VCS METHODOLOGY ELEMENT ASSESSMENT REPORT

FIRST ASSESSMENT OF PROPOSED VCS METHODOLOGY ELEMENT "METHODOLOGY FOR AVOIDED MOSAIC DEFORESTATION OF TROPICAL FORESTS"

REPORT NO. 2010-9458

REVISION NO. 02

VCS METHODOLOGY ASSESSMENT REPORT

Date of first issue: December 13th, 2010	Project No.: PRJC-272390-2010-CCS-USA
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Name of Methodology: Methodology for Avoided Mosaic Deforestation of Tropical Forests

Assessment Phases:

☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues

Assessment Status

☐ Corrective Actions Requested
☐ Clarifications Requested
☒ Full Approval by DNV
☐ Rejected

Det Norske Veritas Certification AS (DNV) has performed the first assessment of proposed VCS methodology "Methodology for Avoided Mosaic Deforestation of Tropical Forests" Version 69 (hereafter called "the MED") for Wildlife Works Carbon LLC. The assessment was performed on the basis of VCS criteria for methodology development.

In summary, it is DNV's opinion that the proposed VCS methodology element MED as described in version 69, meets all relevant VCS requirements for VCS methodology elements. In addition, DNV has reviewed and accepted all changes raised by the second assessment performed by Environmental Services Inc. DNV therefore recommends the methodology element for approval.

Report No.:	Date of this revision:	Rev. No.
2010-9458	Dec 27th, 2010	02

Report title:
First Assessment of Proposed VCS Methodology "Methodology for Avoided Mosaic Deforestation of Tropical Forests"

Work carried out by:
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Work verified by:
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Key words:
VCS
Methodology Element
First Assessment

Abbreviations

A/R	Afforestation/Reforestation (under CDM)
AFOLU Guidelines	Agriculture, Forestry and Other Land Uses section of Guidelines for National Greenhouse Gas Inventories 2006
CAR	Corrective action request
CDM	Clean development mechanism
CL	Clarification request
DNV	Det Norske Veritas
EB	Executive Board
GPG LULUCF	Intergovernmental Panel on Climate Change's Good Practice Guidance for Land-Use Land Use Change and Forestry
GWP	Global warming potential
REDD	Reduced Emissions from Deforestation and Degradation
MED	Methodology element documentation
VCS	Voluntary Carbon Standard
VCSA	VCS Association
VCU	Voluntary Carbon Unit
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

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1 ASSESSMENT STATEMENT

Det Norske Veritas Certification AS (DNV) has performed the first assessment of proposed VCS methodology "Methodology for Avoided Mosaic Deforestation of Tropical Forests", version 69 for Wildlife Works Carbon LLC. The assessment was performed on the basis of VCS criteria for methodology development.

The methodology element was prepared based on the requirement of VCS 2007.1 and VCS Program Normative Document: Double Approval Process, January 21, 2010. The methodology element additionally follows the VCS guidelines and tools listed below:

- VCS Guidance for Agriculture, Forestry and Other Land Use Projects (AFOLU), November 18, 2008
- VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination, November 18, 2008
- VCS Tool for AFOLU Methodological Issues, November 18, 2008

The methodology element belongs to the scope of *agriculture, forestry and other land use (AFOLU).*

The desk review was performed using the following artifacts –

- proposed new MED
- other supporting documentation including referenced, published scientific literature, reports and exiting methodologies listed in section 2.1 of this document.

In summary, it is DNV's opinion that the proposed VCS methodology element MED as described in version 69, meets all relevant VCS requirements for VCS methodology elements. In addition, DNV has reviewed and accepted all changes raised by the second assessment performed by Environmental Services Inc., as stated in "Voluntary Carbon Standard New Methodology Element – Second Validation Report" (Draft, 22 December 2010). DNV therefore recommends the methodology element for approval.

2 INTRODUCTION

Wildlife Works Carbon LLC has commissioned Det Norske Veritas Certification AS (DNV) as the first validator to perform an assessment of the methodology element "Methodology for Avoided Mosaic Deforestation of Tropical Forests". This final report summarizes the clarifications and corrective actions identified by the methodology reviewer after the first phase of the assessment of the methodology element documentation (MED) and summarizes the resolution of issues through phase V.

The assessment consisted of the following five phases:

- I a desk review of the new methodology;
- II follow-up interviews; and
- III the resolution of outstanding issues with WWC
- IV issuance of final methodology assessment report
- V If applicable, confirm any changes to the methodology requested by the second validator and issuance of a new version of the final assessment report and opinion

The following sections outline each step in more detail.

2.1 Desk Review of the New Methodology

The following table lists the documentation that was reviewed during the assessment:

/1/ Wildlife Works Carbon, Inc. , Methodology element documentation "Methodology for Avoided Mosaic Deforestation of Tropical Semi-Arid Forests"," version 32

/2/ Wildlife Works Carbon, Inc., Methodology element documentation "Methodology for Avoided Mosaic Deforestation of Tropical Semi-Arid Forests", version 45

/3/ Wildlife Works Carbon, Inc., Methodology element documentation "Methodology for Avoided Mosaic Deforestation of Tropical Forests", version 69

/4/ VCSA, Voluntary Carbon Standard 2007.1.

/5/ VCSA, VCS Program Normative Document: Double Approval Process, v1.0, January 21, 2010

/6/ VCS Guidance for Agriculture, Forestry and Other Land Use Projects (AFOLU), November 18, 2008

/7/ VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination, November 18, 2008

/8/ VCS Tool for AFOLU Methodological Issues, November 18, 2008 with May 21, 2010 Update

/9/ VCS Tool VT0001 Tool for Demonstration & Assessment of Additionality in AFOLU Project Activities

/10/ UNFCCC CDM EB: "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities", version 1 (available at: http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-

02-v1.pdf)
/11/ The UNFCCC "Tool for testing significance of GHG emissions in A/R project activities", Version 1
(available at: http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-04-v1.pdf)
/12/ The UNFCCC tool for the "Calculation of the number of sample plots for measurements within A/R CDM project activities", version 2
(available at: http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v2.pdf)
/13/ WRI/WBCSD, The GHG Protocol Project Accounting.
http://www.ghgprotocol.org/files/ghg_project_protocol.pdf

2.2 Follow-up Interviews

An initial onsite interview was conducted on November 2nd- 4th, 2010 at Wildlife Works Carbon's office in Sausalito, CA and a follow-up discussion with the methodology developer occurred on December 6th, 2010.

The attendees and topics discussed have been listed in the below Table.

Date	Name	Organization	Topic
11.2.2010	Jeremy Freund Kyle Holland Josh Harmsen Ben Caldwell Sam Stevenson Gordon Smith	WWC EcoPartners EcoPartners EcoPartners DNV DNV	1. The methodology element's eligibility criteria; 2. The baseline approach baseline reevaluation and additionality; 3. Project boundary; 4. Emissions, including leakage; 5. Monitoring, data and parameters. 6. Baseline modeling

Date	Name	Organization	Topic
12.6.2010	Kyle Holland Ben Caldwell Sam Stevenson Gordon Smith Steve Ruddell Shawn McMahon	EcoPartners EcoPartners DNV DNV Carbon Verde ESI Inc.	To discuss the "shift" or lag parameter of the cumulative deforestation model in the context of baseline reevaluation.

2.3 Resolution of Outstanding Issues

The objective of this phase of the assessment is to resolve any outstanding issues that need to be clarified prior to DNV's positive conclusion on the methodology element. The assessment findings relate to the methodology element as documented and described in the initial methodology element documentation /1/.

In order to ensure transparency the issues raised and the methodology element developer's response are documented in Appendix A.

Findings established during the assessment can either be seen as a non-fulfillment of VCS criteria or where a risk to the fulfillment of methodology element objectives is identified. Corrective action requests (CAR) are issued, where:

I. mistakes have been made with a direct influence on methodology application;
II. VCS specific requirements have not been met; or
III. there is a risk that the methodology element would not be accepted as a VCS methodology.

A request for clarification (CL) may be used where additional information is needed to fully clarify an issue.

Fig 1 below provides a sample table for presentation of the CARs and CLs and subsequent response from Wildlife Works Carbon, LLC.

CAR 1
Draft Report Corrective Action Requests by Assessment Team *If the conclusions from the draft assessment are either a CAR or a CL, these should be listed in this section.* **Summary of Methodology Element Developer Response** *The responses given by the methodology element developer during the communications with the assessment team should be summarized in this section.*
Assessment Team Conclusion *This section should summarize the assessment team's responses and final conclusions.*

Figure 1 Assessment Table

2.4 Internal Quality Control

This assessment report underwent a technical review before DNV submitted the final assessment report to Wildlife Works Carbon, LLC. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme.

2.5 Assessment Team

The table below lists the details and involvement of the DNV team for the methodology assessment

			Type of involvement				
Role/Qualification	***Last Name***	***First Name***	Desk review	Interviews	Reporting	Technical review	Expert input
Project manager	Stevenson	Sam	√	√	√		
VCS Validator (under training)							
VCS Validator	Smith	Gordon	√	√	√		
Methodology Reviewer							
Sector Expert	Smith	Gordon					√
Technical reviewer	Pinjuv	Guy				√	

3 ASSESSMENT FINDINGS

The methodology assessment findings have been documented as clarification (CL) and corrective actions (CAR). The CARs and CLs raised during the methodology assessment, responses to the CLs and CARs and the basis on which the response was accepted by DNV have been described in detail in Appendix A.

3.1 Eligibility Criteria

The eligibility criteria for the methodology element is clearly defined in the methodology element documentation (MED). The eligibility criteria were defined as below /3/:

1. This methodology was developed for avoiding deforestation and assumes that degradation and deforestation occur as a result of land use conversion to agriculture for the cultivation of non-perennial (annual) crops rather than for commercial timber harvest. This methodology may be used if all the drivers and agents of deforestation are consistent with those described in section 6 of the methodology.

2. Agriculture in the reference and leakage areas is permanent and cultivation activities do not shift.

3. Forest land in the project area has qualified as forest as defined by FAO 2010 or that of the definition of forest set by the residing designated national authority (DNA) for the project country for a minimum of 10 years prior to the project start date.

4. No biomass is harvested for use in long-lived wood products in the project area under the with-project scenario. Therefore, carbon sequestered in long-lived wood products under the project during any monitoring period $[m]$ may be accounted for as zero.

5. If the soil carbon pool is selected and the default mean rate of soil carbon loss is selected, then the project must be located in a tropical or semi-arid tropical region.

6. Foreign agents of deforestation, if any, are unlikely to shift their activities outside the leakage area.

7. The project shall not be mandated by any enforced law, statute, or other regulatory framework.

8. The project area shall not contain organic or peat soils.

9. A reference area can be delineated meeting the requirements described in section 6.3.1 of this methodology including the minimum size requirement.

10. As of the project start date, historic imagery of the reference region exists with sufficient coverage to meet the requirements of section 6.4.2 of this methodology.

11. Project activities are planned or implemented to mitigate deforestation by addressing the agents and drivers of deforestation as described in section 10.1 of this methodology.

12. The project start date, end date and crediting period are defined.

13. The project proponents have access to the leakage area to sample forest degradation (see section 10.3.2 of the methodology).

14. If the lag period for the cumulative leakage model is estimated after the project start date but before the end of the first monitoring period (see section 10.3.3 of the methodology), then activity-shifting leakage has not occurred prior to the estimation of the lag period.

15. Project areas shall not include land designated for legally sanctioned logging activities.

3.2 Baseline Approach

The methodology element's approach to determine the baseline scenario is clearly defined as below:

- The baseline scenario is defined by two models that predict what would have happened in the absence of the project through the use of two models: 1) the cumulative deforestation model 2) the soil carbon loss model.

- The cumulative deforestation model is parameterized by external, quantifiable drivers of deforestation such as population density, length of road in the region or median household

income. The model is constructed using observations from the reference region which is a region that has similar landscape to that of the project area.

- To determine the drivers of deforestation, the methodology outlines how to conduct a participatory rural appraisal if the project developer seeks to identify the agents of deforestation if they are not obvious.

- The reference region is used for building the deforestation model under the baseline scenario. Per the requirements of "VCS Tool for AFOLU Methodological Issues, 1-10" the reference region is defined by the agents and drivers of deforestation in the methodology. The methodology clearly outlines how project developers should delineate the reference region and reference period.

The approach for determining the baseline is appropriate and adequate according to the VCS standard.

3.3 Additionality

The latest version of the VCS "VT0001 Tool for Demonstration & Assessment of Additionality in AFOLU Project Activities", is used in the MED as the tool to determine project additionality. This is deemed by DNV as appropriate and adequate.

3.4 Project Boundary

The project's physical boundary is clearly and properly defined. The carbon pools included in or excluded from the project boundary are shown in Table 1; the justification to include or exclude certain type of carbon pools is justified reasonably. DNV is able to confirm that the project boundary is defined in line with VCS guidance for AFOLU /6/ & AFOLU Methodological Issues, November 18, 2008 with May 21, 2010 /8/.

Table 1: Selected carbon pools

Carbon pools	Selected (Yes or No)
Above-ground large tree biomass	Yes
Above-ground small tree biomass	Yes
Above-ground non-tree woody biomass	Optional
Below-ground large tree biomass	Optional
Below-ground small tree biomass	Optional
Litter	No
Standing dead wood	Optional
Lying dead wood	Optional
Soil	Optional
Long-lived wood products	Yes

The emission sources included in or excluded from the project boundary area is shown in Table 2. The emission sources included in project boundary is in line with VCS Tool for AFOLU Methodological Issues, November 18, 2008 with May 21, 2010 Update /8/.

Table 2: Emissions sources included in the project boundary

Sources	Gas	Included / Excluded	Justification / Explanation of choice
Flux in carbon pools	CO_2	Included	Major pool considered in the project scenario
Burning of biomass	CH_4	Excluded	Conservatively excluded
Burning of biomass	N_2O	Excluded	Conservatively excluded

3.5 Emissions

The approach provided for calculating baseline emissions, project emissions and emission reductions are deemed appropriate by DNV.

3.5.1 Baseline GHG removals

The baseline net GHG removals by sinks is determined as the carbon stock changes in all pools deducting the GHG emission as a result of activities within the project boundary in the baseline. The carbon pools considered in the baseline scenario include above-ground large trees, above-ground small trees, above-ground non-trees, below-ground large trees, below-ground small trees, below-ground non-trees, standing deadwood, lying deadwood, soil, and wood products.

The carbon stock changes are estimated using the cumulative deforestation model which predicts the proportion of deforestation over time and the decay of wood products over time using peer reviewed sources.

The MED provides guidelines to create the necessary parameters for the cumulative deforestation model.

3.5.2 Project GHG removals

The actual net GHG removals by sink is estimated as the difference between carbon stock in project scenario and increase in GHG emissions as a result of project activity and conforms to the VCS standard.

3.5.3 Emission reductions

The emission reductions are as follows (see equation 34 v 69):

$$C^{[m]} = C_{BE}^{[m]} - C_{U}^{[m]} - C_{PE}^{[m]} - C_{LE}^{[m]}$$

where:

[m]	*Monitoring period*
$C_{BE}^{[m]}$	*Avoided baseline emissions*
$C_{U}^{[m]}$	*Confidence deduction*
$C_{PE}^{[m]}$	*Project emissions*
$C_{LE}^{[m]}$	*Emissions from leakage*

The calculation of the emission reduction from reduced emissions from avoided deforestation has been described clearly.

3.6 Leakage

Emissions from non-market leakage are estimated using a cumulative model of combined deforestation and degradation called the leakage model that uses observations from a leakage area during each monitoring period.

The model estimates leakage by taking the difference between the prediction of the leakage model and the results of the samples taken at each monitoring period.

The consideration of leakage in is line with VCS guidance for AFOLU/6/ and Tool for AFOLU Methodological Issues /8/.

3.7 Monitoring

The monitoring of project implementation, sampling design and stratification are used to establish the initial carbon stock within the project area and the carbon stock at each monitoring period. This is in line with the VCS requirements and is accepted by DNV.

Sampling, stratification, and monitoring requirements have been assessed by DNV to be accurate and specific to REDD projects.

3.8 Data and Parameters

Both monitored, non-monitored, and parameters used in emissions calculations are defined in the MED clearly and appropriately to make it possible for the emission reductions to be estimated and verified in the verification periods. The references used in the MED for the various data parameters have been described clearly.

Requirements for data and calculation reviews are clearly defined in the MED; these requirements are deemed proper by DNV for uncertainties related to the emission reductions to be reduced reasonably.

3.9 Adherence to the project-level principles of the VCS Program

The MED was developed in line with the project-level principles of VCS 2007.1 as elaborated above. It is also deemed by DNV that the principles of relevance, completeness, consistency, accuracy, transparency, and conservativeness are properly addressed in the MED.

3.10 Comments by Stakeholders

Wildlife Works Carbon, Inc has submitted the proposed MED "Methodology for Avoided Mosaic Deforestation of Tropical Forests", to VCS for stakeholder consultation. The MED was published on the VCS website for a period of 30 days from November 1st, 20010 – November 30, 2010 for public stakeholder consultation. There were no comments received from stakeholders during the stakeholder consultation period

http://www.v-c-s.org/methodology_amdt.html

APPENDIX A

RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS

CAR 1

Draft Report Corrective Action Requests by Assessment Team

Page 19, section 4, bullet 9, eligibility criteria. Stating that the project will address agents and drivers of deforestation.

The methodology does not provide guidance to project developers or verifiers describing what constitutes addressing agents and drivers of deforestation. Please add guidance.

Summary of Methodology Element Developer Response

The VCS requires REDD projects to include activities that address the drivers and agents of deforestation as part of a leakage mitigation strategy (see guidance for AFOLU projects, page 27). The types of activities used to reduce deforestation and degradation may vary widely based on local socio-economic factors, and are best determined on a project-specific basis. This applicability condition is intended to ensure that projects adhere to this VCS requirement, while not prescribing the specific activities appropriate for any particular project. To clarify this, the applicability condition has been adjusted to reference section 10.1 and examples of project activities that may be used for this purpose are provided in that section. Also see the response to CL2.

Assessment Team Conclusion

CAR 1 Closed.

CAR 2

Draft Report Corrective Action Requests by Assessment Team

Page 29, section 6.3.1, delineating the reference area. The existing language states that the selection of the reference area boundaries “should address” agents and drivers of deforestation.

We believe that you intend that the reference area must be designed to have agents and drivers similar to the project area.

Summary of Methodology Element Developer Response

This sentence has been changed to "The boundaries and size of the reference area must address the following criteria in order to ensure that the agents and drivers of deforestation in the reference area are similar to those of the project area".

Assessment Team Conclusion
CAR 2 Closed.

CAR 3

Draft Report Corrective Action Requests by Assessment Team

Page 33, section 6.4.2, building the cumulative deforestation model.
Please provide guidance stating the required degree of temporal distribution of images through the reference period.

Summary of Methodology Element Developer Response

Additional language and an example have been added to section 6.4.2. The methodology now requires a plot of image acquisition dates to demonstrate stationarity.

Assessment Team Conclusion
CAR 3 Closed.

CAR 4

Draft Report Corrective Action Requests by Assessment Team

Page 47, section 6.6.4, below-ground large tree biomass.
The methodology should include a decomposition function for below-ground biomass of killed large trees.

Summary of Methodology Element Developer Response

The assumption that belowground biomass not removed in the baseline scenario remains in place is conservative, as it overestimates the carbon stocks in the project area under the baseline scenario. Adding a decomposition function to the baseline model would add considerable complexity and would be difficult to accurately parameterize.

Assessment Team Conclusion
Since it is a conservative approach, CAR 4 closed.
We do note that it is asymmetrical between the baseline and project case accounting. The loss of a tree in the project case will count as a larger emission than the loss of that same tree in the baseline scenario.

CAR 5

Draft Report Corrective Action Requests by Assessment Team

Page 54, section 8.1.1, estimating emissions after re-evaluating the buffer.

The project would not draw credits from the buffer pool as a result of a baseline re-evaluation because existing credits are based on the previously verified baseline.

Summary of Methodology Element Developer Response

The methodology no longer specifies that the project will draw credits from the buffer pool in the case of baseline re-evaluation. Instead, after the baseline is refit, the reevaluated baseline model is shifted by a time lag parameter in order to guarantee that the old baseline model and the new baseline model are continuous. Existing credits based on a verified baseline are not affected by baseline re-evaluation. See section 6.7 for details.

Assessment Team Conclusion

CAR 5 closed.

CAR 6

Draft Report Corrective Action Requests by Assessment Team

Page 56, section 10.1, leakage assessment. Uses the baseline reference area to quantify leakage.

It is our understanding that the area used for leakage assessment must be different from the area used to re-evaluate the baseline because the effect of leakage could not be distinguished from a different baseline than originally modeled. We agree that using the original reference area to assess leakage may be reasonable. Please revise the methodology to solve this problem.

Summary of Methodology Element Developer Response

The approach in the leakage section has been substantially altered. Leakage now accounts for both degradation and deforestation and is based on sampling undertaken in a leakage area, which may be completely separate from the reference area. Section 10.2 provides guidelines for delineating the leakage area. Additional guidance for baseline reevaluation has been added to section 6.7, specifying that the mobility of the agents and drivers of deforestation and the degree of leakage identified over previous monitoring periods should be considered when choosing a new reference area for baseline reevaluation and that that new reference area should not include areas subject to leakage.

Assessment Team Conclusion

CAR 6 closed.

CAR 7

Draft Report Corrective Action Requests by Assessment Team

Equation 32, used in section 10.1.3.
It is our understanding that the third term in this equation should not exist because leakage is not applied to future monitoring periods.
Summary of Methodology Element Developer Response

The leakage section has been completely overhauled. The third term in the original leakage equation was intended to prevent accounting for the same deforestation multiple times when comparing observations from a leakage sample to the prediction of a cumulative model. A similar accounting is applied in the overhauled leakage section, but the equations have been clarified and examples have been provided to clearly demonstrate the intended method.

Assessment Team Conclusion
Continued: see CAR 13

CAR 8
Draft Report Corrective Action Requests by Assessment Team

Equation 34, used in section 11.1.
It is our understanding that the equation is in percent, not proportions. If so, the factor 0.15 in the equation should be 15 (but see the next CAR before making this change). Please make the text in 11.1 explicit as to whether each equation is proportion or percent.
Summary of Methodology Element Developer Response

Equations in the methodology have been reworked to consistently use proportions in the range of [0,1], rather than [0,100].

Assessment Team Conclusion
The renumbered equations 32 and 36 address it adequately. CAR 8 closed.

CAR 9
Draft Report Corrective Action Requests by Assessment Team

Equations 34 and 35, used in section 11.1.
It seems to us that both of these equations should use the same format, either proportion or percent. Please respond.
Summary of Methodology Element Developer Response

Equations in the methodology have been reworked to consistently use proportions in the range of [0,1], rather than [0,100].

Assessment Team Conclusion
The renumbered equations 32 and 36 address it adequately. CAR 9 Closed.

CAR 10

Draft Report Corrective Action Requests by Assessment Team

A minimum depth for soil sampling be established and this minimum depth should be no less than the depth to which soil is disturbed during farming.

Summary of Methodology Element Developer Response

The following sentence was added to sections 6.5.3 and 13.9:

"A minimum depth for soil sampling should be established and this minimum depth should be no less than the depth to which soil is disturbed during farming."

Likewise, matching PD Requirements were added:

"The selected minimum depth for soil sampling no less than the depth to which soil is disturbed during farming and a rationale for selecting this depth."

Assessment Team Conclusion
CAR 10 is closed.

CAR 11

Draft Report Corrective Action Requests by Assessment Team

VCS requires assessment of uncertainty of offset amount quantification. Soil carbon is used to generate offsets under this methodology. Thus, uncertainty of soil carbon emission reductions should be included calculation of overall uncertainty of offset quantification.

Summary of Methodology Element Developer Response

Section 6.5.7 Estimating Uncertainty in the Soil Carbon Loss Model has been added to the methodology to estimate the uncertainty in sampled measurements used to estimate the soil carbon loss model.

Section 11.1 was modified to include estimated uncertainty from the soil carbon loss model. Equation [37] now reflects a weighted average of variances where the weight for uncertainty in the soil carbon loss model is proportional to the total carbon stocks in soil in the project area.

Assessment Team Conclusion
CAR 11 is closed.

CAR 12

Draft Report Corrective Action Requests by Assessment Team

Section 10 (third paragraph) states that the leakage factor is fractional and thus the leakage area does not have to be the same size as the project area. This statement appears to depend on the assumption that project area and the area accessed by drivers of deforestation/degradation are the same size (the area where leakage is measured does not have to be the entire area that is accessed by drivers of deforestation/degradation that might be displaced by the project). It seems that one would have to estimate the size of the area that might be accessed by displaced agents, and normalize the leakage rate by the relative sizes of the project area and area that displaced agents might access.

Summary of Methodology Element Developer Response

Language in section 10.4 has been added to clarify this issue:

"The quantity of degradation and deforestation that may shift outside the project area cannot exceed what would have occurred in the project area, which is a reasonable assumption for the accounting of emissions from leakage. However, the size of the leakage area may exceed the size of the project area as defined in section 10.2. Therefore, equation [34] normalizes the estimated proportion of degradation and deforestation observed in the leakage area such that this proportion is comparable to that that would have occurred in the project area."

A normalization component was added to equation [35] used to estimate the leakage factor:

$$p_{LE}^{[m]} = \frac{a_{LE}}{p_{forest} a_{project}} \times$$

where p_{forest} is the proportion of the project area that is forested, $a_{project}$ is the size of the project area and a_{LE} is the size of the leakage area. This new equation adjusts the old leakage factor proportionally by the ratio of the leakage area (where activity could be shifted to) to forested project area (where activity could be shifted from). For example if leakage in the leakage area was estimated to be 10% based on observed leakage compared to predicted leakage by the leakage model, the size of the leakage area was 300 ha and the size of the project area was 100 ha, then the scaled leakage factor becomes 30%. This adjusted leakage factor is larger than the observed portion of leakage in the leakage area because the leakage area is larger than the project area.

Assessment Team Conclusion
CAR 12 closed.

CAR 13

Draft Report Corrective Action Requests by Assessment Team

The leakage method currently states that leakage does not have to be measured until the end of the first monitoring period. It seems that, especially for subsistence activities, leakage could occur very quickly, and the first monitoring period could be 5 years long. Thus, it appears that leakage could occur well before the end of the first monitoring period. It seems to us that, as a part of the measurement of the lag term in the leakage assessment, one must have a measurement of deforestation in the leakage area made at a point in time that is within the time period used to construct the deforestation model.

Summary of Methodology Element Developer Response

Additional language was added to section 10.3.1:

"If the lag period is estimated at a point in time after the project start date, then the assumption that leakage has not occurred up to this point in time must be confirmed as specified in section 10.3.3."
Additional language was added to section 10.3.3:

"If the lag period for the cumulative leakage model is estimated after the project start date but before the end of the first monitoring period, then each datum used to estimate the lag period must be a factor less than or equal to 0.8 to confirm that leakage has not occurred in the leakage area after the project start date. As defined, the leakage area is entirely forested at the project start date and therefore a factor greater than 0.8 indicates that leakage has probably occurred."

Additional PD Requirement was added:

"A table of plot data showing the observed factors."

An applicability condition was added to section 4:

"If the lag period for the cumulative leakage model is estimated after the project start date but before the end of the first monitoring period (see section 10.3.3), then activity-shifting leakage has not occurred prior to the estimation of the lag period."

Assessment Team Conclusion
CAR 13 closed.

CAR 14

Draft Report Corrective Action Requests by Assessment Team

Section 13.9 addresses carbon in soil. The section uses Equation 61 to calculate the bulk density of soil, used to scale from the carbon content of soil to mass of carbon in soil per unit area. The equation has a factor to adjust for rocks present in the soil and gives the actual density of volumes of soil between rocks. While it is appropriate to use the actual density of soil for many agricultural analyses, we are calculating change in carbon stock. Using the rock adjustment factor in equation 61 and then scaling up to the per hectare basis using equation 62 scales up the carbon as if the entire volume sampled is fine soil, with no rocks. If you have evidence that rocks change carbon stock at the same rate as soil changes carbon stock when switched from forest to agricultural use, then these two equations give the correct results. However, if rocks do not change carbon content significantly, then the given equations overstate the change in carbon stock by the proportion of soil that is rock. For example, if 20% of the soil volume is rock, and one expands the 80% of the sampled volume that is fine soil to 100% of the sampled volume, then the change in soil carbon stock is overstated by 25%. When calculating change in carbon stock per hectare, equation 61 should not have a volume adjustment factor to remove volume occupied by rocks. If you wish to be very precise, in the definition of parameter p, you can state that the density p is mass of fine soil within each unit of volume of soil sampled, rather than calling p the soil bulk density.

Summary of Methodology Element Developer Response

The carbon content of soil is typically estimated based on the fine earth(<2mm) portion of the soil. Rock fragments are generally not included in laboratory estimates of soil carbon content, so applying a bulk density estimate factor that includes rock fragments would likely result in an overestimation of carbon stocks . We do not expect that carbon content in rock fragments will change as a result of project activities. However, when soil carbon stocks are scaled across space, the proportion of soil occupied by rocks must be considered. To correct and clarify these procedures, we have made the following changes:

We have clarified that the soil density used refers to only the density of fine soil. This is calculated using the following revised equation:

$$\rho_{soil,j,k} = \frac{m_{soil,j,k} - m_{rf,j,k}}{v_{soil,j,k} - v_{rf,j,k}}$$

Procedures for estimating each of these parameters have been added to the variable log. Further, an adjustment for the proportion of soil volume occupied by rock fragments has been added to the equation used to estimate the carbon stock per unit area as follows:

$$y_{j,k} = \frac{44}{12} \times 10 \times cf_{soil,j,k} \times \rho_{soil,j,k} \times d_{j,k} \times \left(1 - \frac{v_{rf,j,k}}{v_{soil,j,k}}\right)$$

These procedures parallel those described in the IPCC Good Practice Guidance for Land Use, Land Use Change, and Forestry section 4.3.3.5.4 and equation 4.3.3.

Assessment Team Conclusion
CAR 14 closed.

CAR 15

Draft Report Corrective Action Requests by Assessment Team

Equation 62 scales the soil carbon data up to an area basis. Elsewhere the units of area are hectares. In equation 62 the units of variable y appear to be megagrams per square meter. Given that you will eventually scale up to hectares, either equation 62 should include a conversion factor scaling from square meters to hectares, or the calculations described in section 13.9 should explicitly state that y is in Mg/m^2 and include a step scaling to hectares.

Summary of Methodology Element Developer Response

A unit correction factor has been added to the equation for estimating soil carbon per unit area (formerly equation 62)The equation is now:

$$y_{j,k} = \frac{44}{12} \times 10 \times cf_{soil,j,k} \times \rho_{soil,j,k} \times d_{j,k} \times \left(1 - \frac{v_{rf,j,k}}{v_{soil,j,k}}\right)$$

The conversion factor 10 represents a conversion from kg to tones and from m^{-2} to ha^{-1}.

Assessment Team Conclusion
CAR 15 closed.

CAR 16

Draft Report Corrective Action Requests by Assessment Team

The methodology assumes that belowground biomass of large trees is emitted by the end of the first monitoring period in which the area is classified as deforested. Given that degradation is likely to occur prior to deforestation, and decomposition rates in the tropics are rapid, we believe that this simplifying assumption does not significantly overstate baseline emissions. Using this method, emissions from belowground biomass of large trees should be that amount of belowground biomass that is not removed for other uses (for the area deforested during the period in question). Thus, it appears that the factor "p sub BLGT" in equation 25 should be "1 - p sub BLGT".

Summary of Methodology Element Developer Response

No change – the methodology assumes that a portion of below-ground biomass of large trees is emitted by the end of the monitoring period in which the area is predicted as deforested. This portion is "p_BLGT" and "1 – p_BGLT" conversely means the portion which is not emitted. We assume this portion of below-ground large tree biomass never decomposes.

Assessment Team Conclusion
CAR 16 closed.

CAR 17

Draft Report Corrective Action Requests by Assessment Team

Section 9, addressing project emissions, correctly notes that net emissions from fires within the project area will be reflected in the difference between carbon stocks measured before and after the fire(s). Given that this is the case, why are Section 9.1 and equation 32 in the methodology? If equation 32 should be in the methodology, why does it have an adjustment factor for the water content of burned wood? If the biomass of trees is calculated using the methodology, biomass amounts are dry weights. If the mass of burned material is from field weights of materials, please justify the use of proportion 15% water in wood. This factor seems low for green wood and other factors from the literature might be more appropriate.

Summary of Methodology Element Developer Response
The intent of this section is that the mass of burned materials will be calculated using field (i.e. green) weights of wood from project monitoring. We agree that the use of 15% moisture content for green wood was an oversight – the USFS report we now cite found that most values for tropical hardwoods are between 50 -100% moisture content, or 33%-50% water by weight. We have adjusted equation 32 (now equation 31) accordingly, using 33% as the most conservative percentage for considering project emissions.

Assessment Team Conclusion
The methodology developer states that wording of section 9.1 will be clarified to state that the section refers to burning that is a project activity, not burning that is not a project activity. With this clarification, the CAR 17 will be closed.

Round 2: Summary of Methodology Element Developer Response

Section 9.1 now reads:
"Emissions from the burning of woody biomass as a result of project activities in the project area should be recorded as the weight (in tonnes) of woody biomass consumed

during each burning event."

Round 2: Conclusion of Assessment Team

CAR 17 closed.

CAR 18

Draft Report Corrective Action Requests by Assessment Team

A more desirable way to maintain continuity of the baseline function if, upon re-evaluation of the baseline, the baseline drops below an deforestation proportion for which credits have been issued under a prior baseline, to not issue any further credits until the new baseline passes the deforestation proportion for which credits have been issued.

Summary of Methodology Element Developer Response

The methodology is revised. Language is added to Section 6.7 stating "If the new cumulative deforestation model is below the old model and credits have been issued at a level above that predicted by the new model, then the project proponent may not generate new credits from deforestation until the new model predicts a level greater than or equal to the level used to determine the last issuance of credits from avoided deforestation."

Assessment Team Conclusion

CAR 18 closed.

CAR 19

Draft Report Corrective Action Requests by Assessment Team

There could be a possible issue arising from the methodology counting only loss of forest that was forest at the start of the reference period, and not net loss of forest over the entire reference area and project area.

This may occur if the historic use was shifting cultivation and the project causes people to switch to continuous cultivation of fields, without any change in forest area.

With shifting cultivation clearing could be cancelled by re-growth of forest on fallow/abandoned fields (with carbon stock potentially constant over time), but the baseline methodology shows deforestation with no re-growth. In theory, people could switch from shifting cultivation to permanent cultivation of their fields, stopping new clearing but also stopping re-growth of forest on abandoned/fallow fields. The with-

project case could also have constant carbon stocks, but the WWC methodology would show stopping of deforestation.

We believe it would therefore be conservative to limit the applicability of the methodology to situations where newly cleared fields are cultivated relatively permanently (not shifting cultivation), or if WWC chooses to keep with locations where shifting cultivation occurs, the accounting should include both the loss and gain of the stated project area.

Summary of Methodology Element Developer Response

An applicability condition has been added to the methodology:

Agriculture in the reference and leakage areas is permanent and the cultivation activities do not shift.

Assessment Team Conclusion
CAR 19 closed.

CL 1

Draft Report Clarification Requests by Assessment Team

Page 19, Section 4, bullet 1, eligibility criteria. The methodology is applicable to land use conversion from forest to agriculture.
From our understanding of how WWC is positioning this methodology, we think the second sentence would be clearer if it were to state that the methodology applies to situations where degradation and deforestation occur as a result of conversion to agriculture for the cultivation of non-perennial crops and does not involve commercial harvest of wood products above a de minimus level.

Summary of Methodology Element Developer Response

This sentence now reads "It is assumed that degradation and deforestation occur as a result of land use conversion to agriculture for the cultivation of non-perennial (annual) crops rather than for commercial timber harvest." Methods to account for wood products are provided in this methodology.

Assessment Team Conclusion
CL 1 Closed

CL 2

Draft Report Clarification Requests by Assessment Team

Page 19, section 4, bullet 9, eligibility criteria. Stating that the project will address agents and drivers of deforestation.
The methodology does not provide guidance to project developers or verifiers describing what constitutes addressing agents and drivers of deforestation Guidance would be helpful.
Summary of Methodology Element Developer Response

The following text has been added to section 10.1:
Projects must include activities designed to reduce deforestation that results from at least one of the drivers of deforestation identified in section 6.2. The types of activities most appropriate will vary based on the specific drivers identified, as well as local socio-economic conditions. Examples of these activities may include, but are not limited to:

- Developing economic opportunities for local communities that encourage protection, such as employment as protected-area guards or ecotourism guides
- Developing alternative incomes not derived from forest destruction
- Introducing improved agricultural practices that result in a decreased demand for newly cleared land
- Developing sustainable means of producing fuelwood

Project activities must be monitored in some way to demonstrate their effect on leakage mitigation. Possible monitoring approaches vary by project and may include:

- The number of people that directly benefit from the activity.
- The number of units distributed as a result of an activity (such as number of trees, foodstuffs, vaccines or dollars).
- The time devoted to implementing an activity.

Community surveys about the effectiveness of an activity.

Assessment Team Conclusion

CL 2 Closed.

CL 3

Draft Report Clarification Requests by Assessment Team

Pages 28-30, section 6.3.1, entire section delineating the reference area. Page 29, bullet 1, at bottom of page, gives an example of agents residing in a town stating that

the reference area should be the same distance from the town as the project area.

It is our understanding that WWC intends this methodology to apply to project areas large enough to encompass the entire area that could be accessed by a village for subsistence use. If your reference to agents is referring individuals that clear land for subsistence use, then the reference area must overlap the project area. It is our impression that you do not intend the reference area to overlap the project area. Alternatively, the methodology could specify that the agents in the reference area must be similar to the agents in the project area (though they could not be the same agents). The methodology could require one of these approaches, or allow either approach, as we understand that VCS allows the reference area to overlap the project area. We recognize that having the reference area overlap the project area would create additional difficulties when re-evaluating the baseline.

Summary of Methodology Element Developer Response

The reference area is not intended to overlap the project area. This is now explicitly stated in section 6.3.1. The criteria for demonstrating similarity have been clarified as follows:

1. The reference area and project area must be located with the same proximity to the agents of deforestation (for instance if the agents reside in a town, the project area and reference area must be similar in distance from a town in which agents of deforestation reside. These may be the same agents, or they may be different, but similar agents.

2. Agents of deforestation must have access (legal or otherwise) to both the reference area and project area. The same agents need not have access to both areas, but the agents with access to each area must be similar in regards to the drivers of deforestation identified in section 6.2.2.

In the baseline re-evaluation section (6.7), we have added the following guidance:

When choosing the new reference area, the mobility of the agents and drivers of deforestation and the degree of leakage identified over previous monitoring periods should be considered and any areas subject to leakage should be excluded from the reference area. If leakage has been observed, this may require the exclusion of all or part of the leakage area from the area used to reevaluate the baseline.

Assessment Team Conclusion

CL 3 closed.

CL 4

Draft Report Clarification Requests by Assessment Team

Pages 30-31, section 6.3.2, defining the reference period.

The reference period selection should include an economic element identifying economic factors that also affect land use change during the project period.

Round 1: Summary of Methodology Element Developer Response

Section 6.3.2 has been amended to require consideration of times of significant economic growth and decline in defining the reference period.

Round 1: Assessment Team Conclusion

In section 6.3.2, it is our understanding the reference period should encompass imagery from before and after the events listed in the bullet points in section 6.3.2. If this is the intent, please make this explicit.

Round 2: Summary of Methodology Element Developer Response

Section 6.3.2 now reads:

"The reference period must be established by important historic events as identified by the information obtained from expert knowledge or the participatory rural appraisal and corresponding analysis of agents and drivers of deforestation. These events include the following:

- The arrival time of specific foreign agents of deforestation, if any;
- The times when the drivers of deforestation became apparent, if any; and
- The times of significant economic growth or decline.

Historic imagery of the reference area should be acquired for times before and after these events and this imagery should be used to construct the cumulative deforestation model per section 6.4. If no important events are identified, then the reference period should be established by the times of available historic images of the reference area."

Round 2: Assessment Team Conclusion

CL 4 is closed.

CL 5

Draft Report Clarification Requests by Assessment Team

Page 34, section 6.4.2, building the cumulative deforestation model.

Guidance for the PD states that the imagery must be registered to +/- three pixels. It is our understanding that you intend that the registration must be such that the average root mean-squared error is less than 10%. We are wondering if you are aware of a method for easily calculating RMSE for analog aerial photographs.

Summary of Methodology Element Developer Response

The methodology now reads "All imagery must be spatially registered to the same coordinate system with an accuracy of less than 10% Root Mean-Squared Error (RMSE), on average across all images (Congalton, 1991)." Please see the new reference for the

requested methods.

Assessment Team Conclusion
CL 5 closed.

CL 6
Draft Report Clarification Requests by Assessment Team

Page 34, section 6.4.2, building the cumulative deforestation model.
Please forward the email from VCS stating that VCS intends to use a 95% confidence interval that is +/-15% of the mean.
Summary of Methodology Element Developer Response

The text of the email is below:
Dear Kyle, Todd, Neeta, Rama and Elly,
Our AFOLU steering committee has now signed off on the final guidance regarding model-based methodologies. Please find the guidance below. The updates to the standard, including those on accuracy and confidence intervals will be included in the VCS 2011, which will be out for public comment in mid-August, with final release in January 2011.
Updates to the VCS 2011
As per the requirements set out in VCS 2007.1, conservativeness is an overarching principle for estimating GHG emission reductions and/or removal. In addition, section 6.3 on determining the baseline scenario for VCS methodologies states that he principle of conservativeness as set out in clause 3.7 of ISO 14064-2:2006 shall apply. However, there is a need to provide clarifications on the principle of accuracy, and uncertainty estimation. To clarify this, the following updates are proposed in the VCS 2011 (sections may not correspond):
1) A note will be added to the principles set out in Section 5.1 (of the VCS 2007.1) as follows: "Accuracy should be pursued as far as possible, but the hypothetical nature of baselines, the high cost of monitoring of some types of GHG emissions and removals, and other limitations make accuracy difficult to attain in many cases. In these cases, conservativeness serves as a moderator to accuracy in order to maintain the credibility of project GHG quantification."
2) A note will be added to Section 6.5.2 (of the VCS 2007.1) on quantification of GHG emissions and/or removals related to the methodology, as follows: "The methodology shall clearly state the assumptions, parameters and procedures that have significant uncertainty, and describe how such uncertainty would be addressed. Where applicable, the methodology shall provide a means to estimate a 95% confidence interval, and apply an appropriate confidence deduction if the estimated variance exceeds +/- 15% of the mean. Methods used for estimating uncertainty shall be based on recognized

statistical approaches such as those described in the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories.. Confidence deductions shall be applied using conservative factors such as those specified in the CDM Meth Panel guidance on addressing uncertainty in its Thirty Second Meeting Report, Annex 14."

Recommendations for Assessment of the SALM Methodology

Based on the above, the VCSA recommends that a practice based model, as proposed by the SALM methodology, should be considered as an acceptable approach to monitoring changes in soil carbon. However, the VCSA also recommends the following.

1) The methodology shall have strict requirements to estimate uncertainty in the model, and the model shall be calibrated to the project region using peer reviewed empirical studies from the same agro-ecological zone. Furthermore, the methodology shall apply a discount on the net estimate of emission reductions based on the quantification of uncertainty.

2) Conservative values are to be used for input parameters, and a conservative approach is to be taken to quality assurance procedures for managing data and information to ensure that emission reductions are not over-estimated.

3) The methodology shall provide a pathway for measurement or use of empirical data where practical. The model shall be updated every 5 years based on relevant data such as studies conducted in the region. Such data can be used to refine the model over time and decrease uncertainty.

Thank you for bearing with us in determining the appropriate requirements for such a methodology. We apologize for the delay and look forward to seeing the methodology proceed. Please let me know if you have any further questions.

Best regards,

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Voluntary Carbon Standard Association
Office +1 202 296 2460
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Assessment Team Conclusion

CL 6 closed.

CL 7

Draft Report Clarification Requests by Assessment Team

Section 6.4.

It is our understanding that WWC intends this protocol to apply when using aerial photographs (analog or digital), not just satellite imagery such as LANDSAT. If so, please provide guidance on classifying observations of points on photographs as forest or not forest. Also, please check to see that references to pixels, errors, and registration are applicable.

Summary of Methodology Element Developer Response

The following guidance has been added to section 6.4:
When interpreting a point, use its context to determine the presence of forest. For example, if the point falls onto a pixel and it is unclear whether the pixel is forested, but it is clear that all surrounding pixels are agriculture, its context implies that forest is absent at the point. It is always conservative to interpret forest state as present rather than absent.
References to +/-3 pixel accuracy have been replaced by a requirement for 10% average RMSE across all images, relative to other collocated images or a ground control points. A reference to (Congalton, 1991) has been added to provide methods for assessing registration accuracy.

Assessment Team Conclusion
CL 7 closed.

CL 8

Draft Report Clarification Requests by Assessment Team

Section 6.4.
Please provide an example calculation showing the weighting of observations of forest/not forest. Example weightings given in example tables should be consistent with weighting example.

Summary of Methodology Element Developer Response

A set of example calculations and illustrative figures have been added to section 6.4.1.

Assessment Team Conclusion
CL 8 closed.

CL 9

Draft Report Clarification Requests by Assessment Team

Page 51, section 7, additionality.
Do you intend common practice to be defined in terms of rate of activity (e.g. rate of deforestation) or tons of emission (e,g, tons per hectare of emission from deforestation)? Also, it would be useful to provide guidance telling developers how projects can demonstrate that they are above common practice with respect to addressing agents and drivers of deforestation.

Summary of Methodology Element Developer Response

Defining common practice for activities designed to reduce deforestation is subjective and may vary depending on the location of the project and the type of project activities

implemented. This methodology does not specify the types of activities that will be used to reduce deforestation and degradation, but rather species an accounting method for carbon emissions avoided as a result of those activities. Given this, we believe the guidance provided in section 2.5 of the VCS tool is sufficient, and note that other methodologies have been approved with no additional guidance for assessing additionality beyond that provided in the VCS tool. To clarify the definition of common practice, we have added the following paragraph to section 7:
The common practice test must demonstrate that project activities will address at least one driver of deforestation in such a way that the driver would not have been adequately addressed had the project not been undertaken.

Assessment Team Conclusion
CL 9 closed.

CL 10

Draft Report Clarification Requests by Assessment Team

Equations 43 and 44.
Do these equations properly convert from plot to stratum? The calculation should be summing tons per hectare across plots, and then dividing by the number of plots, and then multiplying by the number of hectares in the stratum to get tons per stratum. Please clarify.

Summary of Methodology Element Developer Response

This was an error in Equation [45] (note that number has changed from previous version). The equation now divides by the number of plots in a stratum to predict total stratum biomass as follows:

$$\sum_{k \in S} \frac{a_k}{n_k} \sum_{j \in \mathcal{P}_k} y_{j,k}$$

Assessment Team Conclusion
CL 10 closed.

CL 11

Draft Report Clarification Requests by Assessment Team

We already discussed having a minimum distribution of imagery across the historical reference period. Would it be appropriate to also specify a minimum number of years of length of the historical reference period?

Summary of Methodology Element Developer Response

Maybe, but it's subjective what this minimum should be as it will vary by project. It makes little sense to specify a minimum 10 years, for example, when most of the deforestation has happened in the last 2 years. Should the minimum be 10 years or 2 years? We think this is a project validation issue and hence included a PD requirement for a narrative rationale.

Assessment Team Conclusion

CL 11 closed - Regarding CL 11, on the temporal distribution of reference images, the stationarity requirement for data in version 45 of the methodology addresses this issue.

CL 12

Draft Report Clarification Requests by Assessment Team

Equation 19, page A5. This equation is the square root of the product of variations in observations of deforestation. It seems that this equation is the standard deviation of observations of deforestation, rather than the variance (as stated in the comment section). Please check this.

Summary of Methodology Element Developer Response

Comments on this equation have been revised to state "standard deviation" rather than "variance."

Assessment Team Conclusion

CL 12 closed.

CL 13

Draft Report Clarification Requests by Assessment Team

Pages B9 through B14 define a variety of variables, some of which are described as standard deviations, and some of which are described as standard errors and all are permutations of a lower case sigma estimate. It would be clearer if the notation follows common notation where sigma denotes standard deviation and S subscript E denotes standard error. It is true that both standard deviation and standard error are measures of deviation around a mean, but common usage is that standard deviation is an estimate of the characteristic of a population and the estimated standard deviation of the population does not change much as the sample size changes (once the sample is greater than a small number) but the standard error of an estimate can be reduced by increasing the sample size, where the standard error of the estimate approximately equals the standard deviation of the sample divided by the square root of the number of samples.

Summary of Methodology Element Developer Response

An new definition was added to the notation section, section 2.1:

3.10.1.1 Standard Errors
Estimated standard error is indicated by the $\hat{\sigma}_{SE}$ symbol, with additional subscripts used to indicate the quantity for which the uncertainty is estimated.

The abbreviation SE for standard error was added to section 3.1.

The rest of the document was updated to clearly differentiate between standard deviation and standard error.

Assessment Team Conclusion
The text and notation changes address the stated CL. DNV notes that residuals in logistic regression do not exhibit means and variances that are invariant to the main covariate (time in this case). Further, the mean and the variance of such residuals are intimately linked as a result of the underlying binomial distribution model assumed by the estimation method (maximum likelihood via IRLS). In general, residual diagnostics for general linear models, like logistic regression, are rather technically challenging and difficult to clearly interpret. Given this complexity of residuals in linear models, and given that the uncertainty equations in the methodology appear to provide a reasonable approximation of true uncertainties, the given uncertainty equations are accepted and CL 13 is closed.

CL 14

Draft Report Clarification Requests by Assessment Team

Section 13.8, at the end of the first paragraph, the methodology states that the sample should be large enough to achieve a standard error of the mean within +/- 15%. At the end of this sentence we suggest adding "at 95% confidence," or similar language for clarity.

Summary of Methodology Element Developer Response
The sentence now reads
"The sample should be large enough to achieve a standard error of the mean within +/- 15% at 95% confidence."

Assessment Team Conclusion
CL 14 is closed.

CL 15

Draft Report Clarification Requests by Assessment Team

Section 6.5.3 should state that the soil sampling depth must be the same for all samples.

Summary of Methodology Element Developer Response

Section 6.5.3 now reads:

"A consistent depth for soil sampling should be established and this depth should be no less than the depth to which soil is disturbed during farming."

A PD Requirement was revised as:

"The selected depth for soil sampling no less than the depth to which soil is disturbed during farming and a rationale for selecting this depth."

Assessment Team Conclusion

CL 15 closed.

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