under a frontier or mosaic configuration) that have been legally sanctioned by the national or local regulatory bodies for logging activities or timber production (e.g., illegal logging and slash-and-burn agriculture in a timber concession) would be covered under the VCS-REDD project category. However, activities that reduce or stop logging only, followed by protection, on forest lands legally designated or sanctioned for forestry activities are included within the Improved Forest Management (IFM) VCS project category and so are not discussed further here.

The following REDD practices qualify as eligible activities under the VCS:

1. Avoiding planned deforestation (APD)[14]: Reduces GHG emissions by stopping deforestation on forest lands that are legally authorized and documented to be converted to non-forest land[15]. This REDD practice can occur in degraded to mature forests, either at the forest frontier or in the forest mosaic configuration. APD project proponents must provide the verifier with evidence showing that the project area was planned to be converted.

2. Avoiding unplanned frontier deforestation and degradation (AUFDD): Reduces GHG emissions by stopping deforestation/degradation of degraded to mature forests at the forest frontier that has been expanding historically, or will expand in the future, as a result of improved forest access, often through construction of roads.

3. Avoiding unplanned mosaic deforestation and degradation (AUMDD): Reduces GHG emissions by stopping deforestation/degradation of degraded to mature forests occurring in a mosaic pattern. Such deforestation/degradation typically occurs where population pressure and local land use practices produce a patchwork of cleared lands, degraded forests, secondary forests of various ages, and mature forests; where the forests are accessible; and where the agents of deforestation/degradation typically are present within the region containing the area to be protected.

14 Avoiding planned degradation (e.g., legally sanctioned timber extraction) is covered under VCS IFM. APD, as an eligible REDD activity, only refers to planned deforestation. However in many countries, valuable timber would likely be extracted before the land was deforested and this would have to be taken into account in the baseline (see IFM section for guidance on how to address this wood product component).

15 APD could include projects initiated by local communities and/or other landowners to protect their forested lands. For example, a community (e.g., ejidos in Mexico) may determine that carbon credits from forest protection are more valuable than the potential revenue from crop production. Similarly, an owner of land zoned for conversion to agriculture or urban development may choose to protect forested lands by partnering with a conservation organization, either in a joint management agreement or an outright sale.

Figure 1. Frontier-type configuration at the regional scale (from Madre de Dios, Peru)[16]. Deforestation frontiers can be seen on either side of the major road.

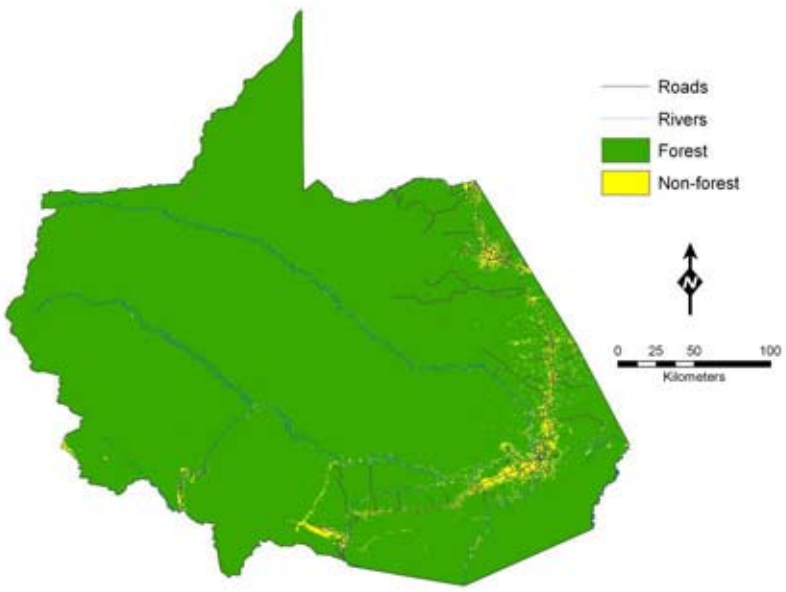
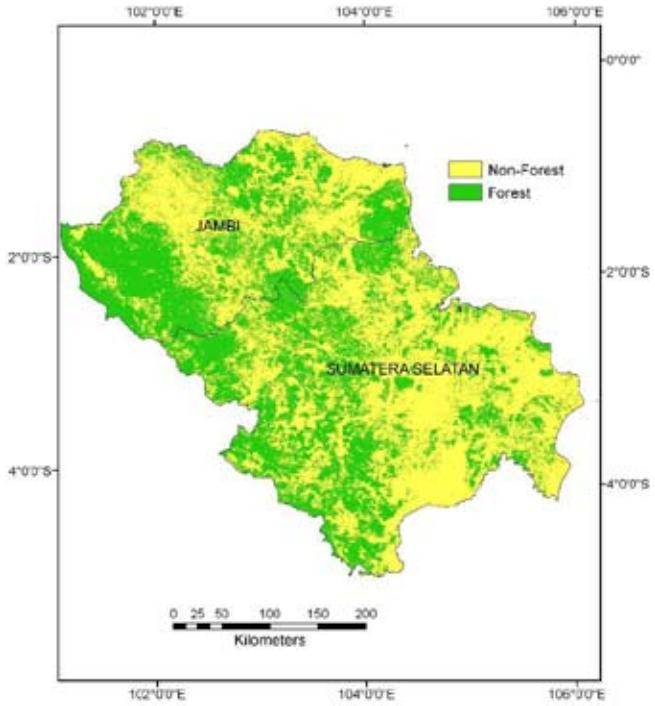


Figure 2. Mosaic-type forest configuration at the regional scale (from Jambi and Sumatera Selatan provinces, Indonesia)



16 Map based on remote sensing data for 2000 provided to S. Brown from G. Asner based on the paper: Oliveira, P. J. C., et al. 2007. Land-use Allocation Protects the Peruvian Amazon. (http://asnerlab.stanford.edu/publications/oliveira_etal_2007.pdf)

B. Eligible activities shall meet the following criteria:

- All areas included within the REDD project boundary must have qualified as a forest (see definitions in REDD introductory paragraph) for a minimum of 10 years before the project start date. This length of time is necessary because it is very difficult to discriminate, through satellite imagery, young forests from certain types of crops and accurately delineate the forest boundary at the start of the project.

- The REDD project boundary may include several land-use activities, but the boundaries of the REDD activity must be clearly delineated and defined, ensuring that only land qualifying as "forest" is included.

- If the REDD project activity includes avoiding unplanned deforestation/degradation activities (e.g., agricultural expansion) as well as stopping logging[17] in an area designated for legally sanctioned logging, project proponents need to follow the REDD guidelines for the unplanned deforestation/degradation activities and the IFM section for the legal logging activities.[18]

Step 0 and Step 1 of the "Tool for AFOLU Methodological Issues": general methodological guidance and determine the land eligibility

Guidance:

No additional guidance.

Step 2 of the "Tool for Methodological Issues": determine the project boundary

4. The project proponent must determine the project boundary which is defined by:

   a. The geographic boundary within which the project will be implemented;
   b. The project crediting period;
   c. The source and sinks, and associated types of greenhouse gases (i.e. CO_2, N_2O, CH_4), the project will affect, and
   d. The carbon pools that the project will consider.

Guidance:

Geographical area: Project participants need to clearly define the spatial boundaries of a project so as to facilitate accurate measuring, monitoring, accounting, and verifying of the project's emissions reductions/removals. The area of implementation for the VCS AFOLU project may be smaller than the entire project area to allow for effective leakage management.

At project verification, the project boundary encompasses the area under the control of the project participants as defined in the VCS PD. In cases where project validation occurs before verification, the project boundary encompasses the area under the control or to become under the control of the project participants as defined in the VCS PD. The entire area is to be validated as if it were under control and ready to be implemented. For validations where less than 80% of the total proposed area of the project is under current control, the project participants must:

17 See the Noel Kempff Climate Action Project (http://www.noelkempff.com/English/Welcome.htm and http://conserveonline.org/workspaces/climate.change/ClimateActionProjects/NoelKempff/NKPDD) as an example of a project that stopped both unplanned deforestation and sanctioned logging activities.

18 For such combined projects, the credits generated by IFM and REDD activities must be kept separate to account for potentially different risk ratings and buffer withholding requirements applied to each.

A. Demonstrate that the differing area (i.e., whether under control now or in the future) does not affect the outcome of the additionality test; and,

B. Assure that if the area is eventually smaller than intended, there are provisions that increased emissions attributable to the project activity in the areas that at verification have not come under control of project shall be considered as leakage. This requires the selection of the appropriate methodology beforehand for the eventuality that this may happen; and,

C. Design a monitoring plan that is flexible enough to deal with changes in the size of the project; and,

D. Verify the project within five years of validation.

At verification, the size of the project becomes fixed and the certifier verifies whether the project took sufficient account of leakage and monitoring accuracy.

When describing physical project boundaries, it is necessary to include the following information: name of the project area (e.g., compartment number, allotment number, local name, etc.); map(s) of the area; geographic coordinates (preferably obtained from a GPS); total land area; and details of ownership.

Project crediting period: This is the period of time for which the net GHG emissions reductions or removals will be verified, which under the VCS is equivalent to the project lifetime. The project must have a robust operating plan covering this period. The project crediting period for ALM projects focusing exclusively on emissions reductions of N_2O, CH_4 and/or fossil-derived CO_2 shall not exceed 10 years, renewable at most two times[19]. The project crediting period for all other AFOLU projects shall be between 20[20] and 100 years.

Eligible gases: Projects must account for any significant sources (sinks are optional) of carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) that are reasonably attributable to project activities — the sum of decreases in carbon pools and increases in emissions that may be neglected shall be less than 5% of the total project GHG benefits. For example, projects must also account for increases in emission sources of N_2O and CH_4 from soils if they exceed 5% of the total CO_2-eq benefits[21]. Emissions of N_2O must be addressed if any nitrogen fertilizer was applied during the crediting period.

Carbon pools: VCS projects should consider the following five pools: above-ground biomass, below-ground biomass, dead wood, litter and soil carbon. Activities that reduce the harvest of timber may also reduce the production of long-lived wood products. Therefore, accounting for the change in wood products must be included to avoid overestimating the net GHG benefit of the project. The IPCC 2003 Good Practice Guidance for greenhouse gas inventories[22] sets a precedent for including this pool if it changes. The IFM section that follows also provides guidance concerning how to include wood products as a carbon pool. Pools can be omitted if their exclusion leads to conservative estimates of the number of carbon credits generated[23].

19 Such ALM emissions reductions projects are not subject to non-permanence risk (or buffer withholding), and therefore shall follow the VCS Program rules governing non-AFOLU projects in terms of an acceptable crediting period (i.e., a maximum of 10 years which may be renewed at most two times.)

20 20 years in considered the minimum acceptable AFOLU project crediting period for the buffer approach to serve as an effective non-permanence risk mitigation tool.

21 The following EB tool can be used to test the significance of emissions sources - http://cdm.unfccc.int/EB/031/eb31_repan16.pdf

22 Winjum, J. K., S. Brown, and B. Schlamadinger. 1998. Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide. Forest Science 44:272-284; and Lim, B., S. Brown, and B. Schlamadinger. 1999. Carbon accounting for forest harvesting and wood products: a review and evaluation of possible approaches. Environmental Science and Policy 2: 207-216; Also see Chapter 12, IPCC Guidelines for National GHG Inventories, 2006.

23 See, for example, the A/R CDM tool for the conservative exclusion of soil organic carbon http://cdm.unfccc.int/EB/033/eb33_repan15.pdf

Step 3 of the "Tool for Methodological Issues": determine the carbon pools

The carbon pools that shall be accounted for are listed in Table 1 below.
Emissions of N_2O shall also be accounted for, unless insignificant, if any nitrogen fertilizer and/or manure is applied, or N-fixing species planted, during the crediting period.

Guidance:

ARR

Eligible carbon pools comprise: aboveground biomass, belowground biomass, dead wood, litter, soil organic carbon, and wood products.

ALM

Soil carbon is the primary pool of concern for ALM, although activities that include a woody biomass component (e.g., agroforestry, silvipasture, orchards) also need to consider aboveground woody biomass C stocks.

IFM

For carbon accounting, all pools that are expected to decrease their carbon stocks above a de minimis (less than 5% of total increase in carbon stock) as a result of project activities must be measured and monitored in both the baseline and project case.[24] For RIL and LtPF, changes in soil C are likely to be less than the de minimis for forests on mineral upland soils, but could be considerably lower than the baseline for forests growing in wetland areas such as peat-swamp forests or mangroves and although conservative to omit, they could provide significant carbon benefits if measured and estimated.

As noted below, wood products must be included in activities that reduce the harvest of timber and the production of long-lived wood products because reducing the quantity of live biomass (i.e. carbon) in the harvested timber does not necessarily entail an atmospheric emissions reduction below the established baseline (see discussion of estimating net emissions). Similarly, projects undertaking RIL and LtPF must account for the dead wood pool in their baseline and project case documents. Both of these activities reduce the amount of timber extracted per unit area, which, in turn, reduces the dead wood pool in the project case (fewer trees harvested means less slash, less collateral damage, fewer skid trails etc.).

For ERA, the issue with the dead wood pool is slightly more complex because it depends on how post-harvest slash is treated. Slash can either be piled and burned on site (as happens in fire prone areas) or left on site to decompose. Extending a harvest rotation would increase the amount of dead wood produced because the trees would be somewhat larger when harvested and thus more slash would remain. Because the dead wood pool would increase (probably more than the de minimis), this pool is deemed optional. (Note: by extending rotation age there is likely to be an increase in the above ground biomass associated with increased logging residues).

The measurement of belowground biomass is optional in all cases because changes in the carbon stocks of roots can be difficult and complex to account for in logged forests. Furthermore, the extent to, and rate at, which decomposition occurs when trees are harvested is unknown, so efforts to model root biomass as a function of aboveground biomass (as is common practice) often encounter problems. In all cases it is conservative to exclude belowground biomass.

24 For VCS AFOLU projects, GHG sources that account for less than 5% of the total CO_2-eq generated by the project are considered "insignificant." The following CDM EB tool can be used to test the significance of emissions sources: http://cdm.unfccc.int/EB/031/eb31_repan16.pdf

REDD

For carbon accounting, all pools that are expected to show a decrease in carbon stocks between the baseline and the project greater than a **de minimis** (5% or less of total difference) as a result of project activities must be measured and monitored in both the baseline and project case.[25]

Above-ground biomass is the primary pool of concern for REDD, although carbon stock changes in other carbon pools may also be included, depending on the magnitude and direction of change. Non-tree biomass must be included in the baseline case if the pool is likely to be relatively large such as when oil palms, short-rotation woody crops for pulp, and the like, are commonly planted in the region where the project is located. Although the below-ground living biomass pool is optional, it is highly recommended that it be included because it can amount to 25% or more of the aboveground biomass (see IPCC 2006 GL[26]).

Soil carbon need not be included if the planned or unplanned conversion was to pasture grasses or other perennial crops given that the body of scientific evidence shows such conversions of tropical forests do not significantly decrease soil carbon stocks. However, conversion of forests to annual crops can cause a large decrease in soil carbon stocks, so the project developer may find it advantageous to include this in their methodology, though as indicated in the table below it is an optional pool. For wetland forests on peat soils, inclusion of soil carbon is highly recommended as large emissions of CO_2 can result if the land is drained during deforestation/degradation and rapid oxidation of the peat occurs. Whilst robust methods for estimating changes in mineral soil carbon stocks are provided in the IPCC 2006 GL, the method for peat soils is not well developed yet and a new methodology would need to be developed for including emissions from this pool.

Wood products must be included if removal of timber is associated with deforestation/degradation because significant quantities of carbon can be stored in long-term wood products rather than being emitted into the atmosphere. Thus the quantity of live biomass (i.e., carbon) going into long-term timber products in the baseline scenario must be quantified (see IFM section for more detail).

Step 4 of the "Tool for Methodological Issues": establish a project baseline

12. All AFOLU projects are subject to the same baseline rules as defined by the VCS. In addition, the following guidance for specific project types is provided.

13. ALM project activities shall consider current and previous management activities. If activity-based methods are used for soil C stocks, stock estimates shall be determined relative to the computed maximum C stocks that occurred in the designated land area within the previous 10 years. Minimum baseline estimates for N_2O and CH_4 emissions shall be based on verifiable management records (e.g. fertilizer purchase records, manure production estimates, livestock data) averaged over the 5 years prior to project establishment.

14. In the case of IFM project activities, project developers using a project-based approach (rather than a performance/benchmark standard) for establishing a baseline shall provide the following information to prove that they meet minimum acceptable standards:

    a. A documented history of the operator (e.g., operator shall have 5 to 10 years of management records to show normal historical practices). Common records would include data on timber cruise volumes, inventory levels, harvest levels, etc. on the property; and

    b. The legal requirements for forest management and land use in the area, unless verifiable evidence can be provided demonstrating that common practice in the area does not adhere to such requirements; and

25 For VCS AFOLU projects, GHG sources that account for less than 5% of the total CO_2-eq generated by the project are considered insignificant, or "de minimis." The following CDM EB tool can be used to test the significance of emissions sources: **http://cdm.unfccc.int/EB/031/eb31_repan16.pdf**

26 **http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm**

c. Proof that their environmental practices equal or exceed those commonly considered a minimum standard among similar landowners in the area.

The baseline for the IFM project is then the management plan projected through the life of the project, satisfying at a minimum the three standards given above.

15. For REDD projects the baseline has two main components: a land-use and land-cover (LU/LC) change component and the associated carbon stock change component. Developing the LU/LC change component of the baseline is handled different for the three eligible REDD activity types.

- Avoiding planned deforestation (APD): Project documentation must clearly demonstrate that the land would have been converted to non-forest use if not for the REDD project (i.e., clear demonstration of the project's additionality). The project developer must provide verifiable evidence to demonstrate that, based on government- and landowner-planned land use changes, the project area was intended to be cleared. The annual rate of forest conversion would be based on the common practice in the area—that is how much forest is typically cleared each year by similar baseline activities.

  If it is common practice in the area for timber to be removed before clearing, then the amount of carbon that ended up in long-lived wood products must be estimated and deducted from the baseline emissions estimates (subject to the de minimis rule of 5%). See the IFM section for further guidance on how to estimate the amount of carbon transferred to long-lived wood products.

- Avoiding unplanned frontier deforestation and degradation (AUFDD): The project developer must demonstrate that the project area is located geographically where deforestation/degradation will likely happen during the crediting period. Where the expansion of the deforestation frontier into the project area is linked to the development of infrastructure that does not yet exist, evidence must be provided to the verifiers that such infrastructure would have been developed in the absence of the REDD project.

- Avoiding unplanned mosaic deforestation and degradation (AUMDD): A baseline projection of deforestation and degradation under this activity must be developed for the region in which the project area is located, making sure it takes into account such factors as historical deforestation/degradation rates and that the proposed regional baseline area is similar to the project area in terms of: drivers of deforestation/degradation, landscape configuration, and socio-economic and cultural conditions.

16. For all REDD projects types, project proponents shall, for the duration of the project, reassess the project baseline at least once every 10 years and have this reassessment validated at the same time as the next VCS verification. The baseline methodology must outline the measurements, calculations and assumptions used to estimate the annual amount and likely general location of the expected deforestation/degradation under baseline conditions.

17. The baseline net GHG emissions and removals must be estimated for each year of the proposed crediting period.

Guidance:

All AFOLU projects are subject to the same baseline rules as defined by the VCS.

In addition, for **ARR** projects the (ex-ante) determination and quantification of the baseline scenario must follow either the IPCC 2006 Inventory Guidelines on the topic or approved A/R CDM methodologies. In the case of emissions by sources occurring under the baseline scenario, these emissions can also be estimated by referring to the IPCC 2006 Inventory Guidelines or approved A/R CDM methodologies, taking into account their applicability conditions.

For **ALM** projects, pre-project C stocks for baseline estimation can be determined from measured inventory estimates using approved methodologies and/or activity-based estimation methods (e.g. IPCC 2006 GL), considering current and previous management activities. If activity-based methods are used for soil C stocks, stock estimates should be determined relative to the computed maximum C stocks that occurred in the designated land area within the previous 10 years.[27] Minimum baseline estimates for N_2O and CH_4 emissions should be based on verifiable management records (e.g. fertilizer purchase records, manure production estimates, livestock data) averaged over the 5 years prior to project establishment.

IFM project developers using a project-based approach (rather than a performance benchmark[28]) for establishing a baseline must provide the following information to prove that they meet minimum baseline standards for improved forest management projects:

- A documented history of the operator (e.g., operator must have 5 to 10 years of management records to show normal historical practices). Common records would include data on timber cruise volumes, inventory levels, harvest levels, etc. on the property[29]; and
- The legal requirements for forest management and land use in the area; however if these are not enforced then this requirement does not have to be met; and
- Proof that their environmental practices equal or exceed those commonly considered a minimum standard among similar landowners in the area.

The baseline for the IFM project is then the without-project management practices projected through the life of the carbon project, satisfying at a minimum the three standards given above.

The baseline for **REDD** project activities has two main components: a land-use and land-cover (LU/LC) change component and the carbon stock component. These can be addressed separately as their scale of analysis may differ. In general, the rate of change in LU/LC will be estimated at a different scale than the carbon stock.

General guidance for estimating the carbon stock component is provided in several sources including the IPCC 2006 GL[30] (e.g., section covering forests converted to cropland, grassland, other land) and the project design document for the Noel Kempff Climate Action Project.[31] The Noel Kempff document provides methods for estimating the baseline carbon stocks for forests projected to be deforested and degraded, including logging, forest regrowth, and dead wood. The guidance on methods provided in the aforementioned documents for the carbon stock component of the baseline can be used for any of the eligible activities under REDD. For inclusion of the non-CO_2 gases, the project developer must provide evidence that the practice for which they plan to claim credit is the common practice in the area. The guidance in the IPCC GPG (Ch. 4.3) and IPCC GL 2006 can be used to estimate such non-CO_2 emissions.

27 For example, if C stocks on the project area were 100 tonnes C/ha in 2002, then declined to 90 tonnes/ha by 2007 after intensive tillage, the minimum baseline C stock for a project established in 2008 would be 100 tonnes/ha.

28 See Additionality section of VCS 2007.1 for description of how a Performance Test versus Project Test may be applied under the VCS.

29 For new management entities with no history of logging practices in the project region, the baseline should reflect just the common practices and legal requirements. However, if the common practice is unsustainable and unsustainable practices contravene the mission of the implementing entity then a sustainable baseline is the minimum that can be adopted. For projects focused on stopping logging or reducing the impact of logging, where the implementing entity takes over ownership of a property specifically as a carbon project to reduce forest management emissions, then the project baseline may be based on the management plans of the previous property owners (i.e., the baseline must represent what would have most likely occurred in the absence of the carbon project).

30 http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm

31 http://conserveonline.org/workspaces/climate.change/ClimateActionProjects/NoelKempff/NKPDD

Developing the LU/LC change component of the baseline is different for the eligible activities.

- **Avoiding planned deforestation (APD):** Project documentation must clearly demonstrate that the land would have been converted to non-forest use if not for the REDD project (i.e., clear demonstration of the project's additionality). The project developer must provide verifiable evidence to demonstrate that, based on government- and landowner-planned land use changes, the project area was intended to be cleared. The annual rate of forest conversion would be based on the common practice in the area—that is how much forest is typically cleared each year by similar baseline activities.

  If it is common practice in the area that timber is removed before clearing, then the amount of carbon that ended up in long-lived wood products must be estimated and deducted from the baseline emissions estimates (subject to the de minimis rule of 5%). See the IFM section for further guidance on how to estimate the amount of carbon transferred to long-lived wood products.

- **Avoiding unplanned frontier deforestation and degradation (AUFDD):** Developing a baseline projection for the LU/LC change component of this activity is probably the most complex of the three eligible activities described here. In most cases the forest area to be protected will have low rates of historical deforestation/degradation because most of the project area was not accessible in the past to the agents of deforestation/degradation expected to encroach during the project term. For frontier deforestation/degradation, the project developer must demonstrate that the project area is located geographically where deforestation/degradation will likely happen during the crediting period. Where the expansion of the deforestation frontier into the project area is linked to the development of infrastructure that does not yet exist, strong evidence must be provided to the verifiers that such infrastructure would have been developed in the absence of the REDD project. Strong evidence includes maps showing construction plans, construction contracts or open tenders, and/or an approved budget.

- **Avoiding unplanned mosaic deforestation and degradation (AUMDD):** A baseline projection of deforestation and degradation under this activity must be developed for the region in which the project area is located, making sure it takes into account such factors as historical deforestation/degradation rates and that the proposed regional baseline area is similar to the project area in terms of: drivers of deforestation/degradation, landscape configuration, and socio-economic and cultural conditions.

For all REDD projects activities, project proponents shall reassess the project baseline at least once every 10 years, and have this validated at the same time as the next VCS verification. Baseline projections for deforestation/degradation beyond a 10-year period are not likely to be realistic because rates of land-use change are subject to many factors that are difficult to predict over the long term, hence the need for periodic re-assessment of the baseline. This re-assessment will capture changes in deforestation/degradation drivers (e.g., changes in national/local policies, population growth, changes in opportunity costs, new roads, new protected areas, etc.) that must then be incorporated into estimates of the rates and patterns of land-use change[32].

For each of these three REDD activity types, the baseline methodology must outline the measurements, calculations and assumptions used to estimate the annual amount and likely general location of the expected deforestation/degradation under baseline conditions. The baseline net GHG emissions and removals must be estimated for each year of the proposed crediting period.

Step 5 of the "Tool for Methodological Issues": assess and manage leakage

18. Leakage is defined as any increase in greenhouse gas emissions that occurs outside a project's boundary (but within the same country), but is measurable and attributable to the project activities. Its effects on all carbon pools shall be assessed and significant

32 Brown, S., M. Hall, K. Andrasko, F. Ruiz, W. Marzoli, G. Guerrero, O. Masera, A. Dushku, B. DeJong, and J. Cornell, 2007. Baselines for land-use change in the tropics: application to avoided deforestation projects. Mitigation and Adaptation Strategies for Global Change, 12 (6):1001-1026.

effects taken into account when calculating net emission reductions. Accounting for positive leakage is not allowed.

19. For small-scale ALM land set-aside projects (< 10,000 ha), leakage due to displaced activities can be assumed to be zero.

20. IFM project developers must demonstrate that there is no leakage within their operations – i.e., on other lands they manage/operate outside the bounds of the VCS carbon project.

21. Leakage shall be assessed and managed for the three eligible REDD activity types as follows:

    a. In the case of avoiding planned deforestation (APD) leakage shall be controlled and measured directly by monitoring the activities of the project landowner who was originally planning on deforesting the project area (i.e., the baseline deforestation agents). Any leakage identified must be quantified and subtracted from the net carbon benefits claimed by the project.

    b. In the case of avoiding unplanned frontier or mosaic deforestation and degradation (AUFDD or AUMDD) developers need to design and implement activities to minimize leakage, and monitor and account for leakage using approved methodologies.

22. If leakage prevention measures for any eligible REDD activity include tree planting, agricultural intensification, fertilization, fodder production and/or other measures to enhance cropland and grazing land areas, then any significant increase in GHG emissions associated with these activities shall be estimated and subtracted from the project's net emissions reductions.

23. Leakage caused by market effects is not considered except for the case where timber production is significantly affected.

24. Table 2 outlines adjustments that shall be made to IFM project credits to account for potential market leakage resulting from a reduction of timber production.

25. For REDD projects, any carbon credits generated from stopping illegal logging activities (to the extent they supply regional/global timber markets) shall also be subject to these market leakage discounts (following the Table 2 guidance for activities that "Substantially reduce harvest level permanently").

26. Instead of applying the default market leakage discounts (from Table 2), project proponents may opt to estimate the project's market leakage effects across the entire country and/or use analysis(es) from other similar projects to justify a different market leakage value.

27. IFM and REDD market leakage assessments (whether using default discounts or project-specific analysis(es)) shall be subject to the VCS double approval process.

Guidance:

Many GHG mitigation activities (whether energy, industrial process or AFOLU based) have the potential to cause leakage (i.e., impacts outside the project boundary that increase emissions). Based on the methodological guidance provided for each AFOLU project category, project proponents must identify potential leakage and mitigate it to the extent possible.

In the context of AFOLU projects, leakage is defined as any increase in greenhouse gas emissions that occurs outside a project's boundary (but within the same country[33]), but is measurable and attributable to the project activities. Leakage caused by market effects is not considered except for the case where timber production is significantly affected (see guidance provided under IFM section below).

Verifiers and project proponents can test the significance of off-site climate impacts using the

33 Following the CDM and VCS policy of not accounting for international leakage.

CDM EB tool designed for this purpose[34]. Insignificant off-site climate impacts can be excluded.

When calculating the number of carbon credits that should be issued to a given project, the tradable credits (VCUs) are estimated by subtracting out the leakage from the total estimated "credits" and then subtracting out the non-permanence buffer.

This calculation process is illustrated in the example below:

Assume two projects (A and B), each subject to a 20% buffer withholding requirement and generating the same increase in carbon stocks (or decrease in forest carbon emissions) within the project boundary, but having different impacts in terms of permanent project GHG emissions (e.g., related to fossil fuel use) and leakage. The number of credits to be retained in the AFOLU Pooled Buffer Account would be the same for both projects because the buffer calculation is based on only the carbon stock changes within the project boundary. However, because the two projects have different impacts in terms of permanent project emissions and leakage, the total number of credits issued would be different (see table below).

	Project A		**Project B**	
	tCO_2-eq	Comment	tCO_2-eq	Comment
Project compared to baseline:				
Change in carbon stocks	1000	non-permanent	1000	non permanent
Change in GHG emissions (e.g., from decrease or increase in machinery use)	50	permanent	-50	permanent
Total project vs. baseline	1050	= 1000 + 50	950	= 1000 - 50
Leakage[35]:				
Change in carbon stocks	-150	considered permanent	100	ignored when positive
Change in GHG emissions	-80	permanent	-80	permanent
Total leakage	-230	= -150 - 80	-80	= N.A. - 80
Carbon credits issued:				
Total credits issued	820	= 1050 - 230	870	= 950 - 80
Credits held in buffer (determined as a percentage of total carbon stock benefits)	200	= 1000 * 20%	200	= 1000 * 20%
Immediately tradable VCUs	620	= 820 - 200	670	= 870 - 200

34 http://cdm.unfccc.int/EB/031/eb31_repan16.pdf

35 Carbon stock losses caused by leakage effects are considered permanent. Some projects may have beneficial spillover effects, but accounting for positive leakage is not allowed (as in Project B example). Leakage can be estimated either directly from monitoring (and quantified in units of tCO_2-eq), or indirectly (as a percentage of total project carbon benefits) when leakage is difficult to monitor directly but where scientific knowledge provides credible estimates of likely impacts (e.g., using the IFM leakage tables found later in this document).

Leakage in relation to **ARR**

ARR leakage impacts can result from, but are not limited to, the: shifting of grazing animals, shifting of households or communities, shifting of agricultural activities, shifting of fuelwood collection, increased use of wooden fence posts, and emissions from transportation and machinery use. The requirements for assessing and managing leakage in ARR projects are, in principle, similar to those for A/R CDM project activities.

- If deforestation increases outside of a project's boundary because the project has displaced agricultural practices to forested areas, then the effects of this deforestation on all carbon pools must be assessed and taken into account when calculating net emission reductions;

- If fuelwood collection or similar activities (e.g., grazing) increase outside of a project's boundary because the project has simply displaced these activities to a new area, then, as long as the activities are not significantly degrading the forest (i.e., the extracted volume results in emissions equivalent to less than 5% of total GHG removals by sinks), only the portion of the gathered wood that is non-renewable must be assessed and taken into account when calculating net emission reductions. In the case that forests are significantly degraded, the effects of this degradation on all carbon pools must be assessed and taken into account when calculating net emission reductions (see methods for Participatory Rural Appraisal (PRA) and Eq. 2.13 for fuelwood removal as outlined in IPCC 2006 GL for AFOLU[36].

- The determination and quantification of off-site GHG impacts must follow the relevant IPCC 2006 Guidelines and/or use approved A/R CDM methodologies applicable under the given conditions of a project.

Leakage in relation to **ALM**

Leakage potential should be assessed for all project activities using full GHG accounting principles and, where significant, estimated leakage must be deducted from the net CO_2 benefits generated by the project. Potential sources of leakage for ALM projects are listed below:

- Reductions in C stocks outside the project area due to the displacement of pre-project activities.

- Increases in N_2O, CH_4 and production-related fossil CO_2 emissions outside the project area due to the displacement of pre-project activities.

- Other emissions of CO_2 from fossil fuel use that are attributable directly to the project but occur outside of project boundaries; for example, the transportation of products from the project that are additional to those accounted for in the baseline.

For ALM projects involving cropland or grassland management activities, the leakage risks are likely to be negligible because the land is being actively maintained for commodity production.

For projects involving land set-asides, i.e., cropland or pastures converted to grassland conservation set-asides, leakage could occur due to displacement of pre-project activities to areas outside the project area. For small-scale land set-asides (< 10,000 ha), leakage due to displaced activities can be assumed to be zero. Projects above this size, should estimate leakage for displacement of pre-project activities, taking into account possible reductions in biomass, C stocks, and emissions of N_2O, CH_4 and fossil CO_2 emissions. Guidance on accounting for leakage associated with shifting of pre-project activities due to land conversions from agriculture to grassland are functionally similar to conversion of land to forest vegetation under ARR (see ARR section for references to CDM-derived guidance). Alternatively, projects should consider including leakage management zones[37] as part of the overall project design.

36 www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm

37 Leakage management zones could minimize the displacement of land use activities to areas outside of a project's boundaries by providing for the maintenance of goods and services (e.g. agricultural products) within areas under the control of project participants. To avoid displacing activities to new (possibly unmanaged lands), more efficient production per unit area of land would be required within a leakage management zone.

Leakage in relation to **IFM**

IFM project developers are responsible for demonstrating that there is no leakage within their operations – e.g., on other lands they operate outside the bounds of the specific project. The project developer must demonstrate to the VCS verifier that the management plans and/or land-use designations of other owned lands have not materially changed as a result of the IFM project (e.g., increasing harvest rates, or clearing lands that would otherwise have been set aside) because such changes could lead to reductions in carbon stocks or increases in GHG emissions. At each verification, documentation must be provided covering the other owned lands where leakage could occur, including, at a minimum, their location(s), existing land use(s), and management plans.

In addition, when improved forest management activities result in a significant reduction of timber production, it is likely that timber production could shift to other areas to make up the reduction. The table below defines adjustments that must be made to account for this potential market leakage.

Project Action	**Leakage Risk**	**Leakage Credit Adjustment** (discount)
Reduced impact logging with no effect or minimal effect on total timber harvest volumes	None	0%
Extend rotations moderately (5-10 years) leading to a shift in harvests across time periods but minimal change in total timber harvest over time	Low	10%
Substantially reduce harvest levels permanently (e.g., RIL activity that reduces timber harvest by 25% or more across the project area[38]; or, a forest protection/no logging project)	Moderate to High	Depends on where timber harvest is likely to be shifted… • Similar carbon dense forests within country: 40% • Less carbon dense forests within country: 20% • More carbon dense forests within country: 70% • Out of country: 0% (according to stated VCS and CDM policy of not accounting for international leakage)

Project proponents not wishing to use the default market leakage discounts provided in this table may justify using a different market leakage value by estimating the project's market leakage effects across the entire country (the required scale for such analysis) and/or referring to existing leakage analysis(es) from other similar projects.[39]

38 Only the RIL carbon credits associated with activities that will reduce timber production are subject to the market leakage discount.

39 The following papers may be helpful to project proponents (and verifiers) seeking to estimate carbon project market leakage effects:

- Murray, B.C., B.A. McCarl, and H. Lee. 2004. "Estimating Leakage from Forest Carbon Sequestration Programs." Land Economics 80(1):109-124. (http://ideas.repec.org/p/uwo/uwowop/20043.html)
- Murray, B.C., B.L. Sohngen, et al. 2005. EPA-R-05-006. "Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture." Washington, D.C: U.S. Environmental Protection Agency, Office of Atmospheric Programs. (www.epa.gov/sequestration/pdf/greenhousegas2005.pdf)
- Sohngen, B. and S. Brown. 2004. "Measuring Leakage from Carbon Projects in Open Economies: A Stop Timber Harvesting Project as a Case Study." Canadian Journal of Forest Research. 34: 829-839 (http://www.winrock.org/ecosystems/files/Sohngen_Brown_2004.pdf)
- Noel Kempff Climate Action Project PDD: http://conserveonline.org/workspaces/climate.change/ClimateActionProjects/NoelKempff/NKPDD

Given that this market leakage assessment may be subject to differing interpretations, which could significantly impact the number of VCUs issued to projects, the outcome of the IFM (or REDD) market leakage assessment conducted at first VCU issuance (whether using the default discounts or relying on project-specific analysis(es)) will be subjected to the VCS double approval process. This will be done at the same time and follow the same procedures as the second verifier review of the original verifier's risk/buffer analysis of the project, as described in the guidance for Step 1 of the Risk Tool found later in this document. Market leakage assessments conducted at validation stage and at verification other than the first VCU issuance are not required to undergo the double approval process.

Leakage in relation to **REDD**

Projects designed to avoid deforestation and degradation activities are prone to leakage, particularly activity shifting, which is the displacement of deforestation/degradation activities from the project area to outside the project area, leading to a decrease in carbon stocks and/or increase in GHG emissions.

Assessment and management of leakage for each of the three eligible activities is discussed below:

1. **Avoiding planned deforestation (APD):** Under this situation, displacement of baseline activities can be controlled and measured directly by monitoring the activities of the project landowner who was originally planning on deforesting the project area (i.e., the baseline deforestation agents). These landowners (including individuals, communities, private companies, or local/national governments) may own multiple parcels of forest land within the country that could be used to make up for the generation of goods and/or services lost through implementation of the carbon project. In such cases, the landowner shall demonstrate to the VCS verifier that the management plans and/or land-use designations of other owned lands have not materially changed as a result of the REDD project (e.g., designating new lands as timber concessions, increasing harvest rates in lands already managed for timber, clearing intact forests for agricultural production, or increasing fertilizer use to enhance agricultural yields) because such changes could lead to reductions in carbon stocks or increases in GHG emissions. At each verification, documentation shall be provided covering the other owned lands where leakage could occur, including, at a minimum, their location(s), existing land use(s), and management plans. Any leakage identified shall be quantified and subtracted from the net carbon benefits claimed by the project.

2. **Avoiding unplanned frontier deforestation and degradation (AUFDD) and Avoiding unplanned mosaic deforestation and degradation (AUMDD):** The project design shall identify leakage potential and address the socio-economic factors that drive deforestation/degradation. Activities that sustainably reduce deforestation/degradation may include the establishment of: agricultural intensification practices; lengthened fallow periods; agroforestry and fast-growing woodlots on degraded land; under-story farming; ecotourism and other sustainable livelihood activities; and/or sustainable production of non-timber forest products[40]. Developers of AUFDD and AUMDD projects shall design and implement activities to minimize leakage, and monitor and account for leakage using approved methodologies.

In addition, for all REDD projects, any carbon credits generated from stopping illegal[41] logging activities (to the extent they supply regional/global timber markets) shall be subject to the market leakage discounts covering IFM activities (see section above). The market leakage effects associated with stopping illegal logging need not be considered if the project proponent chooses not to claim carbon credits from stopping such activities (i.e., illegal logging is not considered in the baseline or project scenario).

40 These mitigating activities can be supplemented by providing economic opportunities for local communities that encourage protection, such as employment as protected-area guards or ecotourism guides, or by training in sustainable forest use and assisting communities securing markets for forest products (e.g., rattan, vanilla, cacao, coffee, natural medicines, etc.).

41 Activities that reduce **legally** harvested timber production are covered under the IFM section of the VCS and are not eligible REDD activities.

If leakage prevention measures for any eligible REDD activity include tree planting, agricultural intensification, fertilization, fodder production and/or other measures to enhance cropland and grazing land areas, then the increase in GHG emissions associated with these activities (e.g., CO_2 from machinery use and N_2O from fertilization of cropland) shall be estimated and subtracted from the project's net emissions reductions (subject to de minimis rule of 5%).

Step 6 of the "Tool for Methodological Issues": estimate and monitor net project greenhouse gas benefits

1. In the case of ARR or IFM rotation forestry projects, the maximum number of carbon credits to be assigned to the project shall not exceed the project's net carbon stock benefits (i.e., project minus baseline carbon stocks, including long-lived wood products) averaged across the harvesting/rotation cycles during the project crediting period[42], adjusted for project emissions of CO_2, N_2O and CH_4, and leakage.

2. ALM projects that target soil C stock increases shall account for, where significant, concomitant increases in N_2O and CH_4 and fossil-derived CO_2; similarly, projects targeting N2O emission reduction need to account for, where significant, reductions in soil C stocks. Measurements shall be based on randomized sampling, using established, reliable methods, with sufficient sampling density to determine statistically significant changes at a 95% confidence level. Soil C stock change factors shall be based on measurements of soil C stocks to the full depth of affected soil layers, accounting for differences in bulk density as well as organic C concentrations.

3. The IPCC 2006 Guidelines shall be used for estimating: CO_2 and non-CO_2 emissions; forest regrowth (carbon accumulation) if degradation is reduced; and, reductions in forest carbon stocks caused by removals of biomass exceeding regrowth. These Guidelines shall also be followed in terms of quality assurance/control and uncertainty analysis.

Guidance:

Estimating net emissions reductions and GHG removals.

Approved VCS AFOLU methodologies provide guidance for estimating net GHG benefits from project activities against the baseline scenario following the methodologies outlined in the IPCC Guidelines 2006 for AFOLU.

Projects must use full greenhouse gas accounting, providing annual estimates of overall project GHG impacts expressed in terms of CO_2 equivalents employing global warming potentials (GWPs) of 310 for N_2O and 21 for CH_4.[43]

In the case of ARR or IFM rotation forestry projects, the maximum number of carbon credits to be assigned to the project shall not exceed the project's net carbon stock benefits (i.e., project minus baseline carbon stocks, including long-lived wood products) averaged across the current harvesting/rotation cycle[44], adjusted for project emissions of CO_2, N_2O and CH_4, and leakage. This is to prevent proponents from unrealistically inflating the project's carbon benefits, and number of credits issued, by timing verification events to coincide with peak carbon stocks and not accounting for subsequent carbon losses from harvesting.

42 This average is calculated from actual carbon measurements and/or estimates/projections based on the project's harvest plan/schedule.

43 It should be noted that these GWPs may be updated over time, in which case the most current UNFCCC GWPs shall be used.

44 This average is calculated from actual carbon measurements and/or estimates/projections based on the project's harvest plan/schedule.

ARR

Emissions sources that must be considered when calculating net emissions reductions for ARR projects include, but are not limited to: emissions from biomass burning during site preparation; emissions from fossil fuel combustion[45]; direct emissions from the use of synthetic fertilizers[46]; and emissions from N-fixing species (CDM EB tool currently being prepared).

Different calculation methodologies must be used when calculating net emissions reductions for activities with and without tree harvesting. Projects harvesting trees must demonstrate that the permanence of their carbon stock is assured and must put in place a management system to reduce the risk of losing the carbon during a final cut with no subsequent replanting or regeneration. In the case of rotation forestry projects, the maximum number of carbon credits to be assigned to the project shall not exceed the long-term average of the carbon stored in the selected carbon pools, adjusted for any project emissions of CO_2, N_2O and CH_4, and leakage.

The (ex-ante) determination and quantification of the project scenario should follow the guidance provided by the IPCC or approved A/R CDM methodologies, accounting for specific project conditions. In general, it is recommended that national or regional biomass tables be used in calculations. Additionally, the project proponent should use the following guidance for quantifying specific carbon pools:

- Litter – see IPCC 2006 GL for AFOLU[47].
- Dead wood – see IPCC 2006 GL for AFOLU, with the assumption that this increase in carbon stock occurs over the lifetime of the project.
- Soil – see IPCC 2006 GL for AFOLU, with the appropriate calculations for the amount of soil organic carbon in non-forest lands as mentioned from elsewhere in the same document.
- Below-ground biomass – estimated using species-dependent root-to-shoot ratios or the Cairns equations (see IPCC 2006 GL for AFOLU).

To reduce the cost of carbon monitoring in cases where good growth tables are available and there is a high tree survival-rate, carbon stocks of above-ground biomass can be conservatively estimated as follows:

- For plantations: the project proponents must demonstrate 90% seedling survival two years after planting and may use national or regional volume or biomass tables for the lowest site class plantations for the species planted. If plantation tables are not available, then natural regeneration tables may be used.
- For natural regeneration: the proponents may use national or regional volume tables for the lowest site class natural regeneration for the species planted. If natural regeneration tables are not available, then plantation tables may be used but 10 years must be added to the age of the stand(s).
- The proponents may use higher site class yield tables if they can demonstrate through measurement that the trees are behaving as expected on the higher site class yield table.

To quantify emissions sources, projects must follow the respective guidance by the IPCC, approved A/R CDM methodologies, or specific tools approved by the Executive Board of the CDM. Two options are available to projects: (1) an approved methodology (CDM A/R and others), in which case the boundary description and its justification defines the list of emissions to be considered and tested; or, (2) their own methodology, in which case they must: justify the list of emissions

45 For their quantification, see, e.g., http://cdm.unfccc.int/EB/033/eb33_repan14.pdf

46 For their quantification, see, e.g., http://cdm.unfccc.int/EB/033/eb33_repan16.pdf

47 www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm

sources to be considered and tested; justify the exclusion of other emission sources; and prove that it has assessed and managed all significant[48] sources of leakage.

ALM

Projects that target soil C stock increases must account for, where significant, concomitant increases in N_2O and CH_4 and fossil-derived CO_2; similarly, projects targeting N_2O emission reduction need to account for, where significant, reductions in soil C stocks. In addition:

- If livestock grazing occurs, projects must account for CH_4 emissions from enteric fermentation and CH_4 and N_2O emissions from manure.
- Where land-use conversion requires intensive energy or infrastructure inputs (e.g., establishment of irrigation or drainage system), the emissions associated with the conversion process must be included in any assessment of overall emissions.
- Reduced emission of CO_2 as a result of energy-conserving practices (e.g., adopting no-till can reduce fuel use) can be included as a part of the net GHG reduction estimate.

Measurement of cropland and grassland soil management projects can include activity-based model estimates or direct measurement approaches or a combination of both. The IPCC 2006 Guidelines for National Greenhouse Gas Inventories (**http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm**) provides guidance for three 'tiers' of estimation methods; with progressively higher tier number, data requirements and complexity increase but uncertainty is reduced.

Tier 1 methods involve the use of IPCC equations and default stock change and emission factors specified for broadly defined climate, soil and land use and management conditions. Tier 2 methods use the IPCC equations, but with more regionally relevant stock change/emission factors. Estimation of stock change and/or soil emission factors for Tier 2 methods should be based on data from replicated field experiments having a duration of at least five years (preferably longer), for climate and soil conditions and management activities representative of the project conditions, using established, reliable measurement methods. Stock change factors for soil C or woody biomass C that are based on experiments of less than 20 yrs duration should be projected over no more than 20 years. Tier 3 methods use more complex, dynamic models which have been validated for conditions representative for the project area, and/or direct measurements of C stock changes and/or N_2O and CH_4 made on the project area. Tier 3 model-based estimates and measurements should span the range of soil, climate and land use/management conditions for the entire project area.

Measurements should be based on randomized sampling, using established, reliable methods, with sufficient sampling density to determine statistically significant changes at a 95% confidence level. Soil C stock change factors should be based on measurements of soil C stocks to the full depth of affected soil layers, accounting for differences in bulk density as well as organic C concentrations. Measurements to estimate project-specific N_2O and CH_4 emissions factors should be based on scientifically defensible measurements of sufficient frequency and duration to determine emissions for a full annual cycle.

IFM

To date, no approved methodologies exist for forest management project activities under the UNFCCC. Guidance for estimating carbon stocks and changes in them is provided in the IPCC 2006 GL[49] (see the "forests remaining as forests" section[50]) and in several other methodological frameworks given below, many of which are tailored more specifically to the eligible activities included in this section. Project developers must prove to verifiers that they used these sources

48 The following EB tool can be used to test the significance of emissions sources - **http://cdm.unfccc.int/EB/031/eb31_repan16.pdf**

49 **http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm**

50 See Volume 4 (AFOLU), Chapter 4 (Forest land), Section 4.2 – on pages 10-27

to guide the monitoring and estimation process for their project (particularly for N_2O and CH_4, quality assurance/control (QA/QC), and uncertainty analysis). In addition, other sound monitoring and estimating protocols exist.

Other methodological frameworks:

- Conversion of selectively logged tropical forest to protected forest (based on the Noel Kempff Climate Action Project[51]) - can also be used for conversion from conventional logging to reduced impact logging. The framework also includes methods for incorporating reduction in harvested wood products and dead wood into the estimation of carbon credits.

- California Climate Action Registry Forest Project Protocol – also includes a protocol for including harvested wood products:

http://www.climateregistry.org/docs/PROTOCOLS/Forestry/Forest_Project_Protocol_Version_2.1_Sept2007.pdf

http://www.climateregistry.org/docs/PROTOCOLS/Forestry/Forest_Project_Protocol_Version_2.0.1.pdf

- The voluntary reporting system of the US Government, known as 1605(b) after Section 1605(b) of the Energy Policy Act of 1992, Technical Guidelines for Voluntary Reporting of Greenhouse Gas Program, Chapter 1, Emission Inventories, Part I Appendix: Forestry (APPENDIX C - Scenarios of Harvest and Carbon Accumulation in Harvested Wood Products, APPENDIX D - Summary of Data and Methods Contributing to Calculation of the Disposition of Carbon in Harvested Wood Products; and Section 3: Measurement Protocols for Forest Carbon Sequestration—provides methodological frameworks for all three VCS eligible activities. (**http://www.pi.energy.gov/enhancingGHGregistry/documents/January2007_1605bTechnicalGuidelines.pdf**)

- Non-CO_2 greenhouse gases: refer to the IPCC 2006 GL methods in the case where biomass is burned as part of the slash removal after harvesting or nitrogen fertilizer is used.

The verifier also needs to check that a QA/QC plan is prepared and used in implementing the project activities.

REDD

Guidance for estimating CO_2 emissions, including recommendations for accounting for emissions of non-CO_2 gases, quality assurance, quality control, and uncertainty analysis, is provided in the IPCC 2006 GL for both deforestation (conversion of forest to non-forest use) and for degradation (forests remaining as forests)[52]. Any CO_2 emissions caused by the increased consumption of fossil fuels for implementing the project (e.g., for forest protection, monitoring and surveillance) must be accounted for (subject to the de minimis rule of 5%).

The IPCC 2006 GL provides guidance for estimating forest regrowth (carbon accumulation) if degradation is reduced, and for estimating reductions in forest carbon stocks caused by removals of biomass exceeding regrowth. Monitoring and estimation methods currently must be based on the IPCC GL. In the future, however, specific methodologies for REDD project activities may become available and approved under the UNFCCC or VCS, in which case their use would be preferred.

Monitoring net emissions reductions and GHG removals for all AFOLU projects. To be eligible under the VCS, AFOLU projects must have robust and credible monitoring protocols as defined in the approved methodologies. Monitoring and ex-post quantification of the project scenario (including off-site climate impacts) must follow the applicable guidance available in approved A/R CDM methodologies and/or IPCC documents.

51 **http://www.noelkempff.com/English/Welcome.htm**, and **http://conserveonline.org/workspaces/climate.change/ClimateActionProjects/NoelKempff/NKPDD**

52 **http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm**

4) Guidance to the Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination (hereafter referred to as "the Risk Tool")

Step 1 of the Risk Tool: conduct a risk assessment

1. Project proponents shall assess both transient and permanent potential losses in carbon stocks and determine the appropriate buffer reserve based on this Tool.

2. The outcome of the risk assessment shall be clearly documented and substantiated and be offered to the VCS verifier for assessment when the project is being validated or verified.

3. The overall risk classification of the project shall be based on risk ratings for generic risk factors and other risk factors associated with the specific AFOLU activity type: Afforestation, Reforestation and Revegetation; Agricultural Land Management; Improved Forest Management; or, Reduced Emissions from Deforestation and Degradation (resp. ARR, ALM, IFM and REDD).

4. When determining the overall non-permanence risk classification, all the risk factors relevant to the project shall be weighed up together. To assist with this process, the "risk likelihood × significance" risk assessment methodology[53], described in Appendix A, may be used.

5. Before VCUs can be issued, a VCS verifier will need to confirm the overall project risk classification and the buffer withholding percentage as determined by the project proponent in accordance with this Tool.[54]

6. If the verifier feels that the non-permanence risk associated with the project warrants a buffer reserve greater than the highest withholding percentage available for that project type (as indicated in the buffer tables below) then the project is not eligible for crediting under the VCS.

7. The outcome of the risk assessment will be subjected to the VCS double approval process. If no agreement can be reached by the two VCS verifiers on the percentage of credits the project must withhold, the project can opt to go with the more conservative of the buffer determinations or appeal to the VCS Association.

Guidance:

For AFOLU projects to be eligible for VCS crediting, the risk of non-permanence (i.e., the potential reversibility of sequestered/protected carbon) must be addressed. As the VCS does not include mandatory future verification of the carbon benefits previously claimed by verified projects (i.e., "re-verification"), an accounting method must be employed that credibly, yet cost-effectively, deals with this non-permanence issue upfront. The VCS approach for addressing non-permanence requires that projects maintain adequate buffer reserves of non-tradable carbon credits to cover unforeseen losses in carbon stocks. The buffer credits from all projects are held in a single AFOLU Pooled Buffer Account.

The number of buffer credits that a given project must deposit into the AFOLU Pooled Buffer Account is based on an assessment of the project's potential for future carbon loss. Project proponents are charged with: (1) undertaking the initial risk assessment, which must consider

53 This approach provides assessors with a framework for evaluating both quantitative and qualitative risks in an integrated manner in order to come to a defendable overall risk classification of "low", "medium", "high" or "unacceptably high/fail".

54 While this tool is intended to cover the key factors driving non-permanence risk, validators and verifiers may identify other risks they consider significant for a given project, in which case these additional factors should be included in the overall risk assessment.

both transient and permanent potential losses in carbon stocks; and (2) determining the appropriate buffer reserve based on guidance provided in this document. This self risk assessment must be clearly documented and substantiated where possible. During verification, the VCS verifier will evaluate the project's risk assessment and adjust it as appropriate before determining the project's required buffer reserve.

As a part of the double approval process, a second VCS verifier will conduct a desk review[55] of this first verifier's risk assessment and buffer determination, and either sign-off on this or work with the original verifier to reach agreement on what constitutes an appropriate buffer. If no agreement can be reached, the project can opt to go with the more conservative of the buffer determinations or appeal to the VCS Assocation according to the appeal process defined in the most recent version of the VCS Program Guidelines. Having another VCS verifier perform the second check will promote cross-learning and consistency among the verifiers making these risk determinations, thereby enhancing the effectiveness, accuracy and fairness of the buffer approach.

Future verification of AFOLU projects that have generated VCUs in the past is optional, but it is in the interests of project proponents to verify periodically in order to claim a greater percentage of the carbon benefits held in the buffer. The buffer can be drawn upon over time as a project demonstrates its longevity, sustainability and ability to mitigate risks.

The advantage of this buffer approach over temporary crediting lies in its simplicity and the fact that it allows VCS projects to produce permanent VCUs that are fully fungible regardless of the project type (AFOLU or otherwise) generating them.

The credibility and environmental integrity of the buffer approach rests on the fact that there will be a periodic "truing up" of the overall VCS buffer pool every few years. This semi-quantitative assessment will be based on a review of existing VCS verification reports for all AFOLU projects under the VCS. This process would flag the projects that have failed or underperformed and then identify their common characteristics. The buffer values and/or risk criteria for VCS projects going forward would then be adjusted accordingly, so that there is always a net surplus of carbon in the overall buffer after subtracting the actual losses from projects. For example, if it is determined that a disproportionate number of the high-risk ARR projects failed over time, then the associated risk criteria for such projects could be tightened, or the recommended buffer increased. This periodic assessment could also identify verifiers whose work is not of acceptable quality and who should be subject to review and potential blacklisting. Operational procedures for the "truing up" will be defined by the VCS Board within two years after the first issuance of VCUs generated by AFOLU projects.

Before any VCUs can be issued, AFOLU projects must undergo a risk assessment by a VCS verifier who will assign a risk rating according to the non-permanence risk criteria outlined in the four project category sections of this document. According to its risk rating, a percentage of the carbon credits generated by a project will be withheld in the AFOLU Pooled Buffer Account to insure against potential future carbon losses from the project and the project pool at large. This buffer reserve cannot be traded.

This risk assessment must occur every time a project seeks VCS verification because the project's risk profile may change. Importantly, the repetition of the risk assessment provides an incentive for projects to enhance their risk mitigation strategies to lower their risk rating over time. Projects that reduce their overall risk rating will be subject to a smaller buffer withholding requirement, allowing them to trade a greater percentage of the total carbon credits generated by the project. In the case of projects that are not validated and verified simultaneously, having their initial risk assessments validated at the time of VCS project validation will assist VCU buyers and sellers by providing a more accurate early indication of the number of VCUs (i.e., tradable units) projects are expected to generate.

The general section and the four project category sections of this document include guidance for verifiers and project proponents to use when determining a project's appropriate risk level.

55 Typically, the desk review conducted by the 2nd verifier should not cost more than $1,500 USD (equivalent to approx. one day's worth of work); so the process should not be unnecessarily costly or burdensome to projects.

Besides evaluating the risk factors outlined in the guidance section relevant to the project type in question, verifiers and project proponents must also consider the full spectrum of risks that can affect all projects, including those outlined in sub-step 1a of the Risk Tool.

Sub-step 1a of the Risk Tool: conduct a risk assessment

> Generic risk factors that shall be assessed for all AFOLU project types are listed in Table 1 [Not repeated here]

Guidance

Guidance on determining the appropriate overall risk level of a given project, based on major risk factors associated with specific project activities, is provided in table form in the four project sections (ARR, ALM, IFM and REDD). In addition to using the tabular guidance, assessors (whether the project proponent or verifier) may choose to apply the "risk likelihood × significance" risk assessment methodology outlined in Appendix A of the Risk Tool.

Sub-step 1b of the Risk Tool: Determination of the risk factors associated with the specific project types

> For the sake of brevity, the text of the Risk Tool has not been repeated here.

Additional Guidance on ARR

As with any carbon reduction project, ARR projects should be assessed for a wide variety of risks, ranging from those that are socio-political in nature at a national level to those that are technical in nature at the sub-project level. Recognizing that it is worth considering the full spectrum of risks, verifiers should look closely at project length when assessing the risks associated with ARR projects.

Project length is considered a factor of paramount importance when assessing ARR projects because of the bearing it has on the risk of non-permanence. For example, if projects commit to only one short rotation (with a short rotation defined as anything less than 25 yrs), the risk of non-permanence is considerably greater than if a series of long rotations is planned. Projects that involve the harvesting of wood can generally be considered to have a higher non-permanence risk than those without harvesting. Verifiers may evaluate such risk by looking at the incentives to replant in rotation forestry, rotation length, and economic, legal or regulatory incentives to continue maintaining the forest beyond the crediting time.

Additional Guidance on ALM

In general, carbon stock accumulations (in particular soil C) associated with ALM activities are less vulnerable to natural disturbances than are carbon stocks associated with other land use activity categories. The primary risk factors for ALM activities are those associated with maintaining a project's economic viability and longevity. For example, if changing economic conditions increase the opportunity cost of not producing an alternative crop, land managers might revert to pre-project conditions, leading to the loss of C stocks.

Project developers and verifiers will evaluate each project's characteristics and will determine its risk rating accordingly. The table in the ALM section of the Risk Tool provides guidance concerning the key risk factors and relative risk ratings for ALM projects. The risk factors considered most significant in terms of potential loss of greenhouse gas mitigation include discontinuation of practices arising from a change in land tenure (ownership type) or a change in potential net financial returns. For example, if costs of maintaining the practice escalate or if the economic returns from an alternative product increase, land managers may be tempted to abandon the C-conserving or GHG mitigating practice.

Additional Guidance on IFM

The four risk factors considered most significant in terms of potential loss of carbon benefits are: fire potential, timber values, illegal logging potential and unemployment potential. For projects with high (or rising) timber values, there is a risk that project implementers would be tempted to harvest some of the valuable species. If projects create unemployment, then there is a risk that those who have lost their employment will resort to illegal activities such as logging or forest conversion to supplement their income, particularly in LtPF activity.

The table in the IFM section of the Risk Tool provides guidance for verifiers to use when assessing the risk of carbon reversal (non-permanence) associated with specific key factors and conditions existing at the project-level. Because the non-permanence risk factors are the most significant ones, when using the table to assess the risk of non-permanence, the factor with the highest rank determines the project's overall risk rating and shall be used to determine the required buffer. For example, if fire has a high return interval frequency and no fire prevention activities are present, then all three project types would be ranked high for this factor and high overall. In contrast, for a LtPF project where fire was not a factor at all, but there were few opportunities for alternative livelihoods, then the overall risk to permanence is medium to high depending on the employment history of the prior logging operation.

Additional Guidance on REDD

None

Step 2 of the Risk Tool: Deposit the appropriate amount of credits into the AFOLU Pooled Buffer Account

1. According to this risk rating, the appropriate percentage of carbon credits shall be withheld. Such credits cannot be traded and will be withheld in the AFOLU Pooled Buffer Account.

2. Future verification of AFOLU projects that have generated VCUs in the past is optional. However, any subsequent verification of a VCS AFOLU project must take place prior to the expiration of its crediting period. As a result of such future verification a percentage of the carbon held in the buffer may be released if a project has demonstrated, over its longevity, the project's sustainability and ability to mitigate risks.

3. The remaining credit balance of a project's buffer is automatically cancelled at the end of the project.

Guidance

The VCS will maintain a single buffer account in which all buffer credits associated with individual projects will be held, and from which the risk of the entire VCS AFOLU portfolio can be managed (see Cancellation of Buffer Credits section below). This pooled buffer account will reside within the central VCS tracking system. In addition, the buffer associated with each project will be tracked by the registry holding the VCUs generated by the project. This will facilitate the release of the buffer, as the project proves itself over time, whereby some buffer credits will be converted into VCUs and made available for trading – see "Incentives for periodic verification" under Step 3 section below.

Individual countries will be allowed to manage the risk associated with their portfolio of VCS projects (i.e., by establishing a national VCS buffer account rather than participating in the general VCS buffer pool) if the country can demonstrate to the VCS Board that this can and will be done credibly and effectively.

In the future, as appropriate insurance products become available, individual AFOLU projects could have the option of managing non-permanence risk through insurance (and potentially other risk mitigation strategies) deemed credible by the VCS Board and could be exempt from participating in the VCS buffer pool.

Cancellation of buffer credits

The environmental integrity of the buffer approach is credible only if credits in the buffer are cancelled when carbon is lost from the project. If total to-date project emissions exceed baseline emissions, or total to-date project emissions removals (from sequestration) are less than in the baseline scenario, then no future VCUs are issued to the project until the deficit is remedied. If VCUs were issued in previous verifications, an amount of buffer credits equivalent to the excess emissions or reduced sequestration is automatically cancelled from the AFOLU Pooled Buffer Account. The minimum buffer values for the various project types have been conservatively estimated and set at a level that should be sufficient to prevent the balance of credits in the AFOLU Pooled Buffer Account from ever becoming negative. The VCS will periodically review the minimum buffer values to ensure that a positive and safe balance of buffer credits is held in the VCS registry at all times (see "truing up" above).

If a project fails to submit a verification report to the VCS within five years from its latest verification, 50% of the credits associated with its buffer will automatically be cancelled. After another five years, all of its remaining buffer credits will be cancelled. If no subsequent verification has been presented within a period of 15 years, and the crediting period of the project has not yet expired, buffer credits are cancelled from the AFOLU Pooled Buffer Account for an amount equivalent to the total number of tradable credits issued to the project. Credits are cancelled under the conservative assumption that if a project does not verify as expected during its crediting period, then carbon held in the buffer must have been lost in the field.

It should be noted that although credits from the buffer pool are cancelled to cover carbon known, or believed, to be lost from the system, the VCUs already issued to projects that subsequently fail are not cancelled and do not have to be "paid back". As a result, all AFOLU VCUs generated under the VCS are considered secure and permanent, which provides market/buyer confidence in the system. This approach also works from an atmospheric integrity perspective because the buffer pool will always maintain an adequate surplus to cover unanticipated losses from individual project failures. Across the entire pool of VCS AFOLU projects the total volume of real carbon benefits generated should always be greater than the total number of VCUs issued if the pool is properly managed.

Projects may claim the cancelled credits in the future by submitting a new verification prior to the expiration of their crediting period.

The remaining credit balance of a project's buffer is automatically cancelled at the end of the project.

Step 3 of the Risk Tool: Repeat the previous steps each time a project seeks VCS verification and adjust the project's buffer account withholding accordingly

1. If during a subsequent verification total to-date project emissions are shown to exceed the baseline emissions, or total to-date project emissions removals (from sequestration) are less than in the baseline scenario, then no future VCUs are issued to the project until the deficit is remedied. If VCUs were issued in previous verifications, an amount of buffer credits equivalent to the excess emissions or reduced sequestration shall be cancelled from the AFOLU Pooled Buffer Account. This necessity shall be indicated in the verification statement within the verification report.

2. If a project's overall risk rating remains the same or decreases from one verification event to the next, then every five years upon verification 15% of its total buffer reserve (including newly deposited credits from the current verification) shall be released and made available for trading. If a project's risk rating increases from one verification event to the next, the total buffer reserve shall not be reduced.

3. If the project's risk rating decreases from one verification event to the next, then the new (lower) buffer withholding percentage shall apply to all credits generated to date by the project.

4. The remaining buffer credit balance associated with the project is automatically cancelled from the AFOLU Pooled Buffer Account at the end of the project.

Guidance

See guidance provided for step 2 of the Risk Tool.

Incentives for periodic verification

The buffer credits associated with a given project can be drawn upon over time as an incentive for future verification and to recognize that, as the project's longevity is demonstrated (through subsequent verifications), certain project risks can be reduced. For example, a project entity that has established a solid track record of successfully operating a given project for a number of years and can provide historic performance data to verifiers should be viewed as lower risk than a similar but less experienced project entity. This "longevity-based" risk adjustment is independent of the more specific risk assessment that will be conducted at each verification event in order to determine if any of the major risk factors and mitigating activities associated with a project have changed since its last verification.

If a project's overall risk rating remains the same or decreases from one verification event to the next, then every five years upon verification 15% of its total buffer reserve (including newly deposited credits from the current verification) shall be released[56] (from the AFOLU Pooled Buffer Account) and made available for trading. If a project's risk rating increases from one verification event to the next, then the total buffer reserve shall not be reduced.

If the project's risk rating decreases from one verification event to the next, then the new (lower) buffer withholding percentage shall apply to all credits generated to date by the project. In such cases, the project's buffer shall be reduced to reflect the lower "risk-assessed" withholding requirement in addition to the 15% "time-related" release (i.e., these two kinds of buffer reductions should be applied cumulatively).

For example, if a project's first risk assessment took place at year five (i.e., five years after project start/implementation date) and determined that it should be subject to 30% buffer withholding, then the project would have 15% of this buffer released at its next verification at year ten or later (i.e., ≥5 years after the 1st VCS verification), provided its risk rating stayed the same. This would mean that now 25.5% of total carbon credits generated by the project (including the new credits issued during the current verification) would have to be withheld. And at year 15 (or later) from the project start, at the next verification event the project would have 15% of its remaining buffer released and so on. The following table illustrates how the buffer would be drawn down over time for a project starting with a 30% buffer.

Years since 1st VCS verification	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Total buffer (% withheld of total carbon credits generated by project)	30.00	25.50	21.68	18.42	15.66	13.31	11.31	9.62	8.17	6.95	5.91	5.02	4.27	3.63	3.08

Projects may choose to be verified more or less frequently than every five years. The total buffer to be withheld is based on the number of years (broken down into 5-yearly increments) since the initial VCS verification, which is considered the date when the project first established its track record for justifying the buffer release.

Appendix 1 summarizes the financial implications for projects subject to VCS buffer withholding under various scenarios. Depending on the project duration (i.e., 30 years or 70 years) and whether the price of carbon increases over time, typical medium-risk ARR and REDD projects will only forgo 3% to 15% of their total discounted carbon revenues starting with 20% - 30% buffers.

56 When released, buffer credits will be cancelled and converted into VCUs and deposited into the registry account of the project and made available for trading.

Appendix 1

Financial Analysis of Buffer Withholding under Different Project Scenarios

The financial impact to projects of the VCS buffer withholding is assessed by analyzing total (life of project) discounted carbon revenue (TDCR), rather than Net Present Value – which is more influenced by costs unrelated to the use of buffers and may vary substantially from one project to the next.

The relevant assumptions are:

- Ex-post sales following every 5-year verification event
- 6% financial discount rate
- Project risk category (i.e., High, Med, Low) remains constant through life of project

The following scenarios were considered:

- Initial buffers of 0, 10, 20, 30 and 50% (except in the case of the REDD project, for which buffers do not exceed 30%) and 15% releases on subsequent verifications
- 30-year and 70-year temperate ARR, tropical ARR and tropical REDD project case studies
- VCS-verified CO_2 emission reduction prices of US$5 per metric ton and annual increases in value of VCS-verified CO_2 emission reduction of 0% and 5%

Note: Total discounted carbon revenue in the summary tables is in units of US$ per hectare for ARR projects and US$ million for the 350,000 ha REDD project (for which a per unit area value is less meaningful).

The project case studies are meant to be illustrative. Absolute amounts of discounted carbon revenue are less informative than percent reductions, which should be broadly representative. Carbon projections for temperate ARR, tropical ARR and tropical REDD projects are drawn from data from Lower Mississippi Valley USA bottomland hardwood forests, tropical broadleaf forests around Mantadia National Park in Madagascar and Makira National Park Madagascar.

The results were fairly consistent across the three project types (temperate and tropical ARR, and tropical REDD). Shorter term (i.e., 30 yr) projects were harder hit because they had comparatively less opportunity to cash in on buffer releases. Total percentage reductions in TDCR were less than the initial buffer percentages due to the progressive releases, but also because the most exacting buffer set-asides were applied at the early stages of projects, coinciding with lower rates of production of emission reductions, as expected for both for ARR and REDD. The assumption of an increasing value (5% per year) of carbon credits reduced the impact of the buffers on TDCR (i.e. values are increasing while set-asides are decreasing) by as much as 50% compared with the assumption of a constant carbon value.

Percentage Reductions in Total Discounted Carbon Revenue (TDCR) due to VCS Buffer Withholding

Project Type and Duration			Total Discounted Carbon Revenues		% Reduction in Total Discounted Carbon Revenues	
		Initial buffer withheld	…with constant C price	…with 5% annual increase in C price	…with constant C price	…with 5% annual increase in C price
Temperate ARR Project	**30 Year Project**	**50%**	$371 /ha	$1,047 /ha	**22.3%**	**19.4%**
		30%	$412 /ha	$1,149 /ha	**13.5%**	**11.6%**
		20%	$435 /ha	$1,198 /ha	**8.8%**	**7.8%**
		10%	$454 /ha	$1,247 /ha	**4.7%**	**4.0%**
		0%	$477 /ha	$1,299 /ha	0.0%	0.0%
	70 Year Project	**50%**	$521 /ha	$2,440 /ha	**16.6%**	**7.2%**
		30%	$563 /ha	$2,517 /ha	**9.9%**	**4.3%**
		20%	$583 /ha	$2,554 /ha	**6.7%**	**2.9%**
		10%	$603 /ha	$2,594 /ha	**3.6%**	**1.4%**
		0%	$625 /ha	$2,631 /ha	0.0%	0.0%
Tropical ARR Project	**30 Year Project**	**50%**	$820 /ha	$1,865 /ha	**25.2%**	**19.9%**
		30%	$931 /ha	$2,050 /ha	**15.1%**	**11.9%**
		20%	$986 /ha	$2,141 /ha	**10.1%**	**8.0%**
		10%	$1,042 /ha	$2,235 /ha	**5.0%**	**3.9%**
		0%	$1,097 /ha	$2,327 /ha	0.0%	0.0%
	70 Year Project	**50%**	$968 /ha	$3,231 /ha	**21.3%**	**8.4%**
		30%	$1,072 /ha	$3,349 /ha	**12.9%**	**5.0%**
		20%	$1,124 /ha	$3,409 /ha	**8.6%**	**3.4%**
		10%	$1,178 /ha	$3,468 /ha	**4.2%**	**1.7%**
		0%	$1,230 /ha	$3,527 /ha	0.0%	0.0%
Tropical REDD Project	**30 Year Project**	**30%**	$14.15m	$34.84m	**14.3%**	**11.8%**
		20%	$14.94m	$36.40m	**9.6%**	**7.8%**
		10%	$15.73m	$37.95m	**4.8%**	**3.9%**
		0%	$16.52m	$39.50m	0.0%	0.0%
	70 Year Project	**30%**	$20.00m	$101.11m	**10.7%**	**4.2%**
		20%	$20.80m	$102.58m	**7.1%**	**2.8%**
		10%	$21.59m	$104.05m	**3.6%**	**1.4%**
		0%	$22.39m	$105.52m	0.0%	0.0%

Glossary

Aboveground biomass
All living biomass above the soil; including the stem, stump, branches, bark, seeds, and foliage.

Absolute risk
A quantitative or qualitative prediction of the likelihood and significance of a given impact. In the VCS, the level of absolute risk can be calculated using the 'likelihood × significance' methodology. The calculated risk can then be converted into a risk classification.

Agroforestry
An ecologically based natural resource management system in which trees are integrated in farmland and rangeland.

Afforestation
The direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources.

Agriculture, Forestry and Other Land Use (AFOLU)
This includes activities related to:

- Afforestation, Reforestation and Revegetation (ARR)
- Agricultural Land Management (ALM)
- Improved Forest Management (IFM)
- Reduced Emissions from Deforestation and Degradation (REDD)

Belowground biomass
All living biomass of live roots. Fine roots of less than ~2mm diameter are sometimes excluded because these often cannot be distinguished empirically from soil organic matter or litter.

Buffer approach
The VCS self-insurance mechanism for addressing the non-permanence risk associated with AFOLU projects (given that such projects are potentially subject to unforeseen losses in their carbon stocks). Based on its individual risk profile, each project is required to deposit a percentage of the total carbon credits it generates into a buffer account shared by all VCS AFOLU projects. This buffer pool will be managed to be of sufficient size to cover potential losses that may occur within individual projects and across the AFOLU portfolio at large. By providing such insurance backing to all AFOLU projects, their VCUs can, in effect, be considered permanent.

Carbon pools
A reservoir of carbon that has the potential to accumulate (or lose) carbon over time. In AFOLU, this encompasses aboveground biomass, belowground biomass, litter, dead wood and soil organic carbon.

Carbon stock
The quantity of carbon held within a pool, measured in metric tons of CO_2.

Climate change mitigation
The process by which the emissions of GHG are reduced or removed in order to stabilize GHGs in the atmosphere.

Community and/or environmental impacts
Refers to the effect that project activities may have on the socio-economic or environmental landscape. The General Approval Process of the VCS requires that project activities do not have any negative impacts and do not provide perverse incentives for the clearing of land to generate carbon credits.

Cropland
Arable and tillage land, and agro-forestry systems where vegetation falls below the threshold used for the forest land category.

Deadwood
Includes all non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the host country.

Fallow
A period during the year when the land is kept bare and no crop is raised on it.

Forest
Forest definitions are myriad; however, common to most definitions are threshold parameters including minimum forest area, tree height and level of crown cover. Under the Kyoto Protocol, a "forest" is defined according to these three parameters as selected by the host country: 0.05 – 1.0 hectares minimum area, with tree crown cover (or equivalent stocking level) of more than 10% – 30% with trees, with the potential to reach a minimum height of 2 – 5 metres at maturity in situ. To be eligible for VCS crediting, REDD project forests must meet internationally accepted definitions of what constitutes a forest, e.g., based on UNFCCC host-country thresholds or FAO definitions.[57] The definition of a forest may include mature forests, secondary forests, and degraded forests. Wetland forests (e.g., peat swamp forests or mangrove forests) are also eligible for crediting under VCS REDD, as long as they meet the forest definition requirements mentioned above.

Grassland
Managed rangelands and pastureland that is not considered as cropland, where the primary land use is grazing. May also include grass-dominated systems managed for conservation or recreational purposes.

Litter
Includes all non-living biomass with a size less than a minimum diameter (for example 10 cm) chosen by each host country, lying dead, in various states of decomposition above the mineral or organic soil. This includes litter, fumic, and humic layers. Live fine roots (of less than the suggested diameter limit for belowground biomass) are included in litter where they cannot be distinguished from it empirically.

Module
Components of a methodology that can be applied stand-alone to perform a specific task. Examples of modules are the **"Tool for demonstration and assessment of additionality"**[58] and the **"Tool for testing significance of GHG emissions in A/R CDM project activities"**[59].

Native or Natural Forests
A forest composed of indigenous trees not established by planting or/and seeding in the process of afforestation or reforestation.

Nitrification inhibitor
A substance that prevents or delays nitrification. These are useful for conserving nitrogen, increasing nitrogen-use efficiency and in reducing losses of applied nitrogen fertilizer.

Non-permanence Risk Analysis
The process by which a project risk assessment is conducted, and subsequently validated independently by a VCS accredited entity. Based on this assessment, the validator/verifier assigns a project risk rating and determines the percentage of the project's carbon credits to be transferred into the AFOLU Pooled Buffer Account.

57 See FAO Global Forest Resources Assessment 2000 Appendix 2 Terms and Definitions: http://www.fao.org/DOCREP/004/Y1997E/y1997e1m.htm#bm58

58 EB 16, Annex 1. (http://cdm.unfccc.int/methodologies/ARmethodologies/approved_ar.html)

59 EB 31, Annex 16. (http://cdm.unfccc.int/methodologies/ARmethodologies/approved_ar.html)

Reforestation
The direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land.

Revegetation
A direct human-induced activity to increase carbon stocks on sites through the establishment of vegetation that covers a minimum area of 0.05 hectares and does not meet the definitions of afforestation and reforestation contained here.

Risk Classification (or class)
One of four categories (low, medium, high, or unacceptably high/fail) representing the general level of non-permanence risk associated with a given project.

Risk Factors
Risk assessment criteria that project activities must be evaluated against in order to determine the level of non-permanence risk. Projects are evaluated against two sets of risk factors, one applicable to all AFOLU projects and the other specific to the project type in question.

Sequestration
The process of increasing the carbon content of a carbon pool other than the atmosphere, e.g., growing trees convert atmospheric CO_2 into biomass carbon through photosynthesis.

Significance of GHG Emissions
An indication of the relative importance of a given GHG emission source. For VCS AFOLU projects, individual GHG sources may be considered "insignificant" and do not have to be accounted for if **together** such omitted decreases in carbon pools and increases in GHG emissions amount to less than 5% of the total CO_2-eq benefits generated by the project. The following CDM EB tool can be used to test the significance of emissions sources:
http://cdm.unfccc.int/EB/031/eb31_repan16.pdf

Slow release fertilizer
A fertilizer that is not readily soluble, but releases its nutrients slowly over a period of time to better synchronize nutrient availability with plant demands. For purposes of application to ALM projects, this refers to N fertilizers only.

Soil organic carbon
Includes organic carbon in mineral and organic soils (including peat) to a specified depth chosen by the country and applied consistently through the time series. Live fine roots (of less than the suggested diameter limit for belowground biomass) are included with soil organic matter where they cannot be distinguished from it empirically.

Tool
Guideline or procedure for performing an analysis (e.g., non-permanence risk analysis) or to help use or select a module or methodology. For example, spreadsheets and/or software that perform calculation tasks according to an approved methodology (e.g., **"Tool to calculate sampling size for terrestrial sampling and the estimated costs of conducting sampling"**[60] or TARAM – **"Tool for Afforestation and Reforestation Approved Methodologies"**[61]).

Wetland
Land that is covered or saturated by water for all or part of the year (e.g., peatland) and that does not fall into the forest land, cropland, grassland or settlements categories.

Wood products
Products derived from the harvested wood from a forest, including fuelwood and logs and the products derived from them such as sawn timber, plywood, wood pulp, paper.

60 Developed by Winrock International and BioCarbon Fund (available at **http://www.winrock.org/Ecosystems/tools.asp?BU=908**)

61 Developed by CATIE and BioCarbon Fund (available at **www.proyectoforma.com and www.carbonfinance.org**).

Acronyms

AFOLU	Agriculture, Forestry and Other Land uses
ALM	Agricultural Land Management
ARR	Afforestation, Reforestation and Revegetation
CDM	Clean Development Mechanism
EB	Executive Board (of the CDM)
ERA	Extending the Rotation Age (of evenly aged managed forests)
GHG	Greenhouse Gas
GWP	Global Warming Potentials
ISO	International Organisation for Standardisation
IFM	Improved Forest Management
JI	Joint Implementation
PD	Project Description
REDD	Reducing (or Reduced) Emissions from Deforestation and Degradation
RIL	Reduced Impact Logging
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
VCU	Voluntary Carbon Unit

Cover: Mt. Sabinyo with agricultural land in foreground, Rwanda.