Voluntary Carbon Standard

Guidance for Agriculture, Forestry and Other Land Use Projects

19 November 2007

VCS VOLUNTARY CARBON STANDARD

Voluntary Carbon Standard
Guidance for Agriculture, Forestry and Other Land Use Projects

19 November 2007

Table of Contents

Using this Document

After its translation into ISO-approved language, this Voluntary Carbon Standard (VCS) guidance document for Agriculture, Forestry and Other Land Use (AFOLU) projects will be incorporated into the next release of the VCS in the first quarter of 2008. In advance of this release, interested parties can use this guidance document to develop VCS-compliant AFOLU projects and methodologies.

Foreword

The framework laid out in this document has 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 ten-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 the following document. More than a dozen independent reviewers, including preeminent risk experts, investors, NGO representatives and project developers helped create the final version of this document.

The following individuals were the primary contributors:

VCS AFOLU Advisory Group

Ken Newcombe (VCS AFOLU AG Chair) – Goldman Sachs, USA
Bernhard Schlamadinger – TerraCarbon, Austria
Toby Janson-Smith (VCS AFOLU project manager) – Conservation International, USA
Tanja Havemann – Climate Change Capital, UK

Afforestation, Reforestation and Revegetation (ARR) Expert Group

Igino Emmer (lead author) – Emmer Internationaal, The Netherlands
Neil Bird – Joanneum Research, Austria
Manuel Estrada – National Institute of Ecology, Mexico
Martin Schröder – TÜV SÜD, Germany
Frank Werner – Swiss Federal Institute of Technology, Switzerland

Agricultural Land Management (ALM) Expert Group

Keith Paustian (lead author) - NREL, Colorado State University, USA
Henry Janzen – Agriculture and Agri-Food Canada, Canada
Daniel Martino – Carbosur, Uruguay
David Powlson – Rothamstead Research, UK
Mike Robinson – Syngenta, UK

Improved Forest Management (IFM) Expert Group

Sandra Brown (lead author) - Winrock International, USA
Brian Murray – Duke University, USA
Timothy Pearson – Winrock International, USA
Brent Sohngen – Ohio State University, USA

Reducing Emissions from Deforestation (RED) Expert Group

Lucio Pedroni (lead author) – CATIE, Costa Rica
Manuel Estrada – National Institute of Ecology, Mexico
Charlotte Streck – Climate Focus, Germany
Eveline Trines – Treeness Consult, The Netherlands
Xiaoquan Zhang – Chinese Academy of Forestry, People's Republic of China

VCS AFOLU Consultants

Amanda Hawn (VCS AFOLU editor) – Ecosystem Marketplace, USA
Michael Jenkins (program development) – Forest Trends, USA
David Shoch (buffer financial analyst) – The Nature Conservancy, USA

Independent Reviewers

Jüergen Blaser – Intercooperation, Switzerland
Benoît Bosquet – Carbon Finance Unit, World Bank, USA
Bruce Cabarle – WWF, USA
Phil Cottle – ForestRe, UK
Jan Fehse – EcoSecurities, UK
Martin Schröder – TÜV SÜD, Germany
Joerg Seifert-Granzin – FAN, Bolivia
Bill Stanley – The Nature Conservancy, USA
Marc Steininger – Conservation International, USA
Craig Trotter – Landcare Research, New Zealand
Martijn Wilder – Baker & McKenzie, Australia
Xiaoquan Zhang – Chinese Academy of Forestry, People's Republic of China

Introduction

As part of its drive for credibility and innovation (combined with the fact that forestry projects account for 35%-50% of all offsets sold within the voluntary carbon market), the VCS will include Agriculture, Forestry and Other Land Uses (AFOLU) in the list of eligible project activities based on a new approach to managing non-permanence risks. To begin with, the following four categories of AFOLU project activities will be covered under the VCS:

- Afforestation, Reforestation and Revegetation (ARR)
- Agricultural Land Management (ALM)
- Improved Forest Management (IFM)
- Reducing Emissions from Deforestation (RED)

In the future, the VCS Board will consider adding new AFOLU project categories (e.g., avoided devegetation) 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 streamline the discussion of each of these topics while at the same time highlighting important differences in the four project categories (ARR, ALM, IFM and RED), the ensuing pages are organized in five sections. The first section will provide general guidance that is common to all four of the project categories, while the subsequent four sections will, in turn, provide guidance specific to each project category.

In order to foster cost-effective integrated projects under the VCS, projects may combine a variety of activities spanning these four general categories into a single Project Document (PD) and verification event. 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 (RED), fast-growing woodlots (ARR) and improved agricultural management practices (ALM) might be combined to maximize synergies within a single project. However, each category of project activity must be assessed (in terms of risk criteria, buffer withholding and carbon accounting) using the relevant guidance sections in this document.

General AFOLU Guidance

1. General VCS Approval Process

A. Carbon verification

VCS verifiers can only perform validations/verifications within the sectoral scopes for which they are accredited. There are two VCS AFOLU sectoral scopes: (1) Forestry – covering ARR, ILM and RED projects; and (2) Agriculture – covering ALM projects. Accredited for the appropriate scope(s), VCS verifiers will possess significant expertise for assessing AFOLU project activities, and will be in a position to use their expert judgment to follow the guidance provided in this document.

B. Validation of methodologies

Methodologies are step-by-step explanations of how emissions reductions or removals of greenhouse gases (GHGs) are to be estimated following accepted scientific good practice. Methodologies should be applied conservatively, transparently and thoroughly. To generate Voluntary Carbon Units (VCUs), a project activity must apply a VCS-approved methodology to estimate and monitor its net GHG emission reductions or removals.

Existing methodologies under the Clean Development Mechanism (CDM) and Joint Implementation (JI) are approved automatically under the VCS. 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 (see VCS 2007). Verifiers should consult with relevant technical experts as appropriate to properly evaluate new methodologies.

Although the guidelines contained in this document have been conceived for project-based activities, the VCS may consider approving methodologies covering sectoral approaches in the future that would encompass country-wide or regional AFOLU activities.

C. Approval of tools

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

Tools can be categorized into two types:

- **Components of a methodology** that can be applied as a stand-alone methodological module to perform a specific task. Examples of this type of tool are the **"Tool for demonstration and assessment of additionality"**[1] and the **"Tool for testing significance of GHG emissions in A/R CDM project activities"**[2]**.** These "tools" should be considered components of a methodology.
- Calculation tools are 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"**[3] or TARAM – **"Tool for Afforestation and Reforestation Approved Methodologies"**[4]).

New tools approved under the VCS should satisfy two main criteria: (1) they should be as simple as possible in order to facilitate their low-cost application; and, (2) they should use conservative and transparent approaches.

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

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

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

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

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

D. Community and/or environmental impacts of projects

It is important to recognize that AFOLU projects have the potential to generate both positive and negative socio-economic and environmental impacts. The positive socioeconomic and environmental co-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/or socio-economic[5] 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[6] to demonstrate project quality across multiple dimensions in advance of VCS verification. Forestry projects may also find the EnCoFor[7] CDM toolkit helpful for assessing environmental and social impacts. For forest management projects, Forest Stewardship Council (FSC)[8] 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.[9]

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

6 www.climate-standards.org

7 www.joanneum.at/encofor

8 www.fsc.org

9 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, since 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, since species diversity 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.

2. Non-Permanence Risk Analysis and Buffer Approach

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, 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 is to require 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 pooled VCS buffer account.

The number of buffer credits that a given project must deposit into the pooled VCS 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 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.

Then a second VCS verifier will conduct a desk review[10] 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 then the project can opt to go with the more conservative of the buffer determinations or appeal to the VCS Organization 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 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 (see "C. Incentives for periodic verification" section below).

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 values could be revised upwards. 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.

A. Non-permanence risk analysis

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

10 The cost of the desk review conducted by the 2nd verifier will be capped at $1,500 USD (equivalent to approx. one day's worth of work), so that the process does not become unnecessarily costly or burdensome to projects.

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 pooled VCS 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.

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. 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 the table below.

Risk factors applicable to all project types

Project risk
Risk of unclear land tenure and potential for disputes
Risk of financial failure
Risk of technical failure
Risk of management failure
Economic risk
Risk of rising land opportunity costs that endanger the future viability of the project
Regulatory and social risk
Risk of political instability
Risk of social instability
Natural disturbance risk
Devastating fire risk[11]
Risk of incidence of pest and disease attacks
Risk of extreme climatic events (e.g. floods, drought, winds)
Geological risk (e.g. volcanoes, earthquakes, landslides)

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, AFM and RED) of this document. In addition to using the tabular guidance, assessors (whether the project proponent or verifier) may choose to apply the "risk likelihood x significance" risk assessment methodology outlined in Appendix A. This approach provides

11 The potential risk of carbon loss is often over exaggerated. For example, even with a devastating fire only a portion of the aboveground forest carbon goes up in smoke – a lot gets left as charred wood, which is practically a permanent store. Another portion is left as standing dead trees, which can take several decades or more to decompose depending on climate and size of trees burned. And in some cases there would be salvage logging, which puts the wood into long-term storage. From Winrock studies in California it is estimated that only about 50% of the carbon is lost due to a severe forest fire, even if there was no replanting of the trees.

assessors with a consistent and comprehensive framework for evaluating both quantitative and qualitative risk in an integrated manner in order to come to a single overall risk classification of “low”, “medium”, “high” or “unacceptably high/fail”. One of the benefits of the proposed methodology is that the assessor is forced to separate absolute risk from the way in which a project mitigates this risk. This approach provides the project with a management tool to support the reduction of non-permanence risks and should enable verifiers to more easily judge changes in a project’s risk profile at subsequent verifications.

B. Buffer account

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” 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.

C. 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 from one verification event to the next, then an additional 15% of its total buffer reserve will be released[12] (from the pooled VCS buffer account) in five-yearly increments upon verification, and made available for trading. If a project’s risk rating increases from one verification event to the next, then there will be no reduction of the total buffer reserves. If the project’s risk rating decreases from one verification event to the next, then the 15% reduction would apply to the new buffer values.

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 has not increased. This would mean that now 25.5% of total carbon credits generated by the project 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.

---

12 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.

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 B summarizes the financial implications for projects subject to VCS buffer witholding 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 RED projects will only forgo 3% to 15% of their total discounted carbon revenues starting with 20% - 30% buffers.

D. 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 net project emissions exceed baseline emissions, or net project emissions removals (from sequestration) are greater 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 VCS pooled buffer account. The minimum buffer values fro 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 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 portfolio buffer account to which the project belongs 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 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 will always be greater than the total number of VCUs issued.

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 after the project ends.

3. Guidance Regarding Approval of New Methodologies

When assessing new AFOLU methodologies, VCS verifiers must use the guidance provided in this document to determine whether the proposed methodology is acceptable and should be approved under the VCS.

The following section provides methodological guidance relevant to all AFOLU projects and is to be used in conjunction with guidance, found later in the document, specific to each of the four project categories. This guidance is not intended to take the place of the actual detailed methodology that projects must use.

A. Determining project boundaries

The project boundary is defined by:

- The geographic boundary within which the project will be implemented;
- The types of greenhouse gases (i.e., CO_2, N_2O, CH_4) and sources and sinks the project will affect; and
- The carbon pools the project will consider.

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. In general, the project boundary encompasses the area under control of the project participants as they are defined in the project design document (PDD). 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 (paper format and/or digital format, if available); geographic coordinates (preferably obtained from a GPS); total land area; and details of ownership.

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—significant sources are those that account for more than 5% of the total CO_2-eq generated by the project. For example, projects targeting soil carbon stock increases must also account for concomitant increases in emissions sources of N_2O and CH_4 if they exceed 5% of the total CO_2-eq benefits[13].

Carbon pools: VCS projects should consider the same pools covered under the IPCC guidelines (i.e., 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 guidance for greenhouse gas inventories[14] 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[15].

B. Establishing a project baseline

AFOLU projects are subject to the same baseline rules as defined by the VCS, applicable to all project types.

C. Proving additionality

AFOLU projects are subject to the same additionality rules and tests as defined by the VCS, applicable to all project types.

---

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

14 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.

15 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

D. Assessing and managing leakage

Many GHG mitigation activities (whether energy, industrial process or AFOLU based) have the potential to cause leakage (i.e., offsite impacts leading to increased 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.

When calculating the number of carbon credits that should be issued to a given project, it is important that VCS verifiers subtract out leakage after accounting for non-permanence risk and other non-CO_2 GHGs (which are not subject to non-permanence risk). 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 within the project boundary, but having different impacts in terms of project GHG emissions and leakage. The number of credits to be retained in the 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 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[16]:				
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

16 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 t CO_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).

E. Estimating and monitoring net project greenhouse gas benefits

Estimating net emissions reductions and GHG removals. Approved VCS AFOLU methodologies will provide guidance for estimating net GHG benefits from project activities against the baseline scenario. 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.[17]

Monitoring net emissions reductions and GHG removals. To be eligible under the VCS, AFOLU projects must have robust and credible monitoring protocols as defined in the approved methodologies.

F. Crediting period

The VCS crediting period for AFOLU projects should be the same as the life of the project, with a minimum of 20 years and a maximum of 100 years. The life of the project is defined as the timeframe over which the project will operate. The project must have a robust operating plan covering this period.

AFOLU projects must have a project length of at least 20 years to be eligible for VCS crediting. Shorter-term projects are not eligible since they carry too high a non-permanence risk to be accommodated under the VCS buffer approach. However, ALM projects focusing on emission reductions of N_2O and/or CH_4 can have shorter project periods, since permanence is not an issue.

AFOLU projects are subject to longer crediting periods than other non-AFOLU projects under the VCS. This is necessary because it can take far longer for many forestry projects, compared to energy and industrial projects, to accumulate a significant portion of the total carbon benefits that the project will generate over its lifetime. Similarly, the accrual of soil carbon in ALM projects typically occurs over a period of several decades, and in fact short-term projects can result in net soil carbon loss.

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

Afforestation, Reforestation and Revegetation (ARR)

1. Eligible Activities

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.

Due to differences in the respective risk profiles of agriculture and forestry, revegetation practices involving woody vegetation (e.g., orchards, agroforestry) should be considered under Agricultural Land Management (ALM) guidelines if the main commodities produced are agricultural in nature (e.g., fruit, animal fodder). Similarly, 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 the: 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.

The VCS does not wish to provide potential perverse incentives for the clearing of forested or other ecologically valuable lands in order to generate carbon credits through tree planting. Therefore, in order to be eligible for crediting under the VCS, ARR project proponents must demonstrate that the project area was not deforested specifically to create VCUs. Specifically, for ARR projects, the project proponent must provide proof to the verifier that the land had been cleared and used for a land-use common in the region, with clearance taking place at least ten years prior to the proposed VCS project start. The burden of proof rests with the project proponent.

Note on timing of VCS verifications for ARR projects: The timing of verifications should be chosen such that a systematic coincidence of verification and peaks in carbon stocks is avoided. For example, verifications should not systematically occur just before timber harvesting activities are scheduled, which would give an unrealistically positive picture of the average carbon benefits associated with the project.

2. Non-Permanence Risk Analysis and Buffer Table

A. Non-permanence risk analysis

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 only to 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.

Verifiers should assign one of four qualitative classes of risk (e.g., low, medium, high, unacceptably high/fail) to each of the risk categories listed in the following table. The interaction between rotation period and the level of a project's commitment to replanting across two or more rotation periods has been captured in the table below as a single project characteristic "commitment period".

- Projects with rotation periods of less than 25 years and no commitment to replant after the first harvest are characterized as having a short-term commitment period.
- Projects with rotation periods of less than 25 years, but with a commitment to replant are characterized as having a medium-term commitment period.
- Projects with rotation periods of more than 25 years, but no commitment to replant are also characterized as having a medium-term commitment period.
- Projects with rotation periods of more than 25 years and a commitment to replant, and those with primarily a forest restoration and habitat emphasis, are characterized as having a long-term commitment period.

Guidance on risk factors and risk ratings for ARR projects

Risk factor	Risk Rating
Project longevity/Commitment Period	
Long-term commitment with harvesting	Medium
Medium-term commitment with harvesting	High
Short-term commitment with harvesting	Fail
Long-term commitment (i.e., many decades or unlimited) with no harvesting	Low
Long-term commitment with no harvesting in politically unstable countries	Medium
Medium-term commitment (i.e., a few decades) with no harvesting	High
Short-term commitment with no harvesting	Fail
Ownership type	
Established NGO or conservation agency; owner-operated private land	Low
Rented or tenant-operated land	Medium
Uncertain tenure but with established user rights	High
Uncertain land tenure and no established user rights	Fail
Technical capability	
Proven technologies and ready access to relevant expertise	Low
Technologies proven to be effective in other regions under similar soil and climate conditions, but lacking local experimental results and having limited access to relevant expertise	Medium
Financial capacity	
Demonstrable backing from established financial institutions, NGOs and governments	Low
No external financing	Medium
Management capacity	
Substantial previous project experience (≥ 5 projects) with on-site management team	Low
Limited project experience (<5 projects) with on-site management team	Medium
Limited project experience (<5 projects) without on-site management team	High
Future income	
Appropriate management plan and financial analysis include future income to finance future management activities (e.g. carbon finance to be used for project management, tending operations, etc.)	Low
Future costs and income not considered	High
Future/current opportunity costs	
Alternative land uses are unlikely to occur in the future	Low
Project is competing with other land uses that are likely to become more attractive in the future	High
Endorsement of project or land-use activity by local or national political establishment	
Endorsement given and not likely to change in the future	Low
Endorsement given but may be subject to change in the future	Medium
No endorsement given	High

When determining the appropriate overall risk level of a project based on the specific risk factors listed above and in the general guidance section, assessors (whether the project proponent or verifier) may choose to use the "risk likelihood x significance" risk assessment methodology outlined in Appendix A if they find it helpful. This approach provides assessors with a consistent 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".

B. Buffer table

The buffer table provides the default buffer percentages for ARR projects associated with low, medium and high non-permanence risk classes.

Risk Class	Buffer Range
High	40-60%
Medium	20-40%
Low	5-20%

3. Methodological Guidance

This section includes general methodological principles for ARR projects and refers to existing tools and guidelines. The requirements for ARR projects are in principle similar to those for A/R CDM project activities.

A. Determining project boundaries

Carbon pools included. Eligible carbon pools comprise: aboveground biomass, belowground biomass, dead wood, litter, soil organic carbon, and wood products. Pools can be omitted if their exclusion leads to conservative estimates of carbon credits[18]. The following table provides guidance as to which pools must be included in the monitoring plan for the baseline and project (Y), which pools are to be included if their reduction due to the project is significant (S), and which pools are strictly optional although their carbon stock increases as a result of the project (O).

ARR Carbon Pools						
Living Biomass			Dead Organic Matter		Soil	Wood products
Aboveground woody	Aboveground non-woody	Below-ground	Litter	Dead wood		
Y	O/S	Y	O/S	O/S	O/S	O

B. Establishing a project baseline

General guidance concerning the determination of baselines, applicable to all project types, is detailed in the VCS.
In addition, for ARR projects the (ex-ante) determination and quantification of the baseline scenario must follow either established IPCC guidance on the topic or approved A/R CDM methodologies. In the case of emissions by sources occurring under the baseline scenario, these emissions can be estimated by referring to the respective guidance in the IPCC approved A/R CDM methodologies, taking into account their applicability conditions.

C. Proving additionality (see overview general AFOLU section)

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

D. Assessing and managing leakage

In the context of ARR projects, leakage is defined as any increase in greenhouse gas emissions that occurs outside of a project's boundary, but is measurable and attributable to its activities. Such 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 simply displaced land-clearing activities to a new area, 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. 3.2.8 for fuelwood gathering as outlined in IPCC GPG 2003: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm).
- The determination and quantification of off-site GHG impacts must follow the relevant IPCC guidance and/or use approved A/R CDM methodologies applicable under the given conditions of a project. Verifiers and project proponents can test the significance of off-site climate impacts using the tool designed for this purpose in the A/R CDM methodologies[19]. Insignificant off-site climate impacts can be excluded.

E. Estimating and monitoring net project greenhouse gas benefits

Estimating net emissions reductions and GHG removals. 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[20]; direct emissions from the use of synthetic fertilizers[21]; 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 amount of carbon credits to be assigned to the project will be determined by the long-term average of the carbon stored in the selected carbon pools, adjusted for buffer withholdings, project emissions of 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:

19 http://cdm.unfccc.int/EB/031/eb31_repan16.pdf
20 For their quantification, see, e.g., http://cdm.unfccc.int/EB/033/eb33_repan14.pdf
21 For their quantification, see, e.g., http://cdm.unfccc.int/EB/033/eb33_repan16.pdf

- Litter – see IPCC 2006 GL for AFOLU
- 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) They may work with 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) They may develop their own methodology, in which case they must: justify the list of emissions sources to be considered and tested; justify the exclusion of other emission sources; and prove that it has assessed and managed all significant[22] sources of leakage.

Monitoring net emissions reductions and GHG removals. 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.

F. Crediting period (see general AFOLU section)

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

Agricultural Land Management (ALM)

1. Eligible Activities

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) 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[23]. Projects developed for agricultural biofuel production as a way to generate VCUs as fossil-fuel offsets are NOT included in the AFOLU section of the VCS guidance and are thus not addressed here.

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.[24]

- 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 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

23 Revegetation practices involving woody vegetation (e.g. orchards, agroforestry) will be considered under ALM guidelines if the main commodities produced are agricultural in nature (e.g., fruit, animal fodder). If revegetation activities mainly target woody biomass production, however, they should be treated as ARR activities, and refer to the guidance provided in that section of this document.

24 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 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.
- Conversion of drained, farmed organic (e.g., peat) soils[25] 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.
- The cessation or reduction in N fertilizer from cropland conversion to grassland set-aside should not be considered an eligible practice for reducing N_2O emission because there is a high risk of leakage (e.g., the N fertilizer is simply displaced to cropland production elsewhere).

2. Non-Permanence Risk Analysis and Buffer Table

A. Non-permanence risk analysis

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 following table 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.

Guidance on risk factors and risk ratings for ALM projects

Risk factor	Improved cropland management	Improved grassland management	Cropland & grassland conversions
Ownership type			
Established NGO or conservation agency; owner operated private land	Low	Low	Low
Rented or tenant-operated land	Medium	Medium	Medium
Uncertain land tenure	High	High	High
Unproven Technologies and practices			

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

Use of proven practices verified for local conditions	Low	Low	Low
Use of proven technology shown to be effective elsewhere, but not verified locally	Medium	Medium	Medium
Use of technologies with minimal previous application in prevalent environment	High	High	High
Use of technologies without any scientific basis for an underlying mechanism of C storage or greenhouse gas mitigation	Unacceptable	Unacceptable	Unacceptable
Change in net financial returns from displaced or avoided commodity production, or from increased costs[26]			
< 10% reduction	Low	Low	Low
10-20% reduction	Medium	Medium	Low
> 20% reduction	High	High	Low
Competitive land uses in immediate vicinity (within 100 km radius) [27]			
Negligible net losses of agricultural land (e.g. conversion to settlement/urban, other land uses)	Low	Low	Low
Discernible but limited (1-2%/yr) net loss of agricultural land	Low-Medium	Low-Medium	Low-Medium
Significant (>2%/yr) net loss of agricultural land	Low-High	Low-High	Low-High
Incidence of crop failure from severe drought or insect/diseases			
Infrequent (< 1 in 10 yrs)	Low	Low	Low
Frequent (> 1 in 10 yrs)	Medium	Medium	Low
Project longevity[28]			
Project plan and demonstrated commitment to long-term project maintenance (>40 yr)	Low	Low	Low
Short-term project commitment (20 to 40 years)	Low	Low	High
Minimal duration of commitment (< 20 years)	Unacceptable	Unacceptable	Unacceptable

When determining the appropriate overall risk level of a project based on the specific risk factors listed above and in the general guidance section, assessors (whether the project proponent or verifier) may choose to use the "risk likelihood x significance" risk assessment methodology outlined in Appendix A if they find it helpful. This approach provides assessors with a consistent 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".

26 This risk factor only applies to activities whose financial viability is largely dependent on continued production of agricultural commodities. For example, land restoration activities or conservation set-asides in conjunction with NGOs or governmental entities may not be subject to these financial risks.

27 Relative risk ratings for competitive land uses will depend, in part, on ownership attributes, where commercial agricultural operations are likely to have higher risk in areas with competitive land uses and increasing land values, whereas land conservation activities (e.g. by NGOs, government) may have a low risk in spite of strong competition from other land uses. Other factors, e.g., proximity to urban development and landscape attributes, will also impact this risk factor, such that the risk analysis should consider competitive land uses in the context of project-specific circumstances.

28 Project longevity criteria do not apply to emission reduction activities (e.g., to reduce N_2O and CH_4) as these are not subject to buffer withholding.

B. Buffer table

The buffer table provides the default buffer percentages associated with low, medium and high non-permanence risk classes for different ALM activities. It should be noted that the permanence risk assessment applies only to emission reductions or removals (through sinks) of CO_2. Activities producing emission reductions of N_2O, CH_4, or fossil-derived CO_2 are not subject to the permanence buffer mechanism, since these GHG benefits cannot be reversed.

Risk Class	**Improved cropland management**	**Improved grassland management**	**Cropland & grassland conversions**
High	30-60%	25-50%	25-50%
Medium	15-30%	15-25%	10-25%
Low	10-15%	10-15%	5-10%

3. Methodological Guidance

A. Determining project boundaries

- **Eligible gases.** Reductions in CO_2 (including those from increased C stocks), N_2O and CH_4 are considered eligible for crediting under ALM project activities.

- **Carbon pools included.** 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. The table below provides guidance as to which pools must be included in the monitoring plan for the baseline and project (Y), which pools need not be measured because they are not subject to significant[29] changes under ALM activities or are transient in nature (N), and which pools are optional for measurement, depending on the ALM practices involved (O).

ALM Carbon Pools						
Living Biomass			Dead Organic Matter		Soil	Wood products
Aboveground woody	Aboveground non-woody	Below-ground	Litter	Dead wood		
Y	N	O	N	N	Y	O

B. Establishing a project baseline

General guidance concerning the determination of baselines, applicable to all project types, is detailed in the VCS. In addition, 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.[30] 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.

29 For VCS AFOLU projects, GHG sources that account for more than 5% of the total CO_2eq benefits generated by the project are considered "significant." The following CDM EB tool can be used to test the significance of emissions sources: http://cdm.unfcc.int/EB/031/eb31_repan16.pdf

30 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.

C. Proving additionality (see general AFOLU section)

D. Assessing and managing leakage

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. For VCS AFOLU projects, GHG sources that account for more than 5% of the total CO_2-eq generated by the project are considered "significant." 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[31] as part of the overall project design.

E. Estimating and monitoring net project greenhouse gas benefits

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.

31 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.

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.

Improved Forest Management

1. Eligible Activities

Activities related to improved forest management are those implemented on forests remaining as forests (see IPCC AFOLU 2006 report[32]). Various 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. The following improved forest management practices, in both upland forests and wetland forests (e.g. peat-swamps, mangroves, etc.), 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. However, reduced impact logging could also potentially reduce the flow of timber off the site, thereby causing leakage through the displacement of logging activity to other forest areas. This leakage should be accounted for using the leakage table below.
2. **Conversion of logged forests to protected forests (LtPF)** includes: (1) protecting currently logged or degraded forests from further logging; and, (2) protecting unlogged forests that would be logged in the absence of carbon finance. Eligible areas for these activities include upland forests, lowland forests and wetland forests (e.g. peat-swamp forests, mangroves, etc.). Generally speaking, converting logged forests to protected forests reduces emissions caused by harvesting 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 productive forests (LPtPF)**, or improving the stocking of poorly stocked forests, can also increase 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.

32 http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm

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.

2. Non-Permanence Risk Analysis and Buffer Table

A. Non-permanence risk analysis

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.

Guidance on risk factors and risk ratings for IFM projects

Risk factors	Conventional to Reduced Impact Logging (RIL)	Convert logged to protected forest (LtPF)	Extend rotation age (ERA)	Conversion of low-productive forests to productive forests (LPtPF)
Devastating Fire Potential				
Low to medium fire return interval (> 50 years)	Zero	Low to Medium	Zero to Low	Low
High fire return interval (< 50 years)…				
…with fire prevention measures such as fuel removal, fire breaks, fire towers, fire fighting equipment	Low	Low to Medium	Low to Medium	Low to Medium
…with NO significant fire prevention measures in place	High	High	High	High
High Timber Value				
Highly valuable species on site, with strong likelihood that the timber value increases over time and…				
…there is no forest certification	Zero	Medium	Zero to Low (if extend rotation ≤5 yrs)	Medium
…the project is certified by a recognized forest certification company	Zero	N/A	Zero for any extension period	Low
Illegal Logging Potential				

Presence of illegal logging in area (location and intensity in relation to the project area affects actual risk value)… …with forest guards	Zero with no change in harvest intensity*	Low	Zero	Low
…without forest guards	Medium with change in harvest intensity (potentially more timber to harvest illegally)	High	Low	Medium
Unemployment Potential				
Alternative livelihood opportunities for local workforce to mitigate risk of unemployment: Few	Zero to Low -because expect no change in labor needs	Medium to High	Low (extend rotation ≤5 yr or >5 yr), because expect no change in labor needs	Zero to Low -because expect no change in labor needs
Many	Zero	Low	Zero	Zero

***Harvest intensity of timber extraction (number or m^3 of commercial species) per unit area per year**

The above table 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 presented here are the most significant ones, when using this table to assess the risk of non-permanence, the factor with the highest rank determines the project's overall risk rating and should 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.

When determining the appropriate overall risk level of a project based on the specific risk factors listed above and in the general guidance section, assessors (whether the project proponent or verifier) may choose to use the "risk likelihood x significance" risk assessment methodology outlined in Appendix A if they find it helpful. This approach provides assessors with a consistent 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".

B. Buffer table

The following table provides guidance for verifiers to use when determining what portion of the carbon credits generated by the project should be withheld as a buffer reserve. The table is broken down by risk class and IFM project activity type.

Risk Class	Conventional to RIL	Convert logged to protected forest	Extend rotation age	Conversion of low-productive forests to productive forests
High	40-60%	40-60%	40-60%	40-60%
Medium	15-40%	15-40%	15-40%	15-40%
Low	5-15%	5-15%	5-15%	5-15%

3. Methodological Guidance

A. Determining project boundaries

- **Eligible Gases.** CO_2 is the primary greenhouse gas involved in improved forest management projects. Additionally, extending rotation periods could produce increases in N_2O and CH_4 if biomass left on site after harvesting is piled and burned as a fire preventative measure in wildfire-prone areas. Emissions of N_2O would also need to be addressed if any nitrogen fertilizer was applied during the crediting period
- **Carbon pools included.** 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.[33] The following table provides guidance as to which pools must be included in the monitoring plan for the baseline and project (Y), which pools are likely to be below the **de minimis** limit or even increase slightly and therefore **need not** be measured (N), and which pools are strictly optional (O). Based on this logic, it is conservative to omit (O). For RIL and LtPF, changes in soil C are likely 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).

33 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.unfcc.int/EB/031/eb31_repan16.pdf

The measurement of belowground biomass is optional in all cases because changes in roots carbon stocks can be difficult and complex to account for. 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.

Eligible activities	Carbon Pools						
	Living Biomass			Dead Organic Matter		Soil	Wood products
	Aboveground-trees	Aboveground-non-tree	Below-ground	Litter	Dead wood		
Conventional logging to RIL: a. with no effect on total timber extracted	Y	N	O	N	Y	N/O	N
b. with >25% reduction in timber extracted	Y	N	O	N	Y	N/O	Y
Convert logged to protected forests	Y	N	O	N	Y	N/O	Y
Extend rotation age	Y	N	O	N	O	N	O
Conversion of low productive forests to productive forests	Y	N	O	O	O	N	O

B. Establishing a project baseline

In addition to following the general VCS guidelines for establishing a baseline, project developers 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; AND
- The legal requirements for forest management and land use in the area; AND
- Proof that their environmental practices equal or exceed those commonly considered a minimum standard among similar landowners in the area.

C. Proving additionality (see general AFOLU section)

D. Assessing and managing leakage

Leakage is defined here as carbon losses occurring outside the boundaries of the project (but within the same country) resulting from the reduction in harvests caused by the project. When improved forest management activities result in a reduction of timber production, it is likely that timber production could shift to other areas of the country to make up the reduction.

The table below outlines adjustments that should be made to account for this potential leakage. These credit adjustments should account for actions that occur offsite. 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.

Given that this leakage assessment is meant to provide guidance it may be subject to differing interpretations, which could significantly impact the number of VCUs issued to projects. Therefore, the VCS requires that a second verifier double check the initial IFM leakage assessment. 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 original verifier's risk/buffer analysis of the project, as described in the General AFOLU Guidance section of this document.

Project Action	**Leakage Risk**	**Leakage Credit Adjustment**
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., forest protection/ no logging project, or RIL activity that reduces timber harvest by 25% or more)	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)

E. Estimating and monitoring net project greenhouse gas benefits

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 2003 Good Practice Guidance for LULUCF[34] (see the "forests remaining as forests" section). Project developers must prove to verifiers that they used this IPCC document 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, many of which are tailored more specifically to the eligible activities included in this section.

The verifier needs to determine if the monitoring and estimation methodology for the project uses one of the following methodological frameworks:

- Conversion of selectively logged tropical forest to protected forest (based on the Noel Kempff Climate Action Project - http://www.noelkempff.com/English/Welcome.htm) 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

34 IPCC NGGIP, Good Practice Guidance for Land Use, Land-Use Change and Forestry, edited by: Jim Penman, Michael Gytarsky, Taka Hiraishi, Thelma Krug, Diana Kruger, Riita Pipatti, Leandro Buendia, Kyoko Miwa, Todd Ngara, Kiyoto Tanabe and Fabian Wagner. 2003. **http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm**

- 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 GPG methods in the case where biomass is burned as part of the slash removal after harvesting or nitrogen fertilizer is used. IPCC NGGIP, Good Practice Guidance for LULUCF: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm).

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

F. Crediting period (see general AFOLU section)

Reduced Emissions from Deforestation (RED)

1. Eligible Activities

Activities that reduce the conversion of forestland to cropland, grassland, wetland, peatland, settled areas and/or other land uses are creditable under the VCS according to the guidance provided in this Reduced Emissions from Deforestation (RED) section.

Activities that reduce forest degradation[35] are included within the Improved Forest Management (IFM) VCS project category and so are not discussed under this RED section. Similarly, activities that restore forest cover on deforested land are included within the Afforestation, Reforestation and Revegetation (ARR) section and are not considered here.

A. Avoiding deforestation reduces three main categories of GHG emissions sources:

- Deforestation typically involves converting forestland with high carbon stocks to non-forestland with lower carbon stocks[36]. Avoiding deforestation reduces the rate of carbon stock decrease in forests.
- Deforestation usually involves the use of fire and/or machinery that consumes fossil fuels. Avoiding deforestation reduces the carbon dioxide (CO_2) emissions associated with fossil fuel consumption and/or the non-CO_2 emissions from the burning of biomass (CO_2 emissions from burning of biomass are to be included in the accounting of carbon stock changes).
- Cropland and grassland management often entails the use of nitrogen-rich fertilizers. Additionally, agricultural land management generally involves the use of machines that consume fossil fuels. Similarly, livestock, where present, generate CH_4 and N_2O emissions. Last but not least, the flooding of forested areas may lead to the emission of CH_4. Avoiding deforestation thus has the potential to reduce emissions from all of these sources, depending on the activities being displaced by a project.

B. Eligible activities must satisfy the following conditions:

- If not properly designed and implemented, activities that reduce deforestation are prone to leakage effects since protecting forests in one area may simply shift the threat of deforestation to another area. Therefore, the geographical area subject to potential leakage must be identified ex ante, taking into account: the characteristics of the project; and the drivers and agents of deforestation. All of these things must subsequently be monitored on a regular basis. Depending on the extent of possible leakage, the area subject to leakage monitoring could encompass the entire host-country. If significant leakage that is directly attributable to the project is likely to occur beyond this area (such that it cannot be monitored), the activity is not eligible.

35 Conversion from forest-land to non-forestland can occur in a very short time (deforestation = forest > non-forest) or over several years, as a consequence of a progressive degradation process (deforestation = forest > degraded forest > non-forest). Practices avoiding either of these pathways are considered eligible under the RED category of the VCS.

36 A few exceptions may occur, e.g., conversion of low-biomass natural forest to planted forest or high biomass crops (such as oil palm). Carbon stocks in carbon pools that are likely to increase after deforestation must be measured and accounted for.

- Data on forest cover and status (i.e., primary-intact; primary-logged; secondary, etc.) must be available for at least three points in time (spanning a period of at least five years) prior to the project start date. These data must allow project proponents to: (1) analyse historical changes in land-use and land-cover (LU/LC); and, (2) model expected changes for future periods. The duration of the historic and projection periods should be sufficiently long to ensure that any detected/projected LU/LC change is above the classification error of the LU/LC data analysed.[37]

- An analysis of agents and drivers of deforestation should be presented, as well as a description of the measures that will be implemented to address them.[38] If this analysis shows that significant leakage is directly attributable to project activities but cannot be monitored and measured, the proposed project activity is not eligible for certification under the VCS.

C. Eligible areas should meet the following criteria:

- All areas included within the RED project boundary should have qualified as "forests"[39] since at least 15 years before the project start date. This length of time is necessary since it is very difficult to discriminate through satellite imagery young forests from certain types of crops and accurately delineate the boundary of forestland at the start of the project.[40] Younger forests remaining forests and maturing into older forests would qualify under IFM or ARR, but not under RED.
- Discrete areas of forest should be allocated to one single pre-defined forest class. A forest class may include primary (old-growth) forests that are either intact or logged, secondary forests, planted forests, agro-forestry and silvo-pastoral systems meeting the definition of "forest". Each forest class must be described unambiguously so that a given area can never be classified into more than one class.[41]
- Areas included in the boundary of a RED project should not include areas that would be eligible for ALM, ARR or IFM activities or that have been registered under another carbon project registries (both voluntary and compliance-oriented).

---

37 Any map of land-use and land-cover (LU/LC) change produced by analysis of remotely sensed data is subject to pre-processing, classification and post-classification errors. The total error of such maps should be smaller than the level of LU/LC change detected. Where annual LU/LC changes are small or distributed across several small patches of land, longer historical and projection periods should be chosen. This is because the larger the historic and projection periods, the more land area will be subject to LU/LC change and the more likely it becomes that LU/LC changes will be detected or projected accurately.

38 Where agricultural expansion is the driver of deforestation, the project could address this by, for example, designing project activities that help farmers increase their crop yields in a sustainable way (with intensification, new production practices, under-story farming, etc.). And, in cases where timber or fuel wood demand is causing deforestation, the project could incorporate a fast-growing plantation component. 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, natural medicines, etc.). Holistic projects taking an integrated approach to satisfying local resource and livelihood needs not only deliver multiple social and environmental benefits but are also more likely to generate robust and resilient carbon benefits.

39 A "forest" is defined according to minimum thresholds of vegetation indicators used for defining forests (area, tree crown cover, height and, optionally, minimum width) by the host country (e.g., for CDM purposes).

40 The second technical challenge associated with including young forests in the eligible area of a RED project, is that then the carbon stocks in the Soil Organic Carbon (SOC) pool should be measured. This is because reforestation in grazing land can cause a loss of carbon in the soil. That loss of carbon stocks in the SOC pool stabilizes after a few decades, so by only including older reforestation in RED projects it is unlikely that the project scenario will cause more carbon stock losses in the SOC carbon pool than the baseline, meaning that this pool can conservatively be excluded.

41 This is important because each class represents a carbon density class and specific profile of GHG emissions, depending on the land use and management in that class.

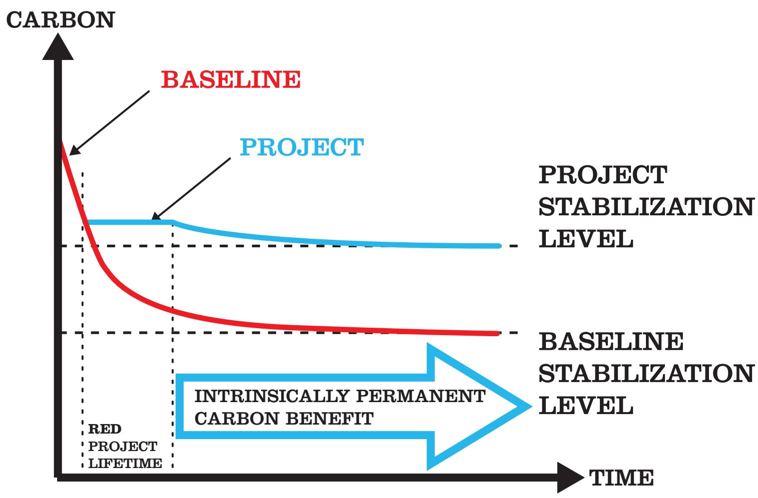
2. Non-Permanence Risk Analysis and Buffer Tables

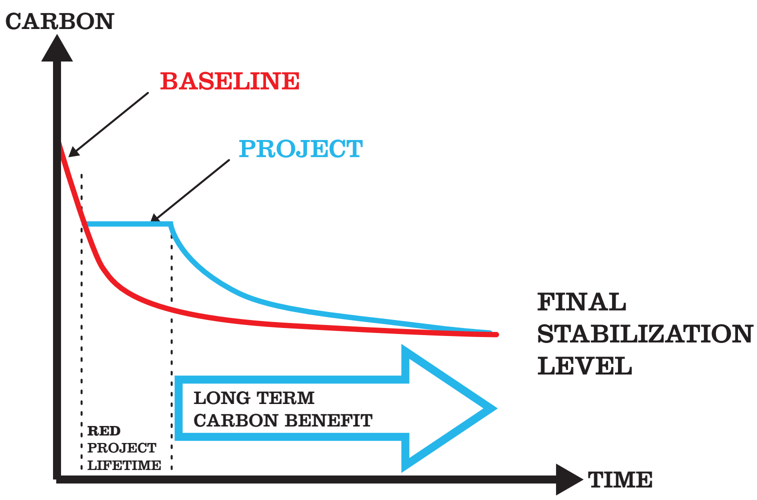
A. Non-permanence risk analysis

Forests do not store carbon forever; natural or anthropogenic disturbances, such as fire, pests or land-use change decisions can result in GHG emissions from forests that were once protected.

In the worst-case scenario RED activities delay deforestation for a finite period of time. That said, any delay in emissions has a long-term effect on atmospheric carbon that, in most circumstances, will be intrinsically permanent (see figure la, below). A loss of benefit for the mitigation of climate change would only occur where the final stabilization level of the forest under the project case is similar to that under the baseline. This would only occur in circumstances where deforestation rates after forest protection were higher than they were under the baseline scenario (see figure 1b). This is unlikely because RED project activities, to be successful, have to address the drivers of deforestation and provide sustainable livelihood alternatives to the deforestation agents. After a minimum period of at least 20 years (the minimum project duration), a successful RED project should have induced structural changes that make a return of pre-project levels of deforestation unlikely. These structural changes and related benefits are, in many cases, likely to extend beyond the accounting boundaries of the project, thereby resulting in positive leakage, even though this is not creditable.

Figures 1a & 1b: Long-term effect of RED project activities





To mitigate the risk of non-permanence, the VCS will use a buffer mechanism to secure the long-term carbon benefits of RED project activities (see General Guidance for discussion of this buffer mechanism). Guidance on the principal risk factors and associated risk ratings for RED projects based on individual project characteristics and circumstances is provided below.

Guidance on risk factors and risk ratings for RED projects

Risk factor	Risk rating
Land ownership type	
Private or public forest conservation organization with a credible track record in similar activity / legally protected land with good enforcement	Low
Privately owned land / legally protected land	Low-Medium
Uncertain land tenure / legally unprotected land or protected with weak enforcement	Medium-High
Technical capability of project developer/implementer	
Proven capacity to design and successfully implement strategies (e.g., creating sustainable livelihood alternatives and/or effectively managed protected areas) for ensuring longevity of carbon benefits?	Low
No previous experience in the design and implementation of strategies for ensuring longevity of carbon benefits	Medium-High
Net revenues from the protected forest (including carbon)	
Lower than pre-project / lower than alternative land-uses	High
Similar to pre-project / similar than alternative land-uses	Medium
Higher than pre-project / higher than alternative land-uses	Low
Infrastructure and natural resources	
High likelihood of new road(s)/rails being built near or inside the protected forest	Medium-High
Low likelihood of new road(s)/rails being built near or inside the protected forest	Low
High-value natural resources (oil, minerals, etc.) known to exist in the protected forest	High
High hydroelectric potential within protected forest	Medium-High
Population surrounding the project area	
Decreasing, or increasing but with low population density	Low
Stable and high population density	Medium
Increasing and high population density	High
Net financial returns for deforestation agents	
> 10% compared to pre-project situation	Low
About similar	Medium
< 10% compared to pre-project situation	High
Incidence of crop failure on surrounding lands from severe droughts, flooding and/or pests/diseases	
Infrequent (<1 in 10 years)	Low
Frequent (>1 in 10 years)	Low-High

When determining the appropriate overall risk level of a project based on the specific risk factors listed above and in the general guidance section, assessors (whether the project proponent or verifier) may choose to use the “risk likelihood x significance” risk assessment methodology outlined in Appendix A if they find it helpful. This approach provides assessors with a consistent 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”.

B. Buffer table

The following table provides guidance for verifiers to use when determining the appropriate buffer size for any given RED project based on its risk class. Specifically, the ranges listed indicate the percentage of a project’s carbon credits that should be withheld as a buffer reserve. In particular, project proponents should assess the risk that deforestation rates will increase after the project has ended, since this is the most significant factor for determining the permanence of the carbon benefits generated by the project. The higher the risk of an increase in the deforestation rate above baseline levels, and the shorter the project (expected) lifetime, the higher the buffer should be set.

Risk Class	Buffer Range
High	20-30%
Medium	10-20%
Low	5-10%

3. Methodological guidance

To date, no approved methodology exists for activities that reduce emissions from deforestation under the Kyoto Protocol. Accordingly, based on the guidance provided below, the VCS will accept new methodologies for RED project activities following the approval process described in the General AFOLU Guidance section of this document.

A. Determining project boundaries

- **Eligible gases.** Reductions in CO_2, N_2O and CH_4 are considered eligible for crediting under RED project activity guidelines (see discussion of Eligible Activities for more on this topic).
- **Carbon pools included.** Eligible carbon pools comprise: above-ground biomass, below-ground biomass, dead wood, litter, soil organic carbon, and wood products. Forests existing for at least 15 years prior to project start date will most likely have higher carbon stocks in their carbon pools than land-use systems that were established after deforestation.[42] Consequently, excluding carbon pools will generally give rise to conservative estimates of a project’s net emissions reductions. Above-ground biomass is the primary pool of concern for RED, although carbon stock changes in other carbon pools may also be measured, depending on the magnitude and direction of change. Carbon stocks in the non-tree above-ground biomass carbon pool should be measured when the land-use system implemented after deforestation is likely to have higher carbon stocks than the original forest (e.g., conversion of forest to coffee or cocoa plantations that do not qualify as “forest” according to the definition of forest used in applicable to the project). The table below provides guidance as to which carbon pools must be measured (Y), which pools are not subject to significant changes under RED project activities and thus do not need to be measured (N), and which pools are optional for measurement (O), depending on the expected magnitude and direction of change.

42 One possible exception to this rule derives from the fact that the non-tree component of the living biomass can be higher in certain cropland and grazing land systems (e.g. coffee plantation) than it is in forests.

Baseline Scenarios	Carbon pools						
	Living biomass			Dead Organic Matter		Soil	Wood products
	Above-ground trees	Above-ground non-tree	Below-ground	Litter	Dead wood		
1. Conversion of forest to land use-systems with high non-tree biomass	Y	Y	O	O	O	O	O
2. Conversion of forest to other systems	Y	N	O	O	O	O	O

B. Establishing a project baseline

General guidance concerning the determination of baselines, applicable to all project types, is detailed in the VCS.

In addition, baselines for RED project activities should have two main components: a land-use and land-cover (LU/LC) change component and the associated carbon stock change component. GHG emissions associated with each LU/LC category may also be counted.

For RED project activities it is good practice to develop baselines for three geographical areas: **a Reference Region, a Project Area and a Leakage Belt.**

- The Reference Region is the analytic domain from which information about deforestation agents, drivers and rates is obtained, projected into the future and monitored. The reference region includes the project area and the leakage belt. To produce credible carbon benefits, a project area must demonstrably be under threat of deforestation during the crediting period. Developing spatially explicit baselines is the most appropriate approach for demonstrating that a project location is under threat of deforestation. Such baselines should be developed for a reference region that is larger than the area of the proposed activity and representative of the conditions prevailing in the project area.
- The Project Area is the geographical area delineated by the project's boundaries within the reference region where the project participants will implement activities to reduce deforestation. There must be a demonstrable deforestation threat within the project area over the time period of the expected emission reductions.
- The Leakage Belt is the land surrounding the project area in which leakage is likely to occur. The leakage belt defines the area outside the project's boundary where project activities influence deforestation.

For each of these three areas, the methodology must outline the measurements, calculations and assumptions used to estimate the **level** and **location** of expected deforestation under baseline conditions (without project intervention). The baseline net GHG emissions and removals must be estimated for each year of the proposed crediting period.

Baselines must be adjusted periodically based on observations of land-use and land-cover change in the reference region. In this way, baselines periodically incorporate the effect that changes in national and local policies and circumstances have on the land-use decisions of deforestation agents. Baselines must be reassessed at least every 10 years.

C. Proving additionality (see general AFOLU section)

D. Assessing and managing leakage

Leakage occurs when a RED project activity displaces deforestation agents outside the project area instead of providing them with alternative livelihoods. To avoid the displacement of deforestation outside the project boundary, leakage prevention measures should be designed, implemented and monitored. If such measures include tree planting, agricultural intensification, fertilization, fodder production and/or other measures to stabilize cropland and grazing land areas, then the increase in GHG emissions associated with these activities must be estimated and subtracted from the project's net emissions reductions.

Leakage in RED project activities has three main components:

- Displacement of deforestation agents from the project area to the leakage belt, leading to a possible decrease in carbon stocks and increase in GHG emissions in the leakage belt;
- Increase in GHG emissions due to leakage prevention measures implemented in the leakage belt; and
- Increase in CO_2 emissions due to the increased consumption of fossil fuels for implementing forest protection, monitoring and surveillance tasks within the leakage belt (otherwise, these would be project emissions).

These potential leakage sources should be assessed, minimized, monitored and accounted for when estimating net emission reductions.

E. Estimating and monitoring net project greenhouse gas benefits

Currently, there is no CDM approved methodology for estimating the net emission reductions generated by RED project activities. Guidance for estimating carbon stocks and changes in carbon stocks (including recommendations for: taking emissions of non-CO_2 gases into account, quality assurance, quality control, and uncertainty analysis) is provided in the IPCC 2003 Good Practice Guidance for LULUCF in chapters: 3.3.2; 3.4.2; 3.6.2; 4.2.6; and 4.3. Monitoring and estimation methods should be based on these reports. In the future, however, specific methodologies for RED project activities may become available. Should these methodologies be approved under the UNFCCC or VCS schemes, their use should be preferred.

Typically, monitoring of a RED project activity will involve estimating Land-Use and Land-Cover (LU/LC) changes using remote-sensing technologies and estimating carbon stock changes and changes in GHG emissions in the areas subject to LU/LC change using field sampling techniques. Measurements and estimations should be carried out at predetermined time intervals in the Reference Region, Project Area and Leakage Belt. Increases in biomass over time would be creditable as long as they do not imply a conversion from non-forest to forest, in which case they would fall under the ARR project category.

F. Crediting period

The crediting period for RED project activities can be specified by project developers, with a minimum of 20 years and maximum of 100 years. However, baselines must be reassessed and validated at least every 10 years, and can take place at the same time as the VCS verification.

Appendix A

Likelihood x Significance Methodology for Assessing AFOLU Project Risk

Both quantitative and qualitative risks can be calculated based on a systematic prediction of the likelihood and significance of a given impact (absolute risk). Proper management practices can help to discount the absolute impact of a potential event. Based on this recognition, a good project design can reduce high **absolute** risk into a low **total** risk rating.

This "risk likelihood x significance" approach provides project proponents and verifiers (together referred to as "assessors") with a consistent and holistic framework for assessing both quantitative and qualitative risk in an integrated manner and coming to a single overall risk classification of "low", "medium", "high" or "unacceptably high/fail".

If relevant expertise and sufficient project information exists, project risk ratings can be defined more directly based on the risk guidelines defined in individual AFOLU project category sections. These risk ratings integrate information on the above components of total risk (i.e. likelihood, significance and counter measures). This appendix outlines a project risk evaluation framework that assessors can use in those instances when direct assessment is not feasible/credible. The following approach can be used to supplement a more direct risk assessment.

Tasks for applying likelihood * significance approach:

1. List any potential threats to permanence and classify them as quantitative or qualitative.
2. Assess the likelihood and significance of the impact without management interference (i.e. **absolute** risk). Quantitative risks should be calculated as a percentage of total carbon benefits, while qualitative risks should be assigned a relative rating (0-4).
3. Identify and list strategies employed for risk mitigation and assess the quality of the management system to control implementation of the counter-measures.
4. Calculate project-specific **total** quantitative and qualitative risks
5. Convert the calculated risk into one of the following risk classes: low, medium, high or unacceptably high/fail

If available, steps 2 through 4 above can be replaced by a direct rating of risk according to tables and guidelines provided under each of the AFOLU project category sections.

LIKELIHOOD

If historical data are available, the likelihood is defined as the inverse of the average number of times the event has occurred over a period equivalent to the life span of the project. If the frequency can only be "guestimated", the following guidelines can be used:

Frequency	**Likelihood**
[General rule	1/(frequency of event)]
Less than once during the life of the project	tends to 0.00
Once every 100 years	0.0100
Once every 50 to <100 years (1/75)	0.0133
Once every 20 to <50 years (1/35)	0.0286
Once every 10 to <20 years (1/15)	0.0667
Once every 5 to <10 years (1/7.5)	0.1333
Once every 1 and <5 years (1/3)	0.3333
Once per year	1.0000

Where the frequency of events cannot be predicted based on historical records or probabilities, the following scoring system is used:

Frequency	Likelihood
Zero likelihood of occurring or not applicable	0
An event likely to occur less than once during the project	0.05
An event likely to occur once or twice during the project	0.1
An event likely to occur several times during the project	0.25
An event likely to occur at least once a year	1

SIGNIFICANCE: QUANTITATIVE RISK

The significance of a quantitative risk is determined by the damage that the project would sustain if the event occurred. This is calculated as the quantity of carbon benefits that would be lost (i.e., the reduction in the ability of the project to sequester or store carbon).

The impact is calculated as:
tonnes of carbon lost * likelihood * no. of years that loss continues

For destructive events, the carbon benefits generated by the destroyed part of the project are assumed to be completely lost. In this case, the number of years that loss continues equates to the remaining lifespan of the project:
tonnes of carbon lost * likelihood * life span of the project

SCORING OF RISK MITIGATION STRATEGY

The risk mitigation strategy includes the risk response and the adequacy of the system in which it is implemented. The approach to the assessment is shown in the following tables.

RATING OF RISK MITIGATION

Quality of mitigation efforts	Score
Failure to recognise potential risks and/or absence of countermeasures	0
Countermeasures developed but not implemented	1
Countermeasures implemented but inadequate for the situation	2
Countermeasures implemented and adequate for the situation	3
Countermeasures using best-practices and adapted to the specific risk	4

RATING OF RISK MITIGATION MANAGEMENT SYSTEM

Guidelines	Score
No evidence of systematic structure in identification of risk or in controlling implementation of countermeasures	0
Control activities implemented irregularly but no documentation or corrective actions	1
Controls for most countermeasures in place but poorly documented management system and no internal auditing	2
System for controlling countermeasures is in place and documented. Internal audits performed but no structures for review and feedback.	3
Documented management system in place with risks identified, targets for reducing them set, procedures and assigned responsibility, internal auditing, reviews, training	4

ISO or EMAS registered management system, (ISO 9000, 14001, EMAS) or equivalent	**Score cont.** 4

CALCULATION OF TOTAL RISK

R = L x S x (1 - (C x M)/16)[43]

Where: R = Total risk, L = Likelihood of occurrence, S = Significance of impact, C = Adequacy of countermeasures to avert or minimize risk, M = Adequacy of management system.

Example: A risk factor is highly likely to occur once a year (likelihood 1) and is destructive (with a permanent loss of carbon, e.g. due to fire, without means to replant); L x S = 100%. If, however, the project has measures and good management practices in place to counter this risk, the total risk will be less than 100%.

SIGNIFICANCE: QUALITATIVE RISK

Where the risks relate to the project as a whole and discrete carbon benefits cannot be assigned directly to the buffer, the significance is scored using the following guidelines:

Degree of impact	Score
Negligible impact	0
Damaging (a part of) one year's work programme	1
Damaging several year's work	2
Damage possibly leading to (almost) complete failure	3

The assessor has freedom to deviate from these guidelines if significance cannot be expressed in these terms. Example:

Shortage of labour	1 (low)
Shortage of income	3 (high)
Political instability	2 (medium)

GUIDELINES FOR RISK CLASSIFICATION

QUANTITATIVE RISK

Score (example[44])	Risk Classification
>60%	Fail
40 – 60%	High
25 – 39%	Medium
0 – 24%	Low

QUALITATIVE RISK

Score	Risk Classification
2.8 – 3.0	Fail
2.0 – <2.8	High
1.0 – <2.0	Medium
0 – <1.0	Low

43 The product C x M is divided by 20 because the maximum scores for C and M are 4 and 5 respectively, and their product is 20

44 Ranges specific for project categories provided in respective sections.

Conversion of total quantitative and qualitative risk into high, medium or low risk class

Translating the risk assessment into a general risk class can be based on a combination of quantitative risks (as a total percentage) and qualitative risks (as a set of scores).

1. The sum of the quantitative risks is converted into one of 4 risk classes, see text box above. One can argue that if the percentage exceeds 60, the project cannot be accepted. This is because absolute risk is very high, or counter measures are lacking, or both.
2. All individual qualitative risk calculations are converted into one of four risk classes, see text box above.
3. The highest risk from the quantitative and quantitative assessment determines the buffer applied. For example, if quantitative risk is high and qualitative risk is medium, the project is considered overall high risk. The buffer percentage is obtained from the guidance provided within each project category section of this document. Since this is a range for each risk class, the assessor has freedom to apply a higher or a lower buffer within this range, depending on the circumstances.

Appendix B

Financial Analysis of Buffer Witholding 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 RED 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 RED project case studies
- VCS-verified CO2 emission reduction prices of US$5 per metric ton and annual increases in value of VCS-verified CO2 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 RED 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 RED 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 RED). 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 RED. 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 Witholding

Project Type and Duration		Initial buffer witheld	Total Discounted Carbon Revenues ...with constant C price	...with 5% annual increase in C price	% Reduction in Total Discounted Carbon Revenues ...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 RED 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 x significance' methodology. The calculated risk can then be converted into a risk classification.

Additionality
Refers to the situation where a project results in carbon benefits additional to those that would have taken place in the absence of the carbon project activity.

AFOLU project activities are subject to the same Additionality rules and tests as defined by the VCS.

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 Uses (AFOLU)
The IPCC rubric used for agricultural and land-based activities that have the potential to impact carbon stocks and emissions. This integrates the previously separate Agriculture and Land Use, Land-Use Change and Forestry (LULUCF) project activities.

In the context of the VCS, AFOLU encompasses four eligible project activities: Improved Forest Management (IFM), Agricultural Land Management (ALM), Reducing Emissions from Deforestation (RED) and Afforestation, Reforestation and Revegetation (ARR).

Afforestation, Reforestation and Revegetation (ARR)
Increasing carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and restoring vegetative cover through the planting, sowing or human-assisted natural regeneration of woody vegetation.

ARR is one of the four eligible project activities under the VCS AFOLU certification.

Agricultural Land Management (ALM)
Decreasing GHG emissions (including increasing carbon stocks in soils and biomass) through the following eligible land use and management activities: improved cropland management, improved grassland management, and cropland and grassland land-use conversions.

ALM is one of the four eligible project activities under the VCS AFOLU certification.

Assessors
The collective term for VCS project proponents and verifiers.

Baseline scenario
The scenario that represents the sum of the changes in carbon stocks (and where significant, N_2O and CH_4 emissions) in the carbon pools within the project boundary that would occur in the absence of the project activity. A baseline scenario should cover all carbon pools within a project boundary.

The baseline scenario is set using one of the approved VCS baseline methodologies.

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

Buffer approach
A self-insurance mechanism whereby a credit reserve is maintained in order to replace unforeseen losses in carbon stock.

In the VCS, the size of the buffer is determined by the level of risk inherent in the project activities as determined by the Non-permanence Risk Analysis.

Buffer credits
Refers to the carbon credits held in the buffer. These credits cannot be traded or sold.

Buffer table
A conversion table indicating the proportion of credits that must be placed in the buffer according to the risk classification.

Carbon credits
The net carbon benefits that a project generates after accounting for leakage. The number of VCUs issued to a project is equal to the total carbon credits generated minus the number of credits that must be withheld as a buffer reserve.

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

The Improved Forest Management (IFM) section of the VCS also requires the inclusion of wood products as a carbon pool.

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.

Crediting period
The period of time for which the net GHG removals are verified and certified.

For the VCS, the crediting period is the same as the life of the project.

Cropland
Arable and tillage land, and agro-forestry systems where vegetation falls below the threshold used for the forestland category, consistent with the selection of national definitions.

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 country.

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

Forest
Kyoto Protocol definition: A minimum area of land of 0.05 – 1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10 – 30 per cent with trees with the potential to reach a minimum height of 2 – 5 metres at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high portion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10 – 30 per cent or tree height of 2 – 5 metres are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest.

Fungible
Fully exchangeable or tradable

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.

Greenhouse Gas (GHG)
A greenhouse gas refers to any gaseous compound that absorbs infra-red radiation in the atmosphere and contributes towards the warming of the atmosphere. In AFOLU, the primary GHG considered is CO2, but project activities may also consider CH4 and N2O emissions.

Global Warming Potential (GWP)
Calculated as the ratio of the radiative forcing of one kilogramme greenhouse gas emitted to the atmosphere to that from one kilogramme CO2 over a period of time (e.g., 100 years). CH4 has a GWP of 21 and N20 of 310.

Impact
The calculation of the level of quantitative risk using the 'likelihood x significance' methodology.

The impact is calculated as:
tonnes of carbon lost * likelihood * no. of years that loss continues.

For destructive events where carbon benefits are completely destroyed, the number of years that loss continues equates to the life span of the project: tonnes of carbon lost * likelihood * life span of project.

Improved Forest Management (IFM)
Changing forest management activities to make a long-term reduction in GHG emissions through one of the following eligible activities: conversion from conventional logging to reduced impact logging (RIL), conversion of logged forests to protected forests (LtPF), and extending the rotation age of evenly aged managed forests (ERA).

IFM is one of the four eligible project activities under the VCS AFOLU certification.

Leakage
Net changes of anthropogenic emissions by GHG sources that occur outside the project boundary, but are measurable and attributable to offsite the project activity.

Leakage belt
The land surrounding the project area in which leakage is likely to occur. The leakage belt defines the area outside the project's boundary in which leakage is likely to occur.

The leakage belt is one of the three geographical areas that a baseline scenario needs to be developed for RED project activities.

Likelihood
The inverse of the average number of times an event has occurred over a period equivalent to the lifespan of the project.

Litter
Includes all non-living biomass with a diameter less than a minimum diameter chosen by each country (for example 10 cm), 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.

Methodology
Step-by-step explanations of how emissions reductions or removals are to be estimated following scientific good practice; to be applied conservatively, transparently and thoroughly.

In addition, a monitoring methodology refers to the method used for the collection and archiving of all relevant data. A baseline methodology refers to the method used to establish the baseline scenario.

Net Emissions Reductions
The GHG removals by the project activity minus the baseline scenario and leakage.

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 risk assessment is conducted, and subsequently verified independently by a VCS accredited entity. A risk rating can then be awarded which determines the size of the buffer. The impermanence risk analysis evaluates four types of risk factors: project risk, economic risk, regulatory and social risk, and natural disturbance risk.

Participatory Rural Appraisal (PRA)
Participatory methods that emphasise local knowledge and enable local populations to make their own appraisal, analysis and plans.

Permanence
Relating to the longevity of terrestrial carbon stocks. A unique feature of the carbon stock managed in AFOLU project activities is the potential for reversal of mitigated GHG when exposed to risk factors.

The VCS utilises the risk buffer approach in order to insure against the risk of impermanence.

Project area
The geographical area within the reference region where the project developers implement activities to reduce deforestation. There must be a demonstrable deforestation threat within the project area.

The reference region is one of the three geographical areas that a baseline scenario needs to be developed for RED project activities.

Project boundaries
The spatial or methodological confines of the project activity. Refers to the geographical implementation area, the types of GHG sources and sinks considered, and the carbon pools considered.

Project proponent
The individual or organisation advocating and initiating the development of a particular project activity. This may include the project investor, designer and/or developer.

Project developer
The individual or organisation implementing and managing the project activity.

Reducing Emissions from Deforestation (RED)
The reduction in GHG emissions from the reduced conversion of forestland to cropland, grassland, wetland, peatland and settled areas.

RED is one of the four eligible project activities under the VCS AFOLU certification.

Reference region
The analytic domain from which information about deforestation agents, drivers and rates is obtained. The reference region includes the project area and the leakage belt.

The reference region is one of the three geographical areas for which a baseline scenario needs to be developed for RED project activities.

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.

Kyoto Protocol definition: reforestation activities are limited to reforestation occurring on lands that did not contain forest on 31 December 1989.

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)
A set of four categories representing the level of qualitative or quantitative risk, based on the results of the 'likelihood x significance' methodology to calculate the level of absolute risk.

The classification system is as follows: low, medium, high or unacceptably high/fail.

Risk Factors
Risk assessment criteria that all project activities must be tested against in order to determine the level of risk. Risk factors are composed of a general section and a more specific project category section.

Risk Mitigation Strategy
The approach used to address the risks identified.

In the VCS, the risk mitigation strategy of a project proponent for addressing quantitative risk can be scored according to the adequacy of countermeasures implemented to avert or minimise risk and the adequacy of the management system.

Risk Ratings
Qualitative or quantitative grading for indicating the level of risk in the Impermanence Risk Assessment. The size of the buffer is dependent on the risk rating.

Sequestration
The process of increasing the carbon content of a carbon pool other than the atmosphere. The VCS AFOLU involves the sequestration of CO2 through biological processes.

Significance of GHG Emissions
An indication of the relative importance of a given GHG emission source.

For VCS AFOLU projects, GHG sources that account for more than 5% of the total CO2-eq generated by the project are considered "significant." The following CDM EB tool can be used to test the significance of emissions sources: http://cdm.unfcc.int/EB/031/eb31_repan16.pdf

Significance of Risk
An indication of the damage that the project would sustain if a given risk event occurred.

The significance of a **quantitative** risk is calculated as the quantity of carbon benefits that would be lost. The significance of a **qualitative** risk is calculated according to a scoring system based on the degree of impact.

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.

Tools
Mechanisms utilised under the General Approval Process of the VCS. Tools are either **components of a methodology** (applied as a stand-alone methodological module to perform a specific task) or are **calculation tools** (spreadsheets or software that perform calculation tasks according to an approved methodology).

Total Risk
In the VCS, the term 'total risk' is used to represent the total level of quantitative risk:
$R = L \times S \times (1 - (C \times M)/20)$

Where: R = Total risk, L = Likelihood of occurrence, S = Significance of impact, C = Adequacy of countermeasures to avert or minimise risk, M = Adequacy of management system.

The project is given a risk classification based on the level of total risk.

Verifier
The VCS individual responsible for ensuring that project proponents comply with all VCS guidelines.

Voluntary Carbon Market
Refers to all CO_2-eq commodity transactions that are not required by regulation or for compliance.

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. Can be subdivided into managed and unmanaged according to national definitions. Includes reservoirs as a managed sub-division and natural rivers and lakes as unmanaged sub-divisions.

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.

VCS Acronyms

AFOLU	Agriculture, Forestry and Other Land uses
ALM	Agricultural Land Management
ARR	Afforestation, Reforestation and Revegetation
CCB	Climate, Community and Biodiversity (standards)
CDM	Clean Development Mechanism
EB	Executive Board (of the CDM)
EMAS	Eco-Management and Audit Scheme
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
LtPF	Logged forest to Protected Forest (conversion)
LULUCF	Land Use, Land-Use Change and Forestry
PDD	Project Design Document
PRA	Participatory Rural Appraisal
RED	Reducing Emissions from Deforestation
RIL	Reduced Impact Logging
TARAM	Tool for Afforestation and Reforestation Approved Methodologies
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
VCU	Voluntary Carbon Unit