平成26年度

REDDプラスに係る森林技術者講習会テキスト＜応用講習b＞

第１章

REDDプロジェクトPDDの作成に向けて

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平成26年度REDDプラスに係る森林技術者講習会（応用講習b）

REDDプロジェクトPDDの作成に向けて

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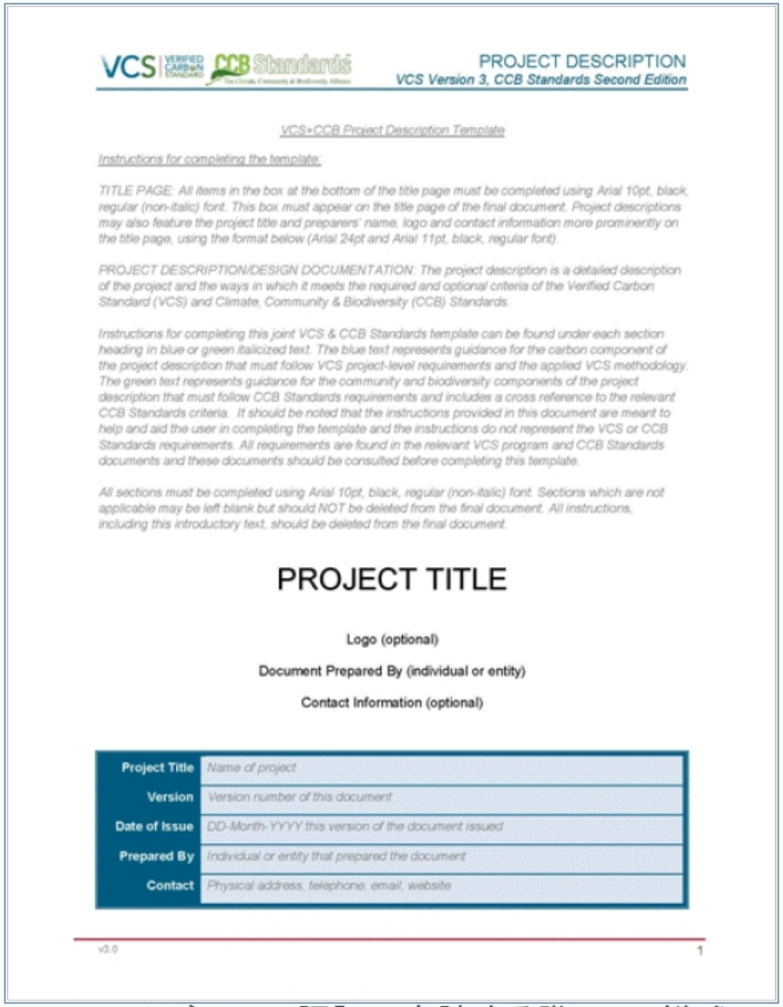
Project Design Document(PDD)とは？

■ PDDとは何か？

- CDMとJCMでは『Project Design Document(PDD)』
- VCSでは『Project Description(PD)』
- オフセット・クレジット(J-VER)制度では『プロジェクト計画書』

⇒ 名前は異なっても、記載する内容に大差はない。



VCS VERIFIED CARBON STANDARD CCB Standards

PROJECT DESCRIPTION
VCS Version 3, CCB Standards Second Edition

VCS+CCB Project Description Template

Instructions for completing the template:

TITLE PAGE: All items in the box at the bottom of the title page must be completed using Arial 10pt, black, regular (non-italic) font. This box must appear on the title page of the final document. Project descriptions may also feature the project title and preparers' name, logo and contact information more prominently on the title page, using the format below (Arial 24pt and Arial 11pt, black, regular font).

PROJECT DESCRIPTION/DESIGN DOCUMENTATION: The project description is a detailed description of the project and the ways in which it meets the required and optional criteria of the Verified Carbon Standard (VCS) and Climate, Community & Biodiversity (CCB) Standards.

Instructions for completing this joint VCS & CCB Standards template can be found under each section heading in blue or green italicized text. The blue text represents guidance for the carbon component of the project description that must follow VCS project-level requirements and the applied VCS methodology. The green text represents guidance for the community and biodiversity components of the project description that must follow CCB Standards requirements and includes a cross reference to the relevant CCB Standards criteria. It should be noted that the instructions provided in this document are meant to help and aid the user in completing the template and the instructions do not represent the VCS or CCB Standards requirements. All requirements are found in the relevant VCS program and CCB Standards documents and these documents should be consulted before completing this template.

All sections must be completed using Arial 10pt, black, regular (non-italic) font. Sections which are not applicable may be left blank but should NOT be deleted from the final document. All instructions, including this introductory text, should be deleted from the final document.

PROJECT TITLE

Logo (optional)

Document Prepared By (individual or entity)

Contact Information (optional)

Project Title	*Name of project*
Version	*Version number of this document*
Date of Issue	*DD-Month-YYYY this version of the document issued*
Prepared By	*Individual or entity that prepared the document*
Contact	*Physical address, telephone, email, website*

v3.0 1

VCS及びCCBS認証に申請する際のPD様式

1

クレジット発行までの作業におけるPDDの位置づけ-1

全体の流れ	プロジェクト実施者（ラオス政府もしくはNGO）	第三者検証機関（適切な機関：選択可能）	VCS事務局
プロジェクト申請書の作成	【申請書の作成】方法論に基づき、プロジェクト申請書を作成する。申請書には、GHG排出削減・吸収を実現するにあたっての多量の情報が必要になる。		
プロジェクト有効化審査		VCSガイドライン基づき有効化審査を実施 【有効化審査】対象プロジェクトとして適格か、また排出削減量・吸収増大量の算定が正しいか等を評価・判断する。	VCSではCDMのDOE、ISO14065審査機関、及びその他VCSの指定を受けた第三者検証機関を指定
プロジェクト登録			【プロジェクトの登録】

REDDプラスプロジェクトの登録のために必要となる計画書

クレジット発行までの作業におけるPDDの位置づけ-2

全体の流れ	プロジェクト実施者（ラオス政府もしくはNGO）	第三者検証機関（適切な機関：選択可能）	VCS事務局

全体の流れ

モニタリング → クレジット検証 → クレジット認証 → クレジット発行・登録・管理

【モニタリング】
プロジェクト実施者は計画に従いモニタリングを実施（モニタリング報告書の作成）

VCSガイドラインに基づき実施

【クレジット検証】
検証機関はプロジェクト実施者からのモニタリング報告書について検証報告書を作成

VCSではCDMのDOE、ISO14065審査機関、及びその他VCSの指定を受けた第三者検証機関を指定

【クレジット認証】
VCS事務局が検証機関からの報告書が完全かどうかを決定し、クレジットを認証

【クレジット発行・登録・管理】
VCS事務局がクレジットを発行

REDDプラスプロジェクトからのクレジット量の定量化のために必要となる報告書

PDDには何を記述するのか-1

■ **PDDには何を書くのか？**

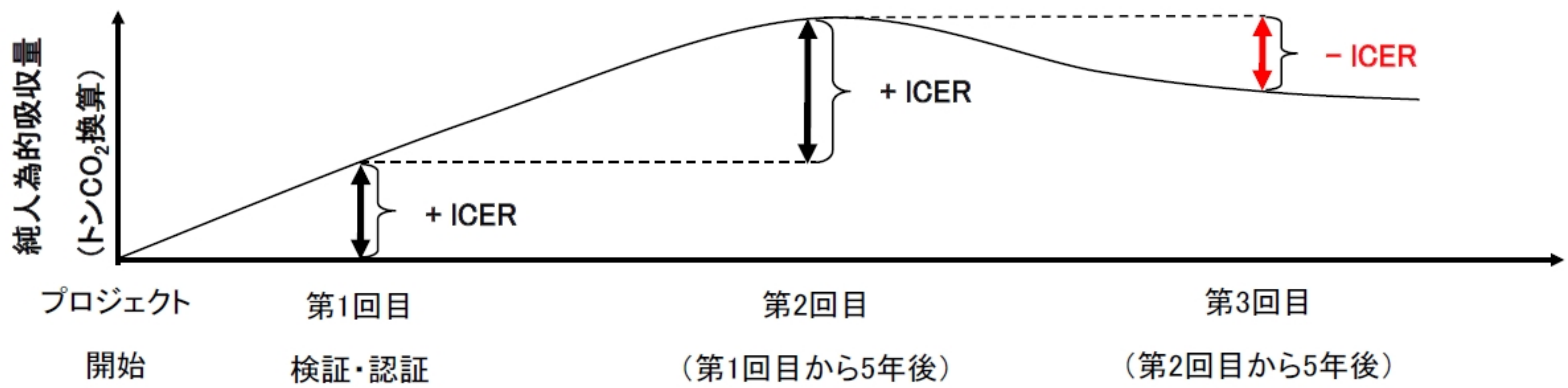
⇒ GHG排出削減・吸収量は「事前推計（Ex-ante）」の結果であり、仮の値である。

■ **省エネ等のプロジェクトとの相違点は何か？**

⇒ 森林吸収源には「特有の課題」があり、それら課題への対処方法を丁寧に説明することが求められる。CDMではプロジェクトタイプの結果から「非永続性」への対処方法が異なっている（以下）。

ICER発行：前回の認証時以降達成された純人為的吸収量に相当するICERが発行される。

純人為的吸収量が減少した場合は、補填しなければならない。



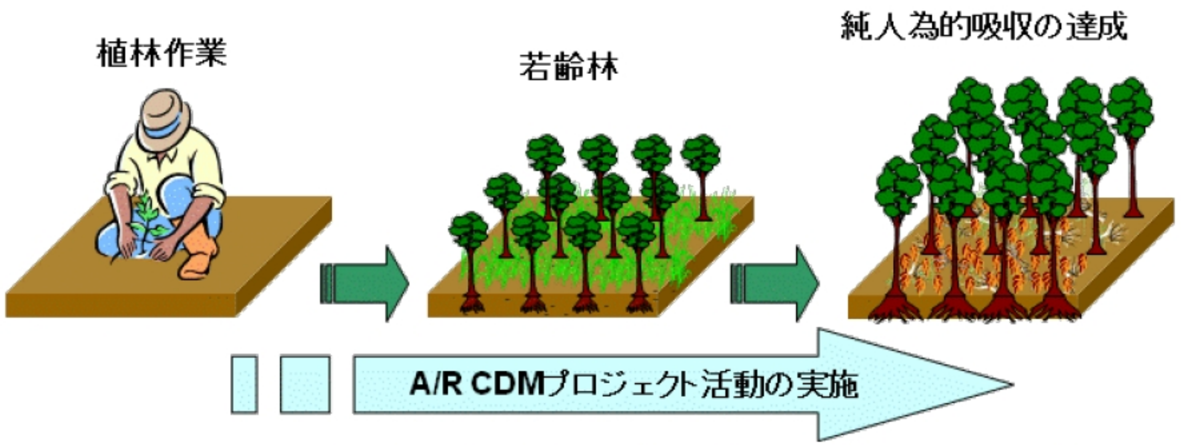
A/R CDMでの非永続性への対処として導入された期限付きクレジットの考え方

PDDには何を記述するのか-2

■ **A/R CDMとREDDプラスの違いは何か？**

⇒ 非森林地から森林への土地利用変化（土地転用）分を定量化することになるが、土地利用変化のあった面積は比較的算定しやすい。

⇒ 植林活動は分かりやすい。植林された森林の成長量を算定するのであり、森林の成長に関する研究成果に基づくことができる。



A/R CDMでの吸収量の位置付け（非森林から森林への土地転用）

What is Project Description (PD)?

- The PD is for explanation of validity of the REDD+ project.
  - Explain the project site (*where*),
  - Explain the project start and end (*when*),
  - Explain responsible person (or organization) of the project (*who*),
  - Explain methods to reduce deforestation and to estimate GHG emission reductions (*how*),

- To explain details of the project, the proponent(s) have to compile all of information of the project (estimation of GHG emission reductions, responsibility of the project and so on).

Outline of Project Description (PD) under the VCS

1 Project Details
- 1.1 Summary Description of the Project
- 1.2 Sectoral Scope and Project Type
- 1.3 Project Proponent
- 1.4 Other Entities Involved in the Project
- 1.5 Project Start Date
- 1.6 Project Crediting Period
- 1.7 Project Scale and Estimated GHG Emission Reductions or Removals
- 1.8 Description of the Project Activity
- 1.9 Project Location
- 1.10 Conditions Prior to Project Initiation
- 1.11 Ownership and Other Programs
- 1.12 Additional Information Relevant to the Project

2 Application of Methodology
- 2.1 Title and Reference of Methodology
- 2.2 Applicability of Methodology
- 2.3 Project Boundary
- 2.4 Baseline Scenario
- 2.5 Additionality
- 2.6 Methodology Deviations

3 Quantification of GHG Emission Reductions and Removals

4 Monitoring

5 Environmental Impact

6 Stakeholder Comments

方法論の選択

■The project applied "VM0015 "Methodology for Avoided Unplanned Deforestation"".

Applicability Conditions of VM0015	Reasons for justifications
a) Baseline activities may include planned or unplanned logging for timber, fuel-wood collection, charcoal production, agricultural and grazing activities as long as the category is unplanned deforestation according to the most recent VCS AFOLU requirements.	The project promotes activities that avoid deforestation and forest degradation in the *HK-VC which is not under planned activities*. Therefore, it is categorized as the Avoided Unplanned Deforestation and/or Degradation (AUDD) of REDD.
b) Project activities may include one or a combination of the eligible categories defined in the description of the scope of the methodology.	Baseline activities include deforestation and forest degradation in natural and secondary forests by pioneer shifting cultivation and other human activities including expansion of grazing area and so on. Therefore, the project is categorized as the Avoided Unplanned Deforestation and/or Degradation (AUDD).
c) The project area can include different types of forest, such as, but not limited to, old-growth forest, degraded forest, secondary forests, planted forests and agro-forestry systems meeting the definition of "forest".	Although there is not an official definition of forest under REDD+ activities in Lao PDR, the Lao PDR's Government has adopted parameters to define forest under Forestry Strategy 2020 and forest classification.
d) At project commencement, the project area shall include only land qualifying as "forest" for a minimum of 10 years prior to the project start date.	From results of satellite imagery analysis from 1994 to 2004, we confirmed that land use of the project area is categorized as "forest".
e) The project area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm. If the project area includes a forested wetlands growing on peat (e.g. peat swamp forests), this methodology is not applicable.	The forest land located within the project boundary is characterized by seasonal tropical forest, therefore no forested wetland is found within the project area.

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PDD作成に係る留意点（UNFCCCでの議論とも関係）

【REL/RL】

堅牢かつ高い透明性を確保したREL/RLの設定が求められる。

プロジェクト実施しなかった場合 ≒ 参照レベル

※過去のトレンドに加えて、国の状況（National Circumstances）の反映が大きな課題となっている。

【MRVシステム】

REDDプラス活動で得られたGHG排出削減・吸収量の算定には、十分なMRVシステムの適用が必要になる。

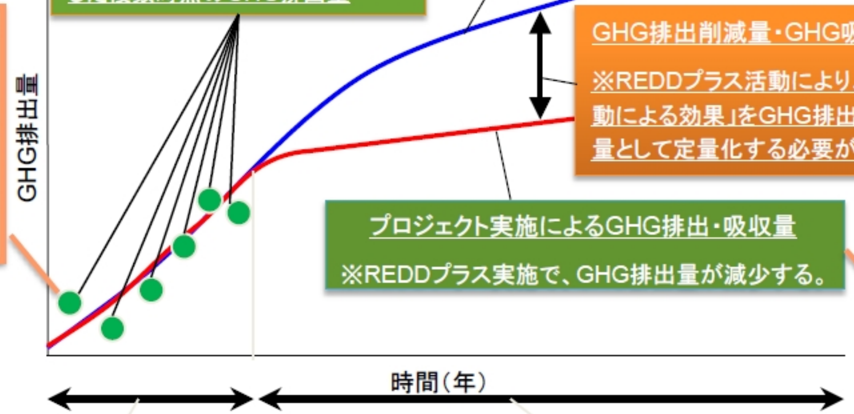
画像解析及び地上調査で定量化した複数時点のGHG排出量

【国家森林モニタリングシステム】

国もしくは準国ベースで森林面積や森林炭素ストック量の定量化にあたっては、国家森林モニタリングシステムの整備・運営を欠かすことができない。

GHG排出削減量・GHG吸収量

※REDDプラス活動により、「活動による効果」をGHG排出削減量として定量化する必要がある。



プロジェクト実施によるGHG排出・吸収量

※REDDプラス実施で、GHG排出量が減少する。

【ドライバー特定】

REDDプラス実施後のGHG排出量を試算/算定するためには、森林減少・劣化のドライバーを特定し、それらへの対処を行った際の効果を定量化する必要がある。

過去の森林減少・劣化によりGHG排出量の算定（トレンド解析）

過去のトレンド及びNational Circumstancesに基づきGHG排出量を推定

【セーフガード】

REDDプラス実施でGHG排出削減・吸収量を獲得できても、他に負の影響がでないよう配慮する必要がある

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PDD作成に係る留意点

■ REDDプラス特有の課題とは何か？

1. MRVシステム及び国家森林モニタリングシステムとの関係

⇒ 森林劣化とは「森林としての土地利用のまま炭素ストック量が変化すること」であり、そのモニタリング技術が求められる。算定にあたり一定水準の精度が求められる。

⇒ REDDプラスを実施する国(ホスト国)の森林インベントリとの一貫性が求められる。

2. REDDプラス活動の妥当性(森林減少・劣化のドライバー特定及びドライバーへの効果的な対策の実施)

⇒森林減少・劣化への対策として、何が効果的か特定しにくく、その対策への評価も難しい。

3. 参照レベルの設定

⇒ 参照レベルの設定方法で発行されるクレジット量の大小が大きく変化する。基本的には将来予測に基づき設定するものなので、完全な正解はない。重要なのは設定の際の透明性の高さになる。

4. スケールの相違への対処

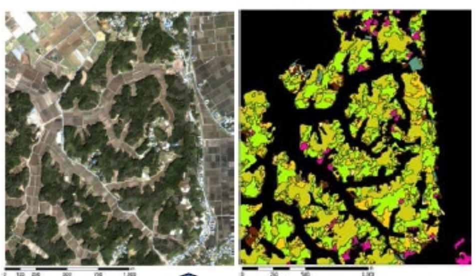
⇒ プロジェクトベースの取組はホスト国における準国もしくは国ベースの取組の1部と位置付けられるため、一貫性が重要になる。

1. MRVシステム及び国家森林モニタリングシステムとの関係

■ 森林炭素ストック量（GHG排出・吸収量）の算定にあたっては。森林面積（活動量）をリモートセンシング、排出/吸収係数（面積あたりの炭素ストック量）を現地調査で特定することとなる。

森林面積（ha）　×　排出/吸収係数（炭素ストック量/ha）　＝　炭素ストック量の算定（GHG排出・吸収量の算定）

リモートセンシング

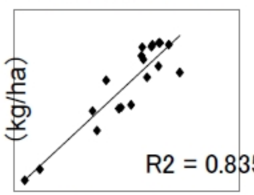


Integration

地上調査による補正

地上調査

Develop volume table



炭素ストック量の算定

（GHG排出・吸収量の算定）

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1. MRVシステム及び国家森林モニタリングシステムとの関係

【画像解析の精度に関する考え方】

■ SOURCEBOOKでは中解像度の画像解析により森林/非森林の解析精度として**「80～95%は達成可能」**としている。

■ VCSでは複数の方法論で具体的に解析精度の要求水準を定めている（以下）。

方法論	活動タイプ	対象地域		精度の要求水準		プロジェクト例
		対象地域	対象森林	森林/非森林区分	森林タイプ区分	
VM0004	計画された森林減少の抑制	東南アジア熱帯地域	熱帯泥炭林であること、また居住地を含んではならない	80%	—	●土地利用区分は、①泥炭湿地林（劣化度：小）、②泥炭湿地林（劣化度：大）、③泥炭低木地（樹冠率20%未満）、④ケランガス林、⑤ケランガス開放低木地、⑥季節的浸水地、⑦開水面　の7区分としている。 ●インドネシアの事例では、判読精度は81.3%と記されている
VM0006	モザイク状の森林減少・劣化の抑制	全世界	全森林	70%	70%	●土地利用区分は、①常緑林、②落葉樹林・混交林、③非森林の3区分としている。 ●カンボジアの事例では、判読精度は94%以上と記されている。
VM0015	計画外の森林減少の抑制	全世界	泥炭林は対象外	90%	80%	●土地利用区分は、①常緑樹林、②季節林、③非森林、④水域の4区分としている。 ●CIジャパンのFS事業（カンボジア）では、判読精度（正しく分類された点数／正しい点数）は、常緑樹林80%、季節林85%、非森林72%、水域100%で、全体で81%と記されている。

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1. MRVシステム及び国家森林モニタリングシステムとの関係

【VCS方法論0015 における地上調査の概要】

■ サンプリングの骨格

- 地上調査については、サンプルサイズ、プロットサイズ、プロットの形状、プロットの位置をプロジェクト計画書に明記する必要がある。
- プロットについては、プロジェクト対象地もしくは参照エリア内に設置することとし、設置方法としては一時的なプロット（Temporary Plot）でも永久プロット（Permanent Plot）でも構わない。

■ プロットサイズ及びプロット数

- プロットサイズはプロット数と大きく関係する。一般的にプロットサイズは100m^2～1,000m^{2}のプロットとなり、それに基づきプロット設置数を計算することとなる。設置数は各森林タイプ区分における炭素ストック量の標準偏差に基づき特定する方法が紹介されている。

■ プロット配置

- 恣意的なプロット配置を避けるため、システマティックサンプリングが望ましい。**ただし、道路状況等でアクセス困難な位置にプロットを配置するのは現実的ではない。その際は、透明性及び保守性に留意しつつ、道路沿いや川沿い等にバッファー（林縁効果を避けるためのエリア）を確保して、プロットを配置する。**
- 上述した通り、プロジェクト実施前にプロット数を特定することは困難であるが、プロット数の特定にあたっては周辺地域を対象に含む森林インベントリ等を活用する方法がある。

PDD作成に係る留意点（再掲）

■ REDDプラス特有の課題とは何か？

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⇒ REDDプラスを実施する国（ホスト国）の森林インベントリとの一貫性が求められる。

2. REDDプラス活動の妥当性（森林減少・劣化のドライバー特定及びドライバーへの効果的な対策の実施）

⇒森林減少・劣化への対策として、何が効果的か特定しにくく、その対策への評価も難しい。

3. 参照レベルの設定

⇒ 参照レベルの設定方法で発行されるクレジット量の大小が大きく変化する。基本的には将来予測に基づき設定するものなので、完全な正解はない。重要なのは設定の際の透明性の高さになる。

4. スケールの相違への対処

⇒ プロジェクトベースの取組はホスト国における準国もしくは国ベースの取組の1部と位置付けられるため、一貫性が重要になる。

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3. 参照レベルの設定（方向性1）

過去のGHG排出量の平均値から設定する方法

⇒（方向性）過去のGHG排出量の平均値を算定するにあたり、最低限の時点数に基づく方法。

⇒（方向性）過去に大規模な森林火災等があり、GHG排出量が大きく年変動している場合は、保守的なGHG排出削減・吸収量となるよう証明することが重要。

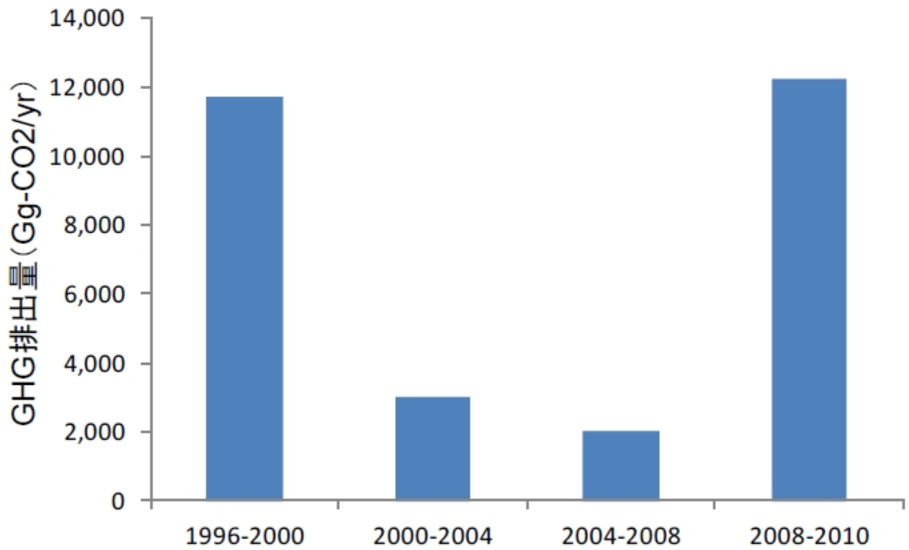


図 過去5時点のGHG炭素ストック量から求めた4期間におけるGHG排出量（例）

※年平均のGHG排出量は7,248Gg-CO2、標準偏差は±5,498Gg-CO2、最大値は12,257Gg-CO2、最小値は2,019Gg-CO2

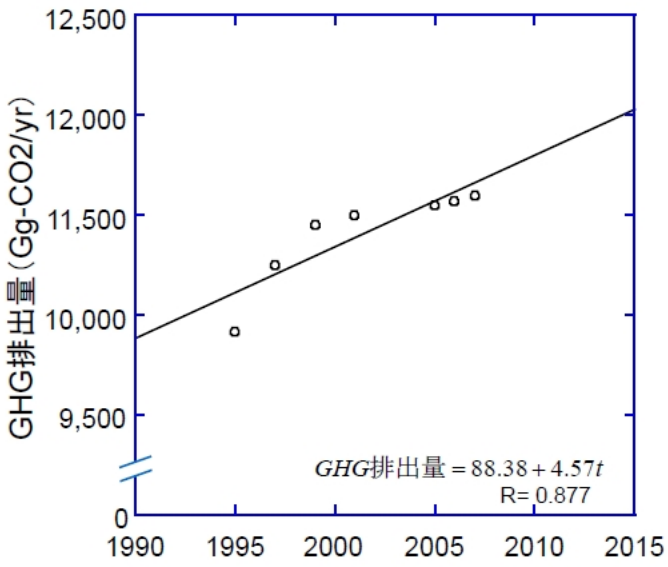
3．参照レベルの設定（方向性2）

過去からのトレンドに基づく回帰式で設定するする方法

⇒（方向性）過去のトレンドに基づくにあたり、最低限の時点数に基づく方法。

⇒（方向性）過去に大規模な森林火災等があり、GHG排出量が大きく年変動している場合は、保守的なGHG排出削減・吸収量となるよう証明することが重要。

⇒（方向性）適用する回帰式の選択にあたっては、直線回帰ではなくゴンペルツ曲線のような曲線が望ましく、GHG排出削減・吸収量を保守的に算定することが重要。



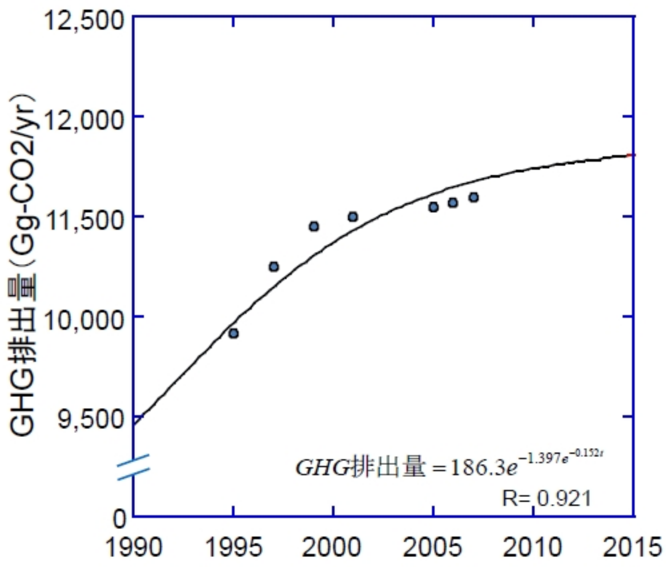


図　直線回帰とゴンペルツ曲線から設定した参照レベル（イメージ図）

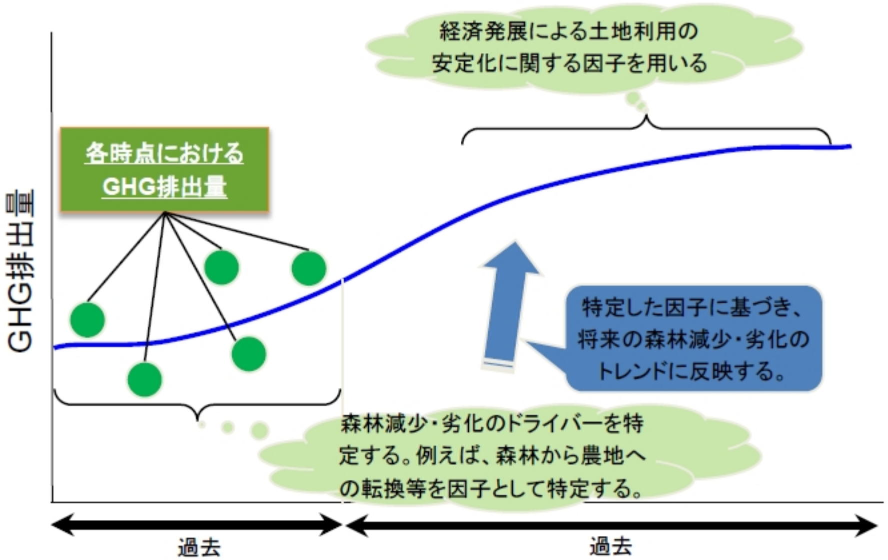
3. 参照レベルの設定（方向性3）

森林減少・劣化のドライバーの分析結果、及び将来に向けた森林・林業政策等のNational Circumstancesを反映して設定する方法

森林減少・劣化のドライバーとしては、人為影響（人口、国内総生産（GDP）、道路総延長等）、及び自然影響（旱魃等）が考えられる。森林減少・劣化を抑制するためには、そのドライバーを適格に把握する必要がある。

⇒（方向性）過去のトレンドから、森林面積/炭素ストック量とドライバーの関係を明確化する。

⇒（方向性）参照レベルの設定にあたり、National Circumstances（NC）を反映させる。



※NCとして反映する情報について、例えばプロジェクト実施前にドライバーとしてオイルパーム農園の増加を選択しても、実際にプロジェクト実施後に政策変更等でオイルパーム農園の増加が起こらない可能性もあり、その場合は反映した情報を実際の値に修正することが求められる可能性がある。その場合、オイルパーム農園の情報（統計情報）が継続的に入手可能かを考慮する必要がある。

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PDD作成に係る留意点（再掲）

■ **REDDプラス特有の課題とは何か？**

1. MRVシステム及び国家森林モニタリングシステムとの関係

⇒ 森林劣化とは「森林としての土地利用のまま炭素ストック量が変化すること」であり、そのモニタリング技術が求められる。算定にあたり一定水準の精度が求められる。

⇒ REDDプラスを実施する国（ホスト国）の森林インベントリとの一貫性が求められる。

2. REDDプラス活動の妥当性（森林減少・劣化のドライバー特定及びドライバーへの効果的な対策の実施）

⇒森林減少・劣化への対策として、何が効果的か特定しにくく、その対策への評価も難しい。

3. 参照レベルの設定

⇒ 参照レベルの設定方法で発行されるクレジット量の大小が大きく変化する。基本的には将来予測に基づき設定するものなので、完全な正解はない。重要なのは設定の際の透明性の高さになる。

4. **スケールの相違への対処**

⇒ プロジェクトベースの取組はホスト国における準国もしくは国ベースの取組の1部と位置付けられるため、一貫性が重要になる。

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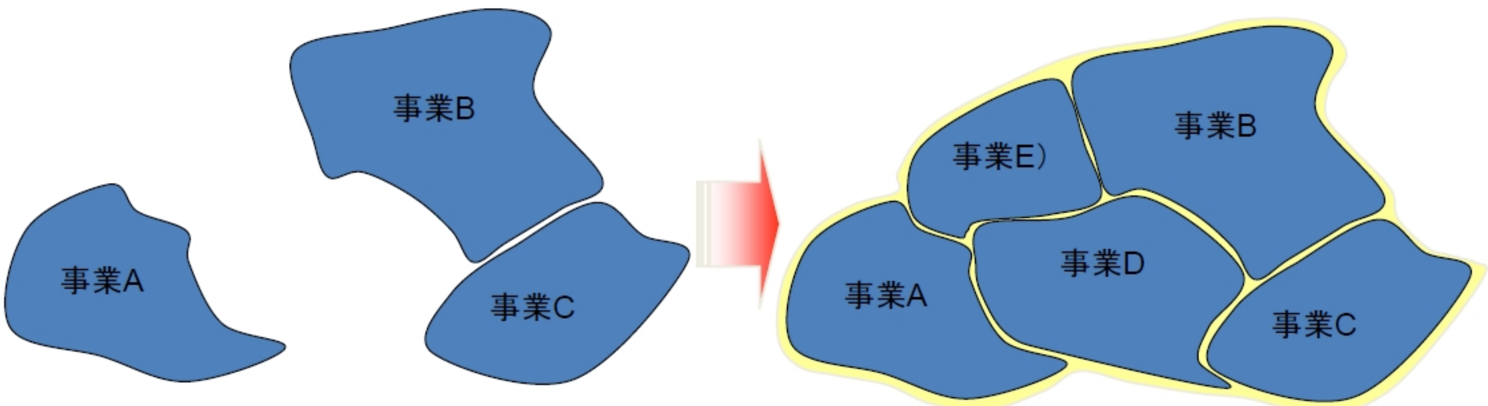
4. スケールの相違への対処 -スケールの考え方-



短期的にプロジェクトベースでのREDDプラス

中長期的に想定する

準国ベースでのREDDプラス

第２章

インドネシア・中部カリマンタン州における、住友林業のREDD+の取り組み

住友林業株式会社
阿部 敏明

木と生きる幸福
住友林業

平成26年度 REDDプラスに係る森林技術者講習会

「インドネシア・中部カリマンタン州における、
住友林業のREDD+の取り組み」

住友林業株式会社
環境・エネルギー部
阿部敏明

住友林業株式会社

木と生きる幸福
住友林業

目次

1. 会社紹介
2. 当部紹介
3. インドネシア・中部カリマンタン州における取り組み

木と生きる幸福
住友林業

会社紹介

住友林業株式会社

本　社　：　東京都千代田区大手町1-3-2

設　立　：　昭和23年2月20日（創業元禄4年-1691年）

事業内容：　山林事業（山林の経営）
木材・建材事業（木材・建材の流通）
住宅事業（注文住宅の建築等）
海外事業（木質建材の製造と流通、住宅の建築、販売）
不動産事業（開発、住宅分譲、流通、仲介）
（連結）建材製造事業、住宅ストック事業、緑化事業、
生活関連事業等

社有林　：　四国・九州・北海道・和歌山　42,868ha（国土の約1/900）

売上高　：　約8,452億円　経常利益　253億円　（2013年3月：連結）

ホームページアドレス：http://sfc.jp/

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木と生きる幸福
住友林業

歴史・沿革 ―川上から川下まで木に関わる事業をグローバルに展開―

1700 1800 1900 2000 (年)

山林事業 国内で45,808ha（国土の約900分の1）、海外で約200,000haの森林を保有、管理

1691 創業。住友家が愛媛県・別子銅山の開坑に伴い、木材の伐採・調達を開始。
1894 「大造林計画」を樹立。
1948 財閥解体が発令。住友本社林業所は6つの林業会社に分割。

木材・建材の流通及び製造事業 国内の木材・建材業界No.1商社

1955 国内材集荷販売体制確立。
1960 木材輸入業務本格化・拡大。
1964 国内に本格的な合板製造会社を設立。
1970 インドネシアに合板製造会社を設立。

住宅及び住関連事業 木造注文住宅のトップブランド

1975 木造注文住宅事業開始。
2003 米国での分譲住宅事業開始。
2008 豪州での住宅事業開始。

バイオマス・木化事業


2011 川崎バイオマス発電所 営業運転開始。
木化事業開始。

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木と生きる幸福
住友林業

大造林計画と保続林業の始まり

1881　旧製錬吹処之図

2003　製錬所跡全景

伊庭 貞剛

1691年（元禄４年）
別子銅山開坑、江戸幕府より周辺山林の立木利用を許可

1894年（明治27年）
「大造林計画」を樹立。木材の過剰伐採と煙害で荒れ果てた別子の山々を大規模な植林で復旧

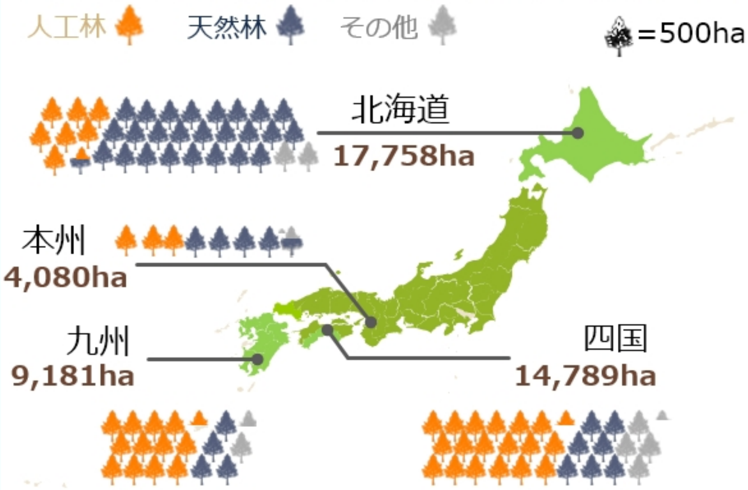
国土報恩

1903年（明治36年）
民間初の「施業案（森林計画）」編成開始　→　“保続林業”理念確立

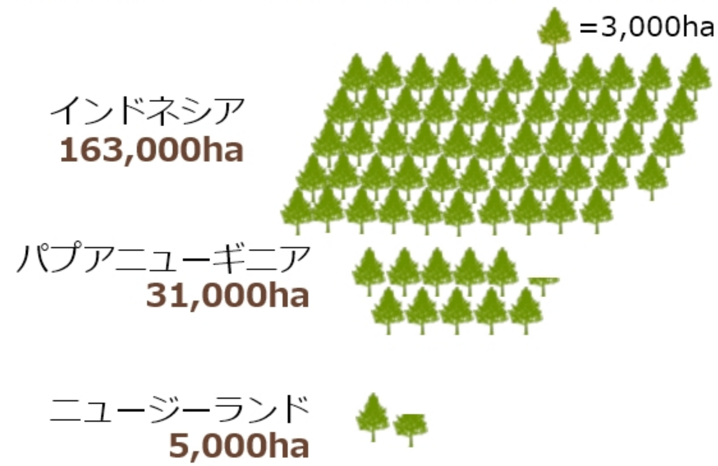
木と生きる幸福
住友林業

国内外での植林事業

日本国内の社有林
45,808ha 2014年4月1日時点



海外の植林管理保有面積
約200,000ha 2014年3期末日時点

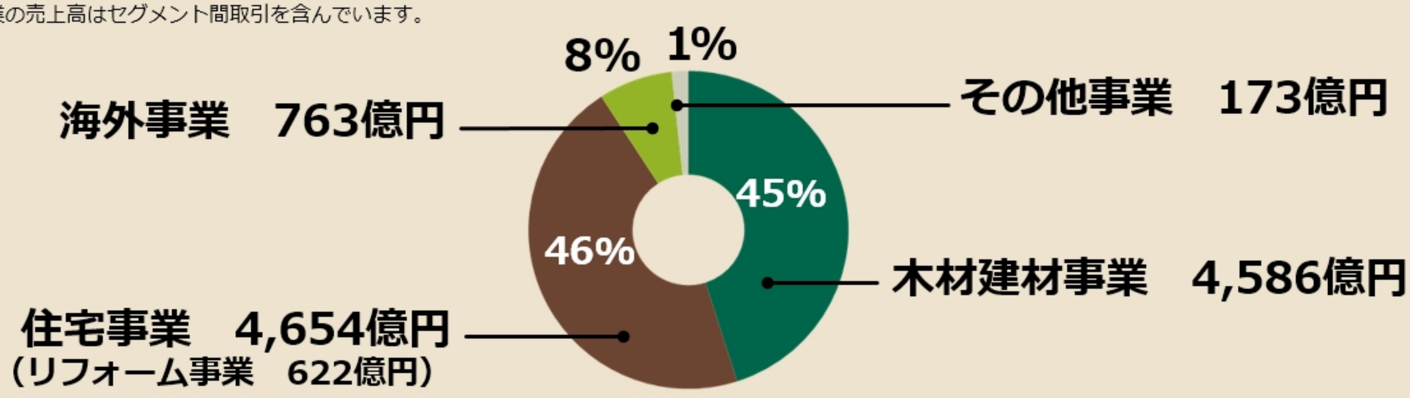


会社概要（2014年３月期）

木と生きる幸福
住友林業

社名	住友林業株式会社
創業・設立	創業1691年　設立1948年
資本金	27,672百万円
従業員数	連結：17,413名　単体：4,486名
関係会社	子会社58社（海外31社）関連会社17社（海外14社）
売上高	9,730億円 （2014年3月期実績）

※各事業の売上高はセグメント間取引を含んでいます。



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住友林業の経営理念

木と生きる幸福
住友林業

経営理念

住友林業グループは、再生可能で人と地球にやさしい自然素材である「木」を活かし、「住生活」に関するあらゆるサービスを通じて、豊かな社会の実現に貢献します。

行動指針

- 住友精神　　公正、信用を重視し、社会を利する事業を進める。
- 人間尊重　　多様性を尊重し、自由闊達な企業風土をつくる。
- 環境共生　　持続可能な社会を目指し、環境問題に全力で取組む。
- お客様最優先　　お客様満足に徹し、高品質の商品・サービスを提供する。

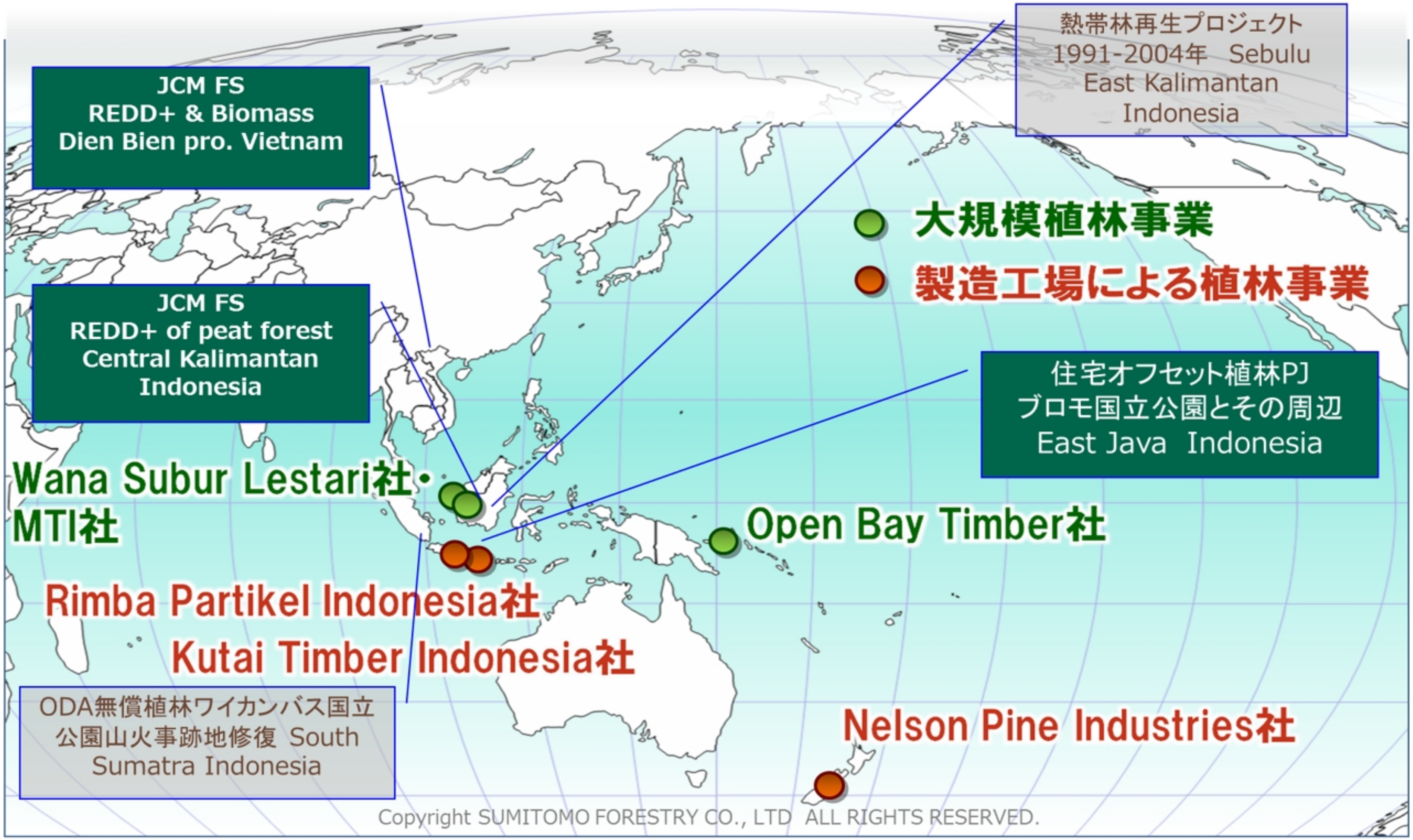
CSRマネジメントにおける4つの重要課題

■持続可能な森林から木材製品や資材を供給する
■環境にやさしい住まいを提供する
■事業を通じて地球温暖化対策を進める
■社員の家族を大切にはぐくむ暮らし方を追求する

国内外で
保続林業を進める
社会的責任

海外の植林事業拠点

木と生きる幸福
住友林業



木と生きる幸福
住友林業

当部活動の紹介

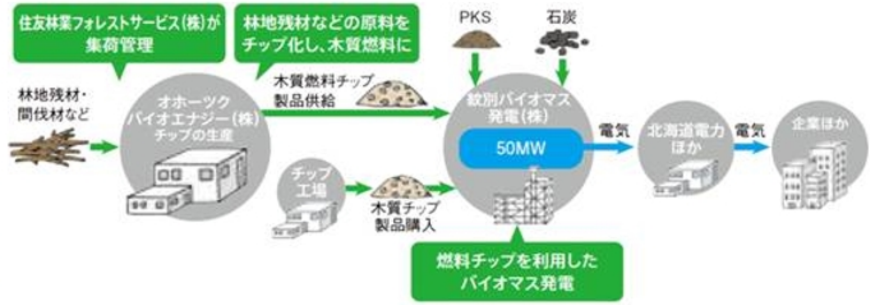
バイオマス発電事業

木と生きる幸福
住友林業

バイオマス発電事業は、エネルギー課題に対応する新事業領域であるとともに、山林の価値を高める事業

「紋別バイオマス発電所」のスキーム

山間地型バイオマス発電



紋別バイオマス発電

川崎バイオマス発電

「川崎バイオマス発電所」のスキーム

都市型バイオマス発電

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ベトナム国 Dien Bien 省での REDD＋実証活動（CSRプロジェクト）

木と生きる幸福
住友林業

持続可能な森林管理

生計向上プログラム


森林パトロール、境界画定等


果樹栽培、養魚池、飼料栽培を含んだ家畜生産

最終目標：

持続可能な森林経営をベースとした、

地域コミュニティの形成。

Partnership with

JICA Japan International Cooperation Agency　ASKUL　YANMAR Solutioneering Together

JICA ベトナム国北西部水源地域における持続可能な森林管理プロジェクト (SUSFORM-NOW)
http://www.jica.go.jp/project/vietnam/004/materials/pdf/leaflet_02.pdf

ベトナム国 Dien Bien 省での REDD＋実証活動（CSRプロジェクト）

木と生きる幸福
住友林業

連携

民間企業によるＲＥＤＤ＋実証活動
住友林業、アスクル、ヤンマー
（対象 ４カ村）

森林管理プログラム
・森林パトロール
・森林分与
・植林等

生計向上プログラム
・果樹栽培
・養豚技術指導
・バイオガス利用
・高効率ストーブ等

民間企業の本業に関連した活動の導入を模索中：

・二国間クレジット（JCM）ビジネス検討
・自社商品の現地での販売・導入
・現地商品のオフテイク

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インドネシアにおける、社会林業 KTI社事例

木と生きる幸福
住友林業

公社との契約: 2,000ha　社会林業: 13,000ha
（内FSC森林認証: 332ha → 1,005haへ拡大）

インドネシアにおける、社会林業
Project Earth　（住宅オフセット事業）

木と生きる幸福
住友林業

環境植林＋住民協働型植林（植林後10年間管理）
　→6 ton-CO2/棟をオフセット
年間植林面積は300ヘクタール
　※年間引渡し戸数10,000棟として計算、東京ドーム約64個分

木と生きる幸福
住友林業

インドネシア
中部カリマンタン州
における取り組み

（泥炭地修復活動の二国間クレジット化）

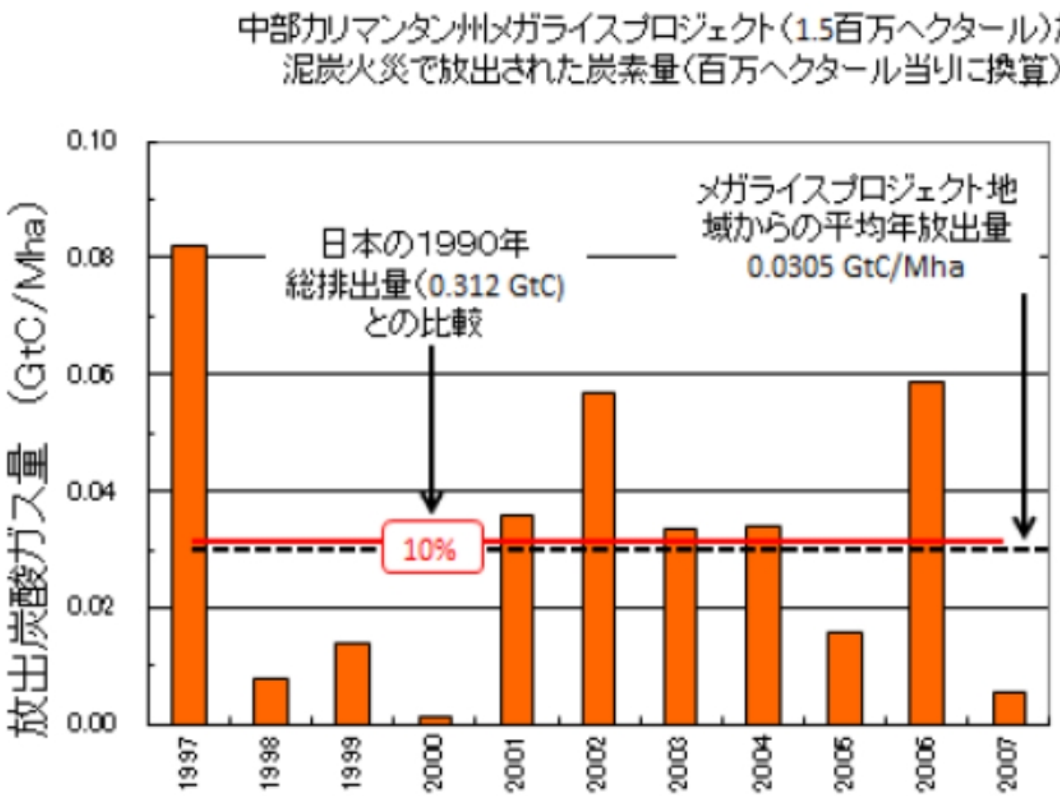

Tackling Climate
Change “Ground Zero”

木と生きる幸福
住友林業

背景情報：ビデオ

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業



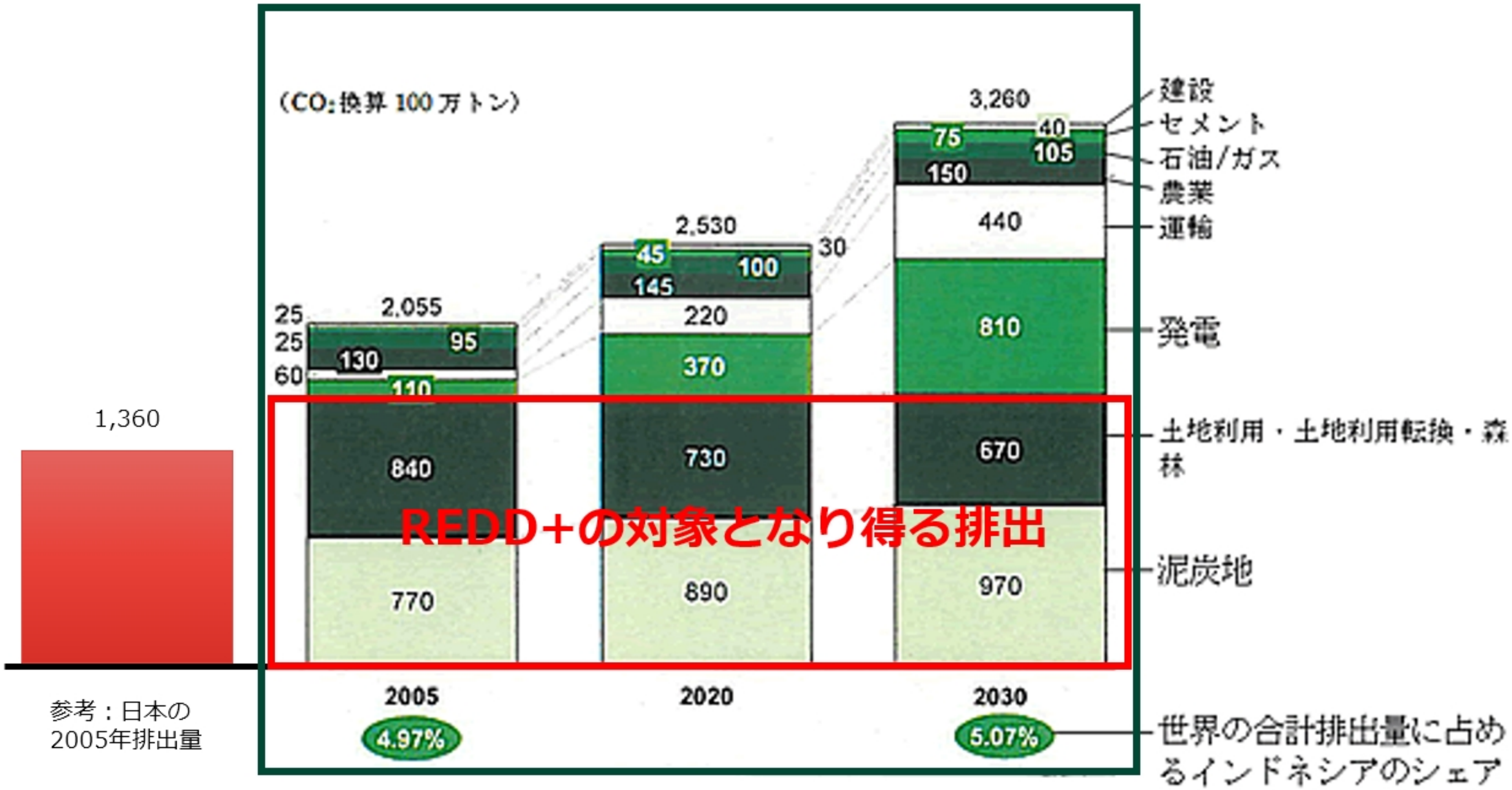
メガライス跡地の泥炭火災からの排出のみで、平均1.1億トンCO2/年という試算

地球規模課題対応国際科学技術協力　最終報告書
「インドネシアの泥炭・森林における火災と炭素管理」
代表者氏名：大崎満（北海道大学農学研究院　教授）

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福 住友林業

インドネシアの温室効果ガス排出量



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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

日本側FS/実証体制

	2010	2011	2012	2013	2014	2015
経産省助成		○	○	○	○	
北大（協力）	→	→	→	→	→	
住友商事	→	→	→	→		
三菱総研		→	→	→	→	
日本工営		→	→	→	→	
住友林業		→	→	→	→	
明星電気	→	→	→			

・2010年より開始（2013年4月撤退）
・現在は、三菱総研と住友林業の二社が主体。

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

どうすれば二国間クレジット化できるか？

科学的知見の確立
- 炭素収支
- MRV技術
- 対策技術

REDD+に関する法的枠組みの確立
- 国際枠組
- 二国間枠組み
- 国内制度における JCM-REDD+の取扱い
- 泥炭火災からのCO2排出の取扱い

資金確保
- 国際資金
- 日本政府からの資金支援
- クレジット・バイヤーの確保

実施準備
- 地元カウンターパートの選定
- 州・郡とのパートナーシップの構築
- 地域住民への周知
- 実施体制構築
- 実施エリア確定

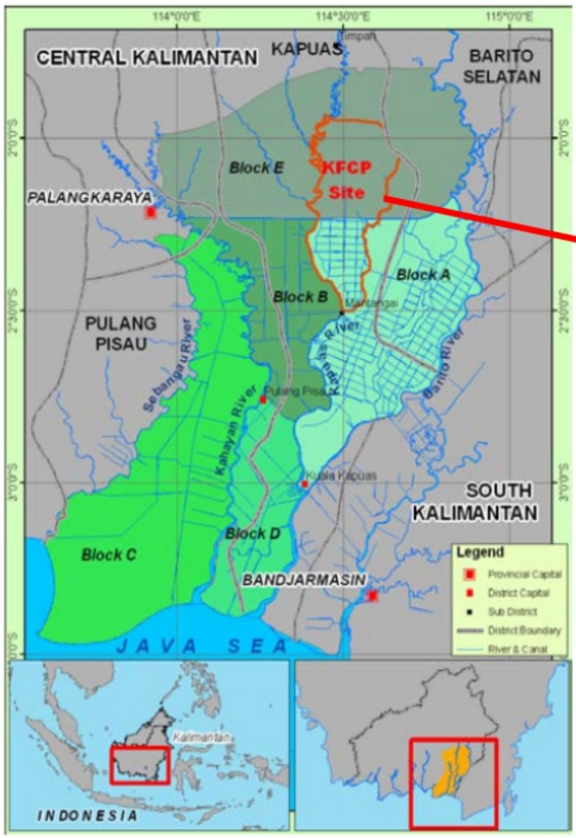
実施

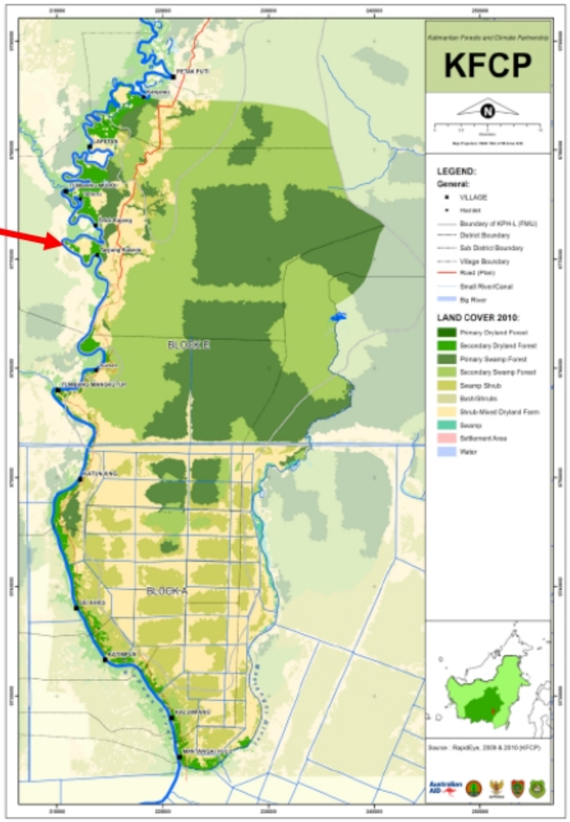
Unknownな要素が多すぎる！

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

先行事例分析：Kalimantan Forests and Climate Partnership (KFCP)





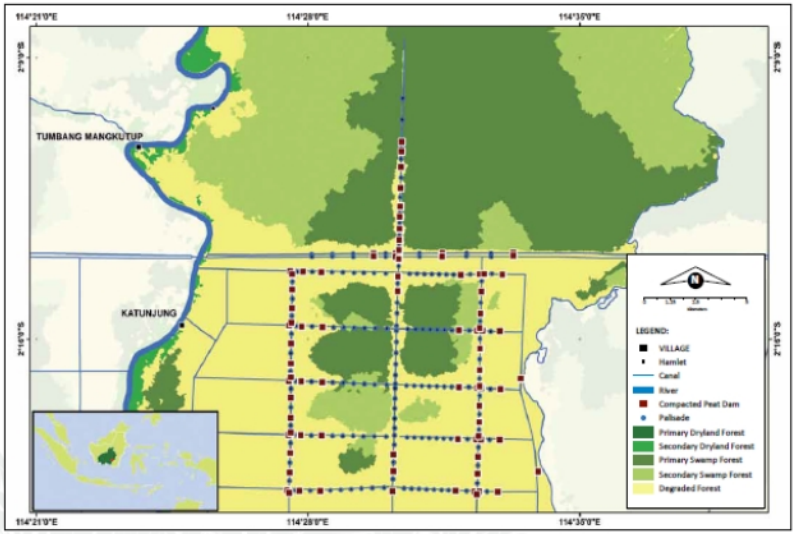
2007年開始。

（計画）
- 総予算A$47百万（約44億円）。
- メガライスプロジェクト跡地地域、20万haの荒廃泥炭地の修復を目指す。
- 1億本の早生樹植林。
- 7万haの泥炭湿地林の保全。
- 30年間で7億トンCO_2の削減（年平均2,300万トンCO_2）

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

先行事例分析：Kalimantan Forests and Climate Partnership (KFCP)



An illustration of the planned hydrological rehabilitation system in KFCP. Compacted peat dams, palisades and reforestation are visible along the canals.

- 網の目のように走る水路に、標高ごとに圧縮泥炭のダムを設置。
- 泥炭地の水位を保持することによって、火災とCO2排出を抑制する。

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

先行事例分析：Kalimantan Forests and Climate Partnership (KFCP)

- 開始当初より、地域住民社会（Dayak族）よりプロジェクトに対する強い反発。
- 国内議会からの突き上げもあり、2012年プロジェクトは中止。

要因

- Carbonに対する過度な期待を誘発する、住民向け説明。
- 住民意向・既存の生活を考慮しない、ダム建設・ゾーニング。

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福 住友林業

先行事例分析：Kalimantan Forests and Climate Partnership (KFCP)

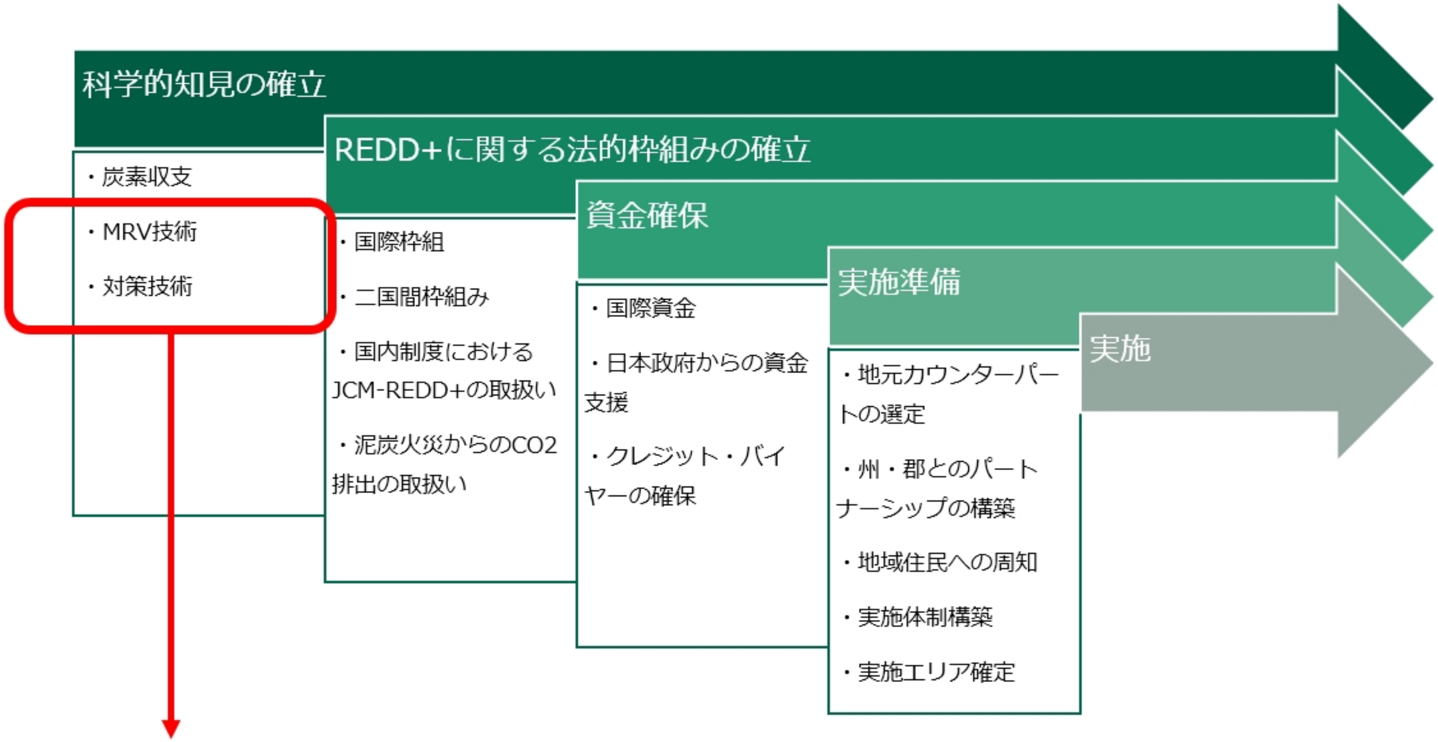
学んだこと

- ダム建設による水位回復は、成功例が少ないほか、住民との軋轢が惹起される。
- ゾーニングを行う際には、影響を受ける住民に対して必ず代替の実収入源を提供する必要あり。（カーボンではダメ）
- 森林に依存して生活している住民のこれまでの生活・慣習を変えるという作業は、スケジュール通りに進む可能性は小さい。
- 長期の働きかけ、目に見えるBenefitの提示が不可欠。

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

どうすれば二国間クレジット化できるか？



住民が受け入れ可能で持続可能な対策と、その効果測定の手法開発がKey。
可能であれば、カーボンを含む外部資金に頼らずとも回る対策を。

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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対策手法の検討（原因分析）

メガライス・プロジェクトを目的に建設された残置排水路

泥炭水位の低下と、乾季の乾燥化

火災の頻発と、CO_2排出

100%人為起源の火災

- 焼畑
- 違法伐採者によるキャンプファイア
- タバコ
- 土地所有権主張のための火入れ

★何らかの経済活動が行われているエリアでは、火災は限定的。

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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対策手法の検討（対策の方向性）

現状

対象地域での泥炭火災と、泥炭地劣化をもたらす、負の連鎖の継続と拡大。

事業実施により期待する効果

対象地域での泥炭火災抑制と、持続的な生産活動をもたらす正の連鎖の導入と拡大。

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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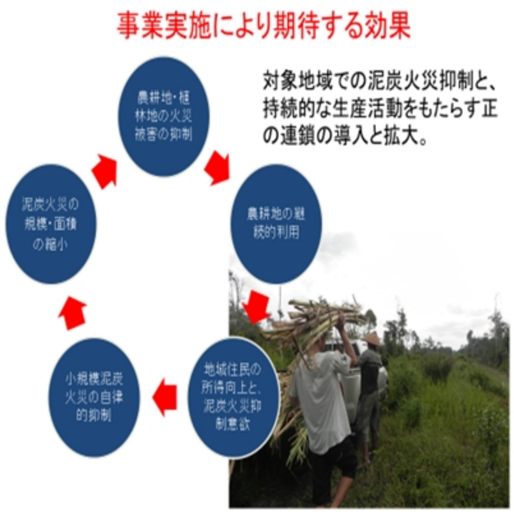
対策手法の検討（対策の方向性に関する仮説）



火災の減少による、植生の自然回復

泥炭火災・分解由来のCO2排出の削減

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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対策手法の検討（実証活動：2012年～）

①農村所得向上と防火

雨季に冠水する泥炭地に、養殖池＋在来樹種植林（トゥミ、カフイ等）の実施。
（カウンターパート：パランカラヤ大学）

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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対策手法の検討（実証活動：2012年～）

②社会林業（アグロフォレストリ）
カウンターパート：インドネシア林業省研究庁（FORDA）
時期： 2013年春～
ジェルトン、ランブータン等の在来有用樹種と養鶏・魚養殖の複合利活用。

↑既存のFORDA試験地(プランピサウ県泥炭地)

The lay outs of planned agroforestry models are presented below.

Ditch for drainage with the size of 0,5 m x 0,5 m x 0,5 m

nase ukuran 0,5 m x 0,5 m x 0,5 m

vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv
v	@	iiiiiiii	@	Fish pond with chicken cages at the top				iiiiiiii	@	iiiiiiii	v
0	#	$	#					$	#	$	0
v	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	v
0	#	$	#	$	#	$	#	$	#	$	0
v	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	v
0	#	$	#	$	#	$	#	$	#	$	0
v	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	V
0	#	$	#	$	#	$	#	$	#	$	0
v	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	@	iiiiiiii	V
0	#	$	#	$	#	$	#	$	#	$	0
vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv	vv0vv

Parit drainase ukuran 0,5 m x 0,5 m x 0,5 m

Ditch for drainage with the size of 0,5 m x 0,5 m x 0,5 m

↑対象サイトデザイン

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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対策手法の検討（実証活動：2012年～）

③　高収量バイオマス草本生産　（飼料・バイオマスペレット用途）
カウンターパート　パランカラヤ大学

- 1.7ha試験栽培は、2mの冠水に晒されたにも拘わらず、生育良好。
- 10haに拡大し、中規模レベルでの栽培試験を実施中。

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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対策手法の検討（実証活動：2012年～）

高収量バイオマス草本生産のメリット・デメリット （飼料・バイオマスペレット用途）

メリット	デメリット
極めて容易に栽培が可能で、自律的な栽培拡大が見込める	土地養分の収奪に対する懸念
種子による繁殖ではなく、無秩序に拡散しない	燃焼後灰分が多く、ペレット原料としての価値が低い
◎年間2～6回の収穫が可能	乾季の火災頻発時に助燃材となる可能性？
将来の市場拡大が見込める	泥炭地での栽培データ・実績が殆ど無い。
火災・冠水に強い	
Ph 3 の貧栄養土壌でも高収量が見込まれる	
◎カーボン収入無しでも自立した事業となる可能性あり	
在来種（またはその近縁種）であり、地元住民に受け入れられやすい	

インドネシア・中部カリマンタン州における取り組み
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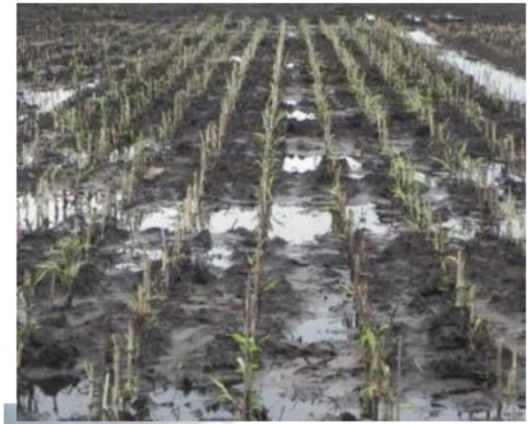
対策手法の検討（実証活動：2012年～）

高収量バイオマス草本生産　（飼料・バイオマスペレット用途）
　カウンターパート　パランカラヤ大学




植栽後1週間
（昨年12月30日）


植栽後1か月
（本年1月7日）

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
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どうすれば二国間クレジット化できるか？

科学的知見の確立
・炭素収支
・MRV技術
・対策技術

REDD+に関する法的枠組みの確立
・国際枠組
・二国間枠組み
・国内制度における JCM-REDD+の取扱い
・泥炭火災からのCO2 排出の取扱い

資金確保
・国際資金
・日本政府からの資金支援
・クレジット・バイヤーの確保

実施準備
・地元カウンターパートの選定
・州・郡とのパートナーシップの構築
・地域住民への周知
・実施体制構築
・実施エリア確定

実施

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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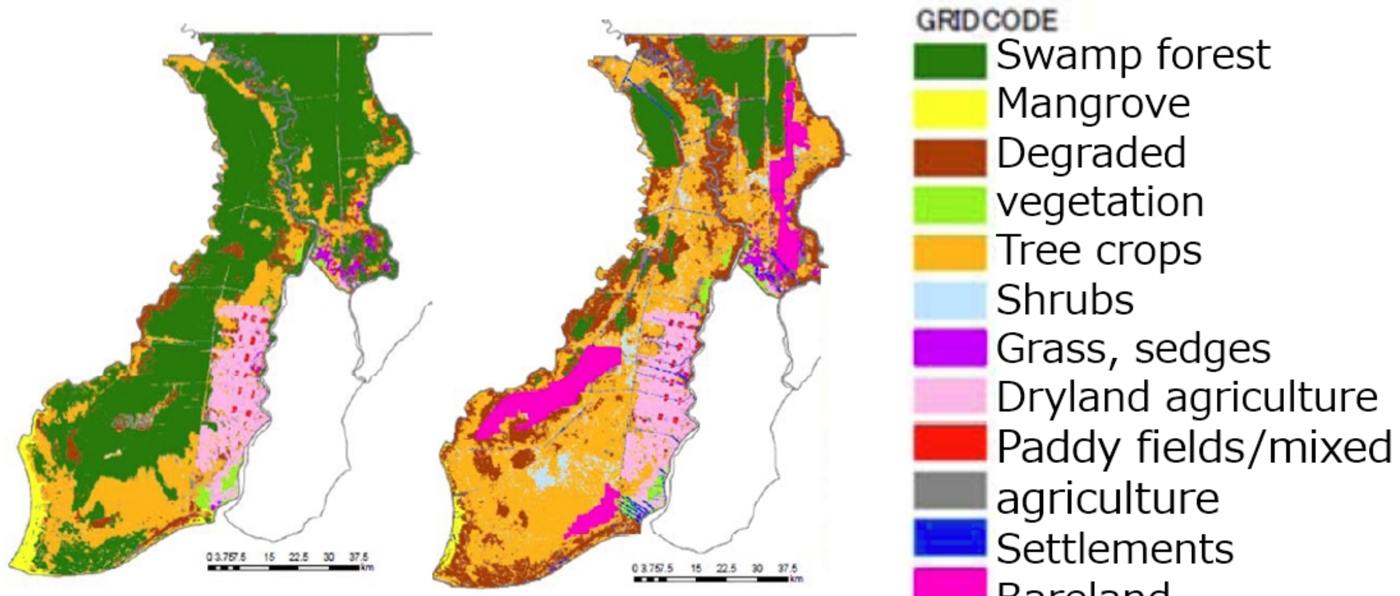
MRV方法論
～雑多な土地利用と、複雑なCO2排出トレンド～



Changes in Forest Area (left:1997,right:2011, Forest = green area)

Source: Sumitomo Corporation
"REDD+ Feasibility Study Project Final Report" March 2012

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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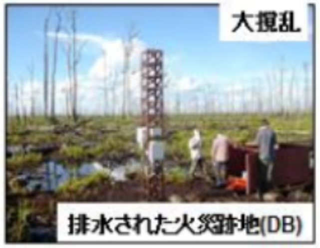
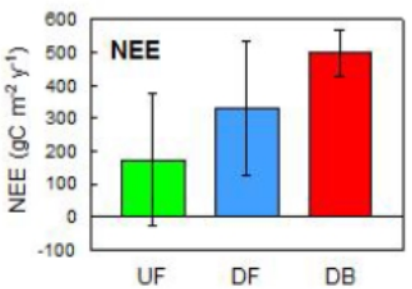
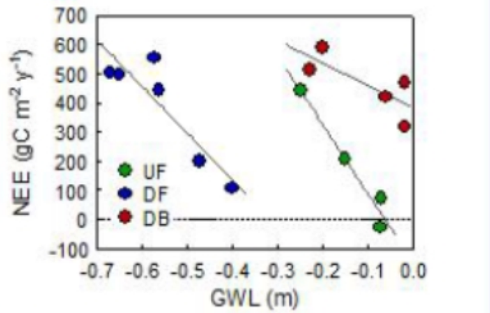


年間CO_2収支の比較(4年間の平均)



- 未攪乱の森林もCO_2ソース!!
- 攪乱が進むとCO_2排出量が増加

地下水位(GWL)と年間CO_2収支の関係



- 地下水位が低下によりCO_2排出量が直線的に増加
- 未攪乱の森林が最も地下水の変化に敏感

NEE:炭素換算のCO_2収支，正値のとき炭素ソース

地球規模課題対応国際科学技術協力　最終報告書
「インドネシアの泥炭・森林における火災と炭素管理」
代表者氏名：大崎満（北海道大学農学研究院　教授）

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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Reference Emission Level (REL)

3つの排出コンポーネントからのCO2排出を、別々に計算:
(1) 泥炭火災
(2) 泥炭分解
(3) 土地利用変化（森林火災含む）

$$REL = \underbrace{EM(P\_Burn) + EM(P\_Decom)}_{\text{Soil organic carbon}} + \underbrace{EM(Land\_Use)}_{\text{Above-ground biomass}}$$

$$EM(P\_Burn) = Area(P\_Burn) \times \underline{\underline{Depth(P\_Burn)}} \times \underline{\underline{Density(P\_Burn)}} \times \underline{\underline{EF(P\_Burn)}}$$

$$EM(P\_Decom) = Area(P\_Drained) \times \underline{\underline{EF(P\_Drained)}}$$

$$EM(Land\_Use) = Area(Land\_Use) \times \underline{\underline{EF(Land\_Use)}}$$

$\underline{\underline{\quad}}$ Reference data

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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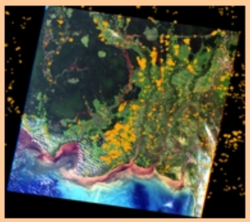
(1) 泥炭火災からのCO2排出量（ホットスポット数・燃焼面積・泥炭密度から算出。）：

EM (P_Burn) = Area (P_Burn) x Depth (P_Burn) x Density (P_Burn) x EF (P_Burn)

"Burnt area" of peat fire



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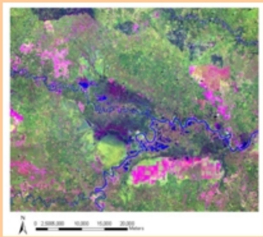

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Fire burnt area

Step1: Count No. of hotspots in the project area [hotspots/y] (MODIS hotspot data)

Step2: Estimate the average fire burnt area / hotspot [ha/hotspot]

Step3: Calculate the fire burnt area [ha/y]

Source: A. Anggraeni, and C. Lin, "Application of SAM and SVM Techniques to Burned Area Detection for Landsat TM Images in Forests of South Sumatra"

"Depth" of burnt peat

<Existing data>
- 1997-2001: 51cm (Page et al,2002)
- 2002-2009: 33cm (Usup A,2005)
  *Average value of 42 cm applied.

<Monitoring data>
- Applying the methodologies "VCS VM004"

"Density" of peat

Peatland Type	n	n_{SC}	Water content (fresh mass)	Carbon Content % (dry mass)	Total pore space (fresh volume)	Dry bulk density kg m^{-3}	Volumetric carbon density kg m^{-3}
Riverine	31	26	87.9 ± 3.2^{a}	55.5 ± 4.2^{bc}	92.1 ± 1.8^{efg}	117 ± 27.5^{h}	64.5 ± 14.0^{jk}
Terrace*	67	1	88.5 ± 3.3^{a}	56.7 ± 5.1^{b}	92.1 ± 1.8^{fg}	124 ± 31.3^{h}	71.5 ± 17.3^{ij}
(woody)	(11)		(91.2 ± 1.6)	(58.9 ± 5.7)	(93.5 ± 1.5)	(95.6 ± 21.7)	(56.3 ± 13.8)
(pure†)	(56)		(88.1 ± 3.3)	(56.4 ± 5.0)	(91.0 ± 2.0)	(130 ± 19.7)	(74.4 ± 16.3)
Basin/Domed	15	0	91.1 ± 2.1^{a}	57.0 ± 4.5^{bc}	93.3 ± 1.5^{def}	98.4 ± 22.3^{h}	55.8 ± 8.7^{kl}
(woody)	(8)		(91.0 ± 2.3)	(55.9 ± 4.4)	(93.3 ± 1.5)	(99.2 ± 25.6)	(54.6 ± 10.9)
(pure†)	(7)		(91.2 ± 1.7)	(58.3 ± 4.4)	(93.2 ± 1.2)	(97.4 ± 17.8)	(57.2 ± 4.9)
Marginal	32	3	91.3 ± 1.9^{a}	56.6 ± 3.9^{bc}	93.8 ± 1.5^{de}	94.9 ± 25.2^{h}	53.6 ± 12.5^{kl}
(woody)	(27)		(91.3 ± 2.0)	(55.9 ± 3.8)	(93.9 ± 1.6)	(95.1 ± 27.2)	(53.1 ± 13.5)
(pure†)	(5)		(91.6 ± 0.5)	(60.3 ± 1.5)	(93.7 ± 0.3)	(93.4 ± 6.5)	(56.2 ± 3.8)
Floodplain	57	2	87.9 ± 2.9^{a}	52.5 ± 8.0^{c}	90.4 ± 2.9^{g}	141 ± 35.1^{h}	72.9 ± 16.2^{ij}
(woody)	(7)		(89.9 ± 1.4)	(50.4 ± 10.3)	(92.9 ± 1.0)	(114 ± 17.7)	(57.2 ± 13.0)
(pure†)	(50)		(87.6 ± 2.9)	(52.8 ± 7.6)	(90.1 ± 2.6)	(145 ± 35.3)	(75.1 ± 15.3)
Coastal**	29	0	90.9 ± 2.3^{a}	57.3 ± 2.8^{b}	94.2 ± 0.8^{d}	84.1 ± 11.5^{h}	48.7 ± 6.3^{l}
Sandy/Clayey layer		32	78.8 ± 10.7	44.3 ± 8.0	88.4 ± 2.5	264 ± 163	83.6 ± 18.7^{ij}
Woody peat (total)	(53)		(91.0 ± 2.0)	(55.8 ± 6.1)	(93.6 ± 1.5)	(98.6 ± 25.6)	(54.5 ± 13.2)

n: number of samples; n_{SC}: number of sandy/clayey layer samples.
†Samples without woody, sandy, clayey peat layers.
*Some data (n = 9) are adapted from Neuzil (1997); **All the data are adapted from Neuzil (1997).

Source: S. Shimada, et. al. 2001

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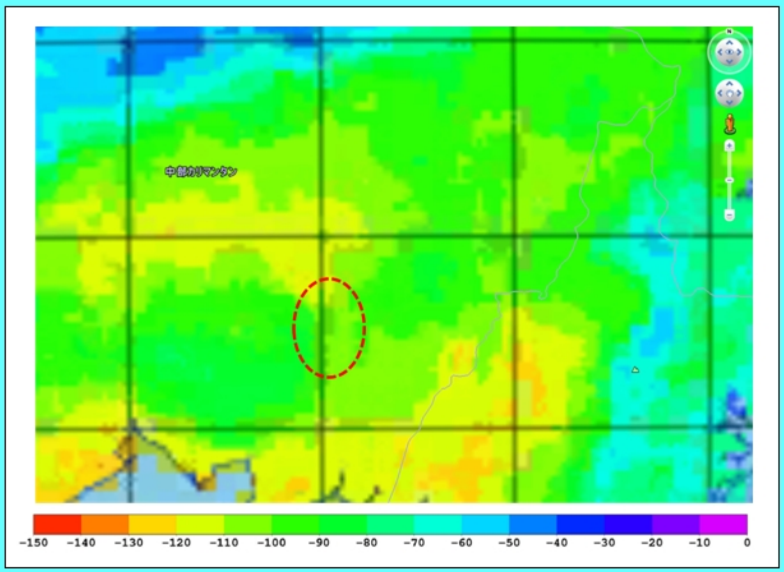
(2)泥炭分解からのCO2排出量（地下水位・水位別排出係数から算出）

EM (P_Decom) = Area (P_Watertable) x EF (P_Watertable)

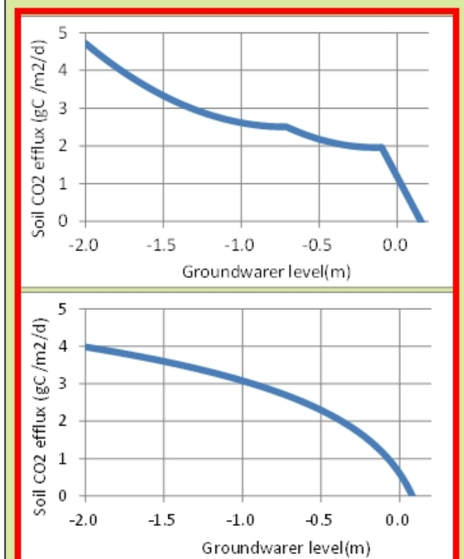
"Watertable" of peatland area



Step1: Identify area according to the water table by using the "water table map"

Source: Takeuchi (http://jica-jst.lapanrs.com/~wataru/GWT/)

"Emission factor" of decomposition of "forest/non-forest" peatland



Peat swamp forest

Peat land non-forest

Step2: Estimate emission factor by using the correlation formula

Source: S.Sundari et al.(2012), T.Hirano et al.(2014), J.Jauhiainen et al.(2012)

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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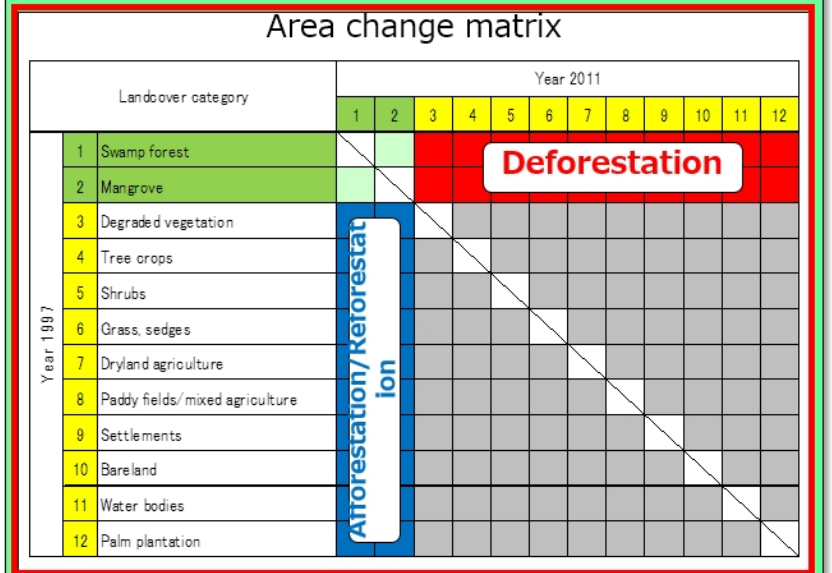
(3)土地利用変化：（インドネシアで採用されているデフォルト値を採用）

EM (Land_Use) = Area (Land_Use) x EF (Land_Use) ── Reference data

"Forest fire & other land-use change" area



Step1: Develop area change matrix based on land use change data between 2 different points of time [ha]

"Emission factor" of land-use, land-use change and forestry

	Penutupan Lahan	Land cover	Carbon stock [tCO2/ha]
1	Hutan Lahan Kering Primer	Primary Dryland Forest	227.59
2	Hutan Lahan Kering Sekunder	Secondary Dryland Forest	173.50
3	Hutan Mangrove Primer	Primary Mangrove Forest	161.00
4	Hutan Mangrove Sekunder	Secondary Mangrove Forest	119.69
5	Hutan Rawa Primer	Primary Swamp Forest	250.50
6	Hutan Rawa Sekunder	Secondary Swamp Forest	206.05
7	Hutan Tanaman Industri	Industrial Forest Plantation	101.90
8	Perkebunan	Plantation	86.85
9	Pertanian Lahan Kering	Dryland Agriculture	12.85
10	Pertanian Lahan Kering Campur	Mixed Dryland Agriculture	15.25
11	Belukar	Shrub	25.68
12	Belukar Rawa	Shrub swamp	25.68
13	Savana	Savana	n/a
14	Sawah	Field	6.00
15	Rawa	Swamp	0.00
16	Tambak	Embankment	0.00
17	Transmigrasi	Transmigration	12.00
18	Permukiman	Settlement	1.20
19	Bandara	Airport	6.00
20	Pertambangan	Mining	0.00
21	Tanah Terbuka	Open land	n/a
22	Badan Air	Water area	n/a

Source: Central Kalimantan REL team: "Documen REL Provinsi Kalimantan Tengah, Draft"

Step2: Applying emission factor based on the existing literature [tCO2/ha]

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

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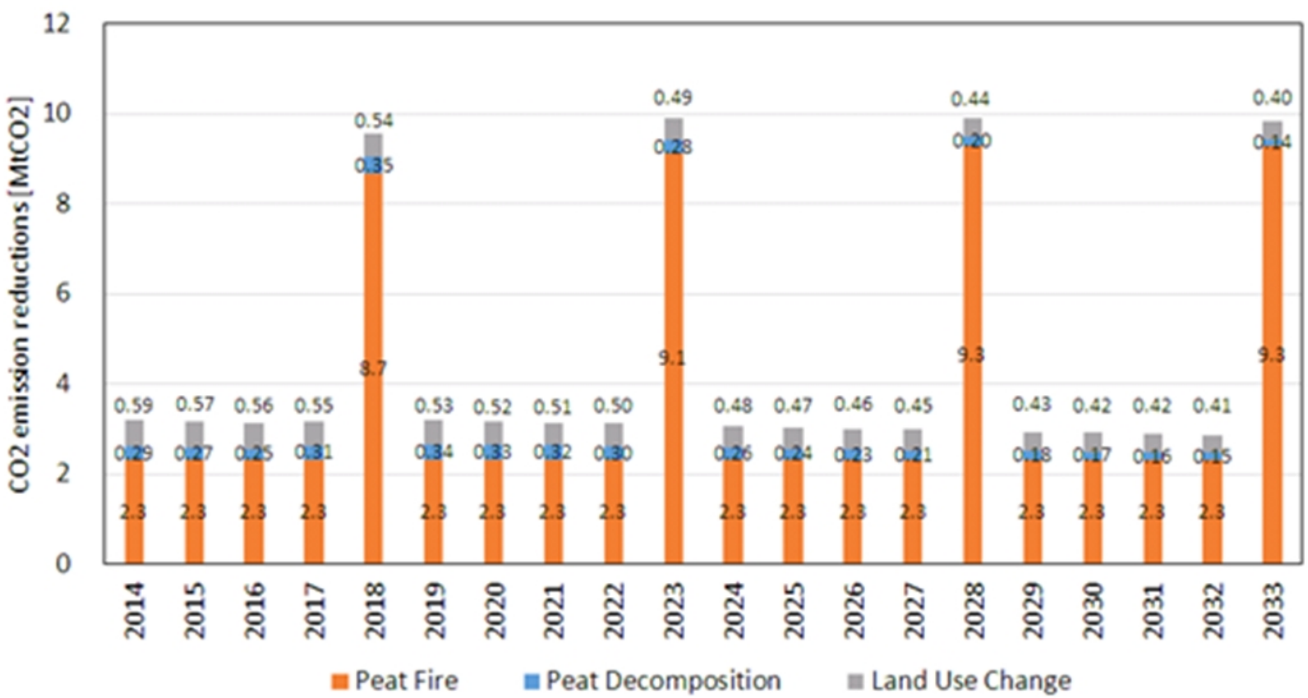
排出削減量の試算（ブロックB・C北地区、18.7万ha）

- 20年間で8,800万トンの削減量（年平均440万トン）
  - エルニーニョ年: **980万トンCO2**
  - 通常年: 310万トンCO2



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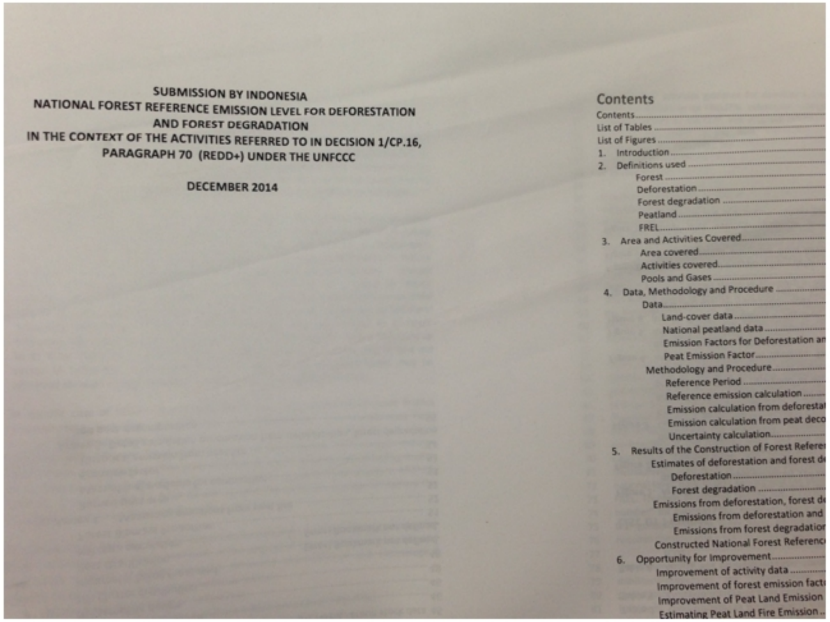
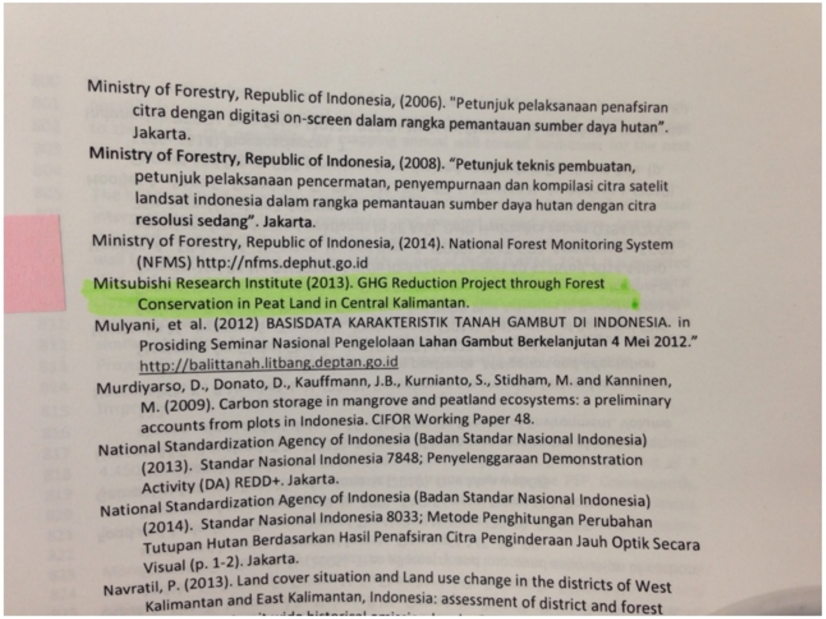
木と生きる幸福
住友林業


SUBMISSION BY INDONESIA
NATIONAL FOREST REFERENCE EMISSION LEVEL FOR DEFORESTATION AND FOREST DEGRADATION
IN THE CONTEXT OF THE ACTIVITIES REFERRED TO IN DECISION 1/CP.16, PARAGRAPH 70 (REDD+) UNDER THE UNFCCC

DECEMBER 2014

Contents


Ministry of Forestry, Republic of Indonesia, (2006). "Petunjuk pelaksanaan penafsiran citra dengan digitasi on-screen dalam rangka pemantauan sumber daya hutan". Jakarta.
Ministry of Forestry, Republic of Indonesia, (2008). "Petunjuk teknis pembuatan, petunjuk pelaksanaan pencermatan, penyempurnaan dan kompilasi citra satelit landsat indonesia dalam rangka pemantauan sumber daya hutan dengan citra resolusi sedang". Jakarta.
Ministry of Forestry, Republic of Indonesia, (2014). National Forest Monitoring System (NFMS) http://nfms.dephut.go.id
Mitsubishi Research Institute (2013). GHG Reduction Project through Forest Conservation in Peat Land in Central Kalimantan.
Mulyani, et al. (2012) BASISDATA KARAKTERISTIK TANAH GAMBUT DI INDONESIA. in Prosiding Seminar Nasional Pengelolaan Lahan Gambut Berkelanjutan 4 Mei 2012." http://balittanah.litbang.deptan.go.id
Murdiyarso, D., Donato, D., Kauffmann, J.B., Kurnianto, S., Stidham, M. and Kanninen, M. (2009). Carbon storage in mangrove and peatland ecosystems: a preliminary accounts from plots in Indonesia. CIFOR Working Paper 48.
National Standardization Agency of Indonesia (Badan Standar Nasional Indonesia) (2013). Standar Nasional Indonesia 7848; Penyelenggaraan Demonstration Activity (DA) REDD+. Jakarta.
National Standardization Agency of Indonesia (Badan Standar Nasional Indonesia) (2014). Standar Nasional Indonesia 8033; Metode Penghitungan Perubahan Tutupan Hutan Berdasarkan Hasil Penafsiran Citra Penginderaan Jauh Optik Secara Visual (p. 1-2). Jakarta.
Navratil, P. (2013). Land cover situation and Land use change in the districts of West Kalimantan and East Kalimantan, Indonesia: assessment of district and forest

・昨年12月にインドネシアREDD+庁（BP-REDD+）から国連に提出された、全国レベルの森林REL（F-REL）算出の一部に、本MRV方法論が採用される。

・本年3月に、日本政府に対して、二国間クレジットMRV方法論として提案予定。

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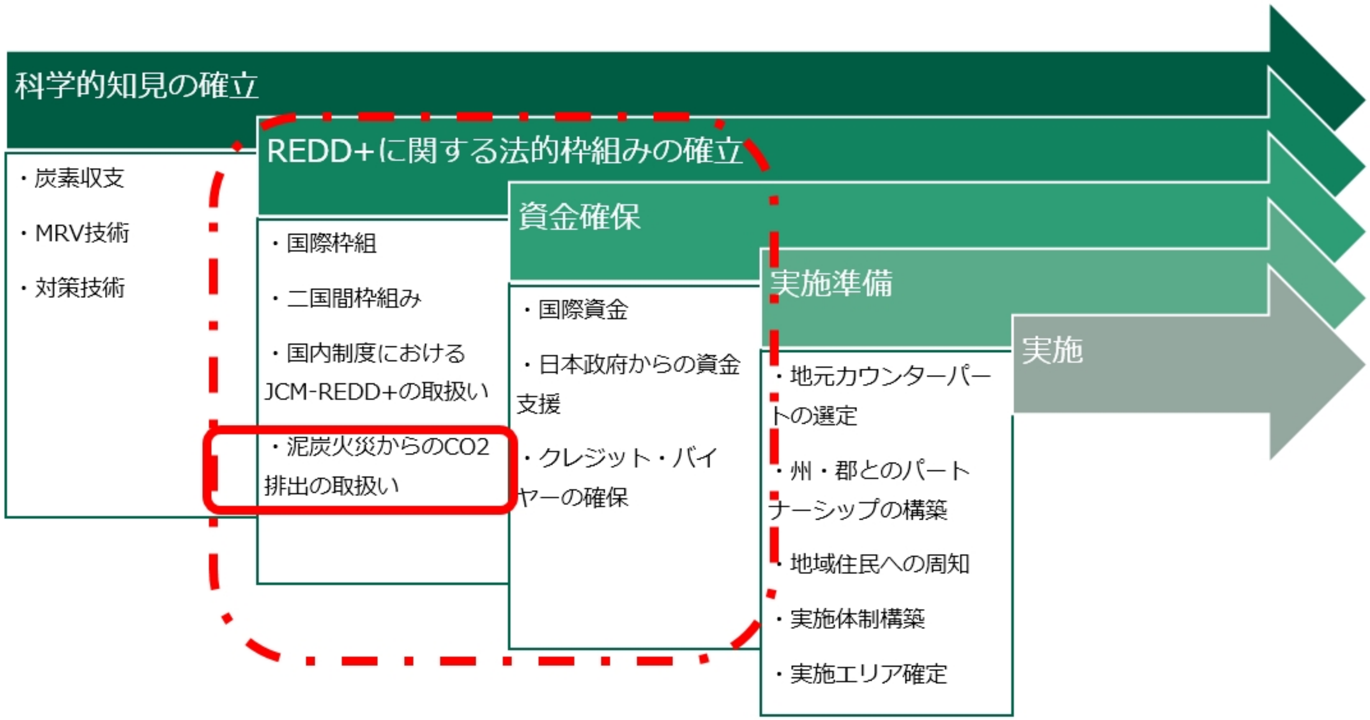
インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

どうすれば二国間クレジット化できるか？

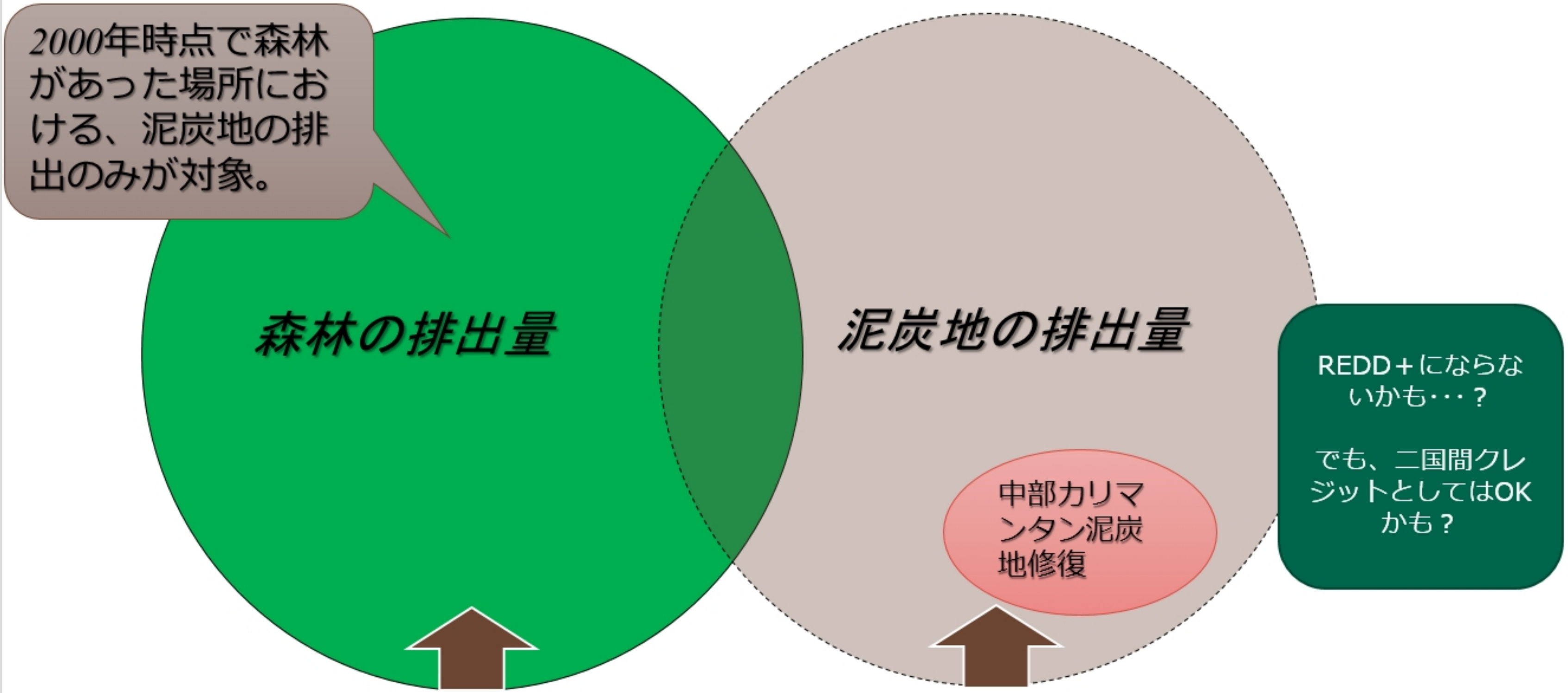


枠組み、資金確保については、なるようにしかならないが…

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

2014年12月にインドネシア政府が国連に提出した、森林由来排出量
（約15億トンCO2の内訳）



森林からの排出として、
国連に提出済み排出量

森林からの排出量となるか
未確定の排出量

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

どうすれば二国間クレジット化できるか？

科学的知見の確立
・炭素収支
・MRV技術
・対策技術

REDD+に関する法的枠組みの確立
・国際枠組
・二国間枠組み
・国内制度における JCM-REDD+の取扱い
・泥炭火災からのCO2排出の取扱い

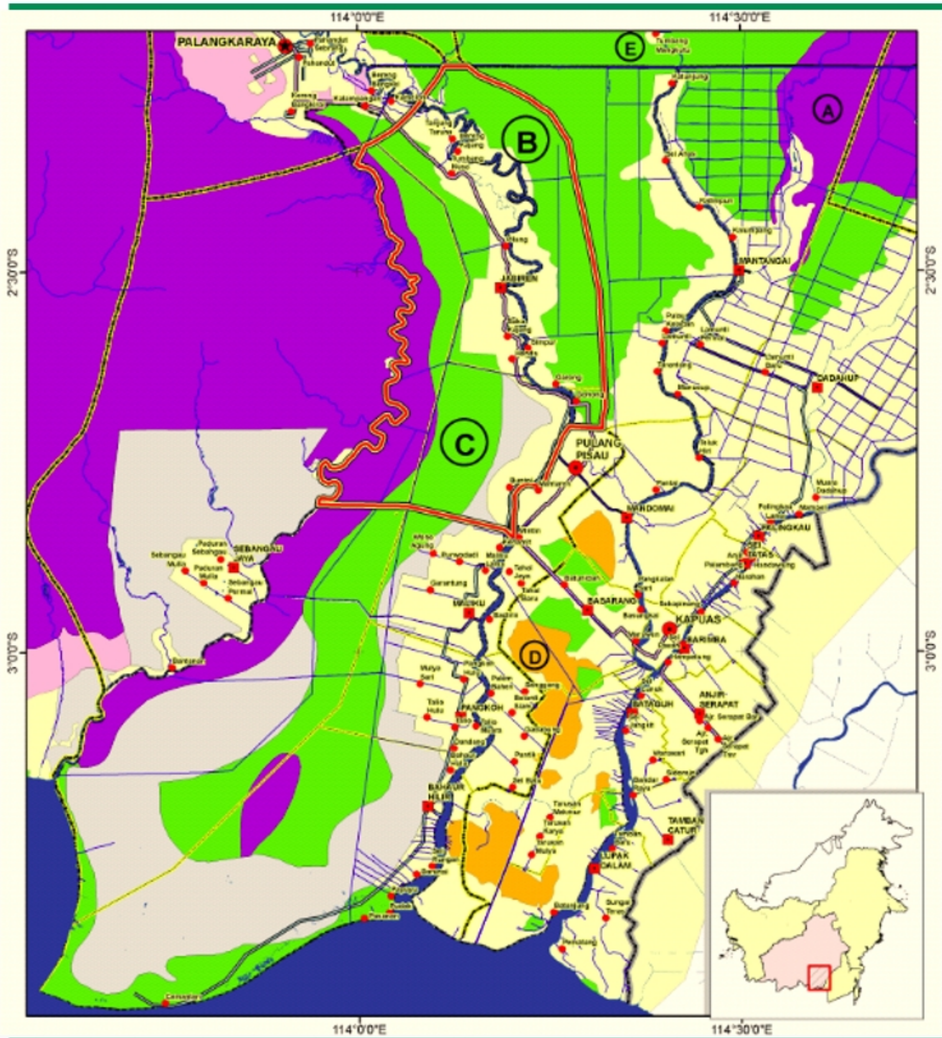
資金確保
・国際資金
・日本政府からの資金支援
・クレジット・バイヤーの確保

実施準備
・地元カウンターパートの選定
・州・郡とのパートナーシップの構築
・地域住民への周知
・実施体制構築
・実施エリア確定

実施

インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業



保護林

保全林

生産林

その他エリア

・メガライス・プロジェクト跡地の一部エリアから、プランピサウ郡全域（Jurisdictional Level）へのFS対象領域の拡大を提案中。

・この際のカウンターパートは、プランピサウ郡政府。

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インドネシア・中部カリマンタン州における取り組み（泥炭地修復事業の二国間クレジット化）

木と生きる幸福
住友林業

自信を持って提案できる対策・MRVスキームを構築し、Jurisdictionと協働しつつREDD+/二国間クレジット化を実現していくことが目標。

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（最後に）住友林業がREDD+に取り組む目的

木と生きる幸福
住友林業

1. 企業の社会的責任として

- 森林保全・環境保全への貢献
- 途上国持続的な発展への貢献
- 日本の削減目標達成への貢献

2. 森林の持続的利用への貢献

- 安定的な木材資源の確保
- 当社の持続的森林経営ノウハウの活用

3. 新しい環境ビジネスとして

- 排出権創出ビジネス
- 調査・請負・コンサルティング
- REDD+より派生するビジネス

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木と生きる幸福
住友林業

お知らせ

JICA殿主導の
REDD+官民プラットフォーム

51

木と生きる幸福
住友林業

『世界を変える森林保全プラットフォーム
～Green Earth Platform （仮称）』の設立について

2014年11月

独立行政法人 国際協力機構 地球環境部
独立行政法人 森林総合研究所 REDD研究開発センター

1.熱帯林保全をめぐる現状

熱帯林の保全は喫緊の課題です。
森林は、有史以来私たちの生活を育んできました。しかし、20世紀以降、人類の経済活動により森林は急速に減少しつつあります。過去およそ半世紀にわたり、各国政府や国際機関のみならず、市民

- 国内のREDD+に対する普及啓もうと、民間企業の参画促進を目指して、2014年11月7日に設立。
- REDD+に関心のある企業のほか、環境省・林野庁などが参加。
- 関係者のノウハウ共有や、REDD+を活用したビジネスモデルの開発を狙う分科会も設立。

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木と生きる幸福

住友林業

http://sfc.jp

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第３章

REDDプロジェクトPDDの作成に向けて②

コンサベーション・インターナショナル・ジャパン
政策・パートナーシップシニアマネージャー
浦口　あや

2015/1/21
REDDプラスに係る森林技術者講習会　応用講習b

REDDプロジェクトPDDの作成に向けて②

コンサベーション・インターナショナル・ジャパン
政策・パートナーシップシニアマネージャー
浦口あや

自然を守ることは、人間を守ること。

CONSERVATION INTERNATIONAL

1

今日の内容

1. CIの紹介
2. フィリピンの事例：現場から
3. 炭素の定量化方法（森林再生）
4. ペルーの事例：現地から
5. 炭素の定量化（森林保全）
6. Jurisdictional Nested REDD+

CONSERVATION INTERNATIONAL
Japan

2

1. CIの紹介

自然を守ることは、人間を守ること。

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3

団体概要

✧<u>設立</u>：1987年（日本では1990年より活動開始）

✧<u>組織</u>：国際環境NGO

✧<u>事務所</u>：26カ国　米国バージニア州(本部）、各地域事務所　（アフリカ、アジア太平洋、中央アメリカ、南アメリカ）、欧州、日本、シンガポール、香港

✧<u>スタッフ</u>：約900名（ＣＩジャパンは7名＋インターン生）

✧<u>活動対象地</u>：生物多様性ホットスポット、原生地域、シースケープ

✧<u>活動パートナー</u>：政府、企業、国際機関、大学、NGO等

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CIのVisionとMission

Vision

自然は、人と地球上すべての生命に長期的な恩恵をもたらしてくれます。この自然を守り、尊重しつづける社会、健やかで繁栄した世界を私たちは目指します。

Mission

「科学」、「パートナーシップ」、そして「世界各地での実践」に基づき、次世代に豊かな自然を引き継いでいく社会を実現し、人類の幸福に貢献します。

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ミッションの変更、ロゴの変更

People need nature to thrive

人間を守るために、自然を守る。

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⇧

自然を守るために、自然と調和した人間の暮らしを実現する。

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CIが取組む分野

気候変動

淡水

衛生・健康

食糧

文化サービス

生物多様性

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中心の考え、アプローチ

人類の幸福　human well-being

安全保障　securities
気候、生物、水、食糧、健康、文化

持続可能な
生産、消費、市場、ファイナンス、体制….

自然資本

生態系サービス

健全な生態系、生物多様性

科学

政策

経済・マーケット

能力向上への支援

実践モデル

普及・啓発

CONSERVATION INTERNATIONAL

2. フィリピンの事例：現場から

自然を守ることは、人間を守ること。

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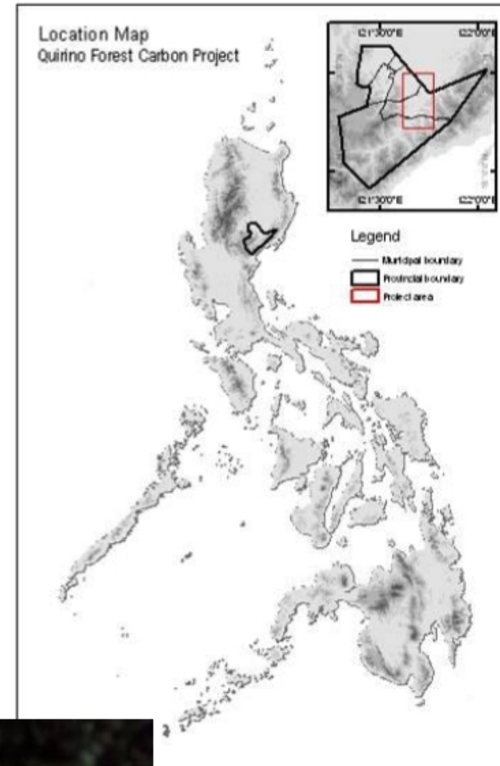
キリノ森林再生プロジェクトの対象地

- ❑対象地：フィリピン・キリノ州
  - ➢フィリピンに残された貴重な森林を有するシエラマドレ生物多様性コリドー
  - ➢重要な水源地
  - ➢約半数の世帯が年間1,000ドル～2,000ドルで生活
- ❑現状
  - ➢キリノ州では、トウモロコシ畑が急速に拡大。しかし、痩せた土地での生産には多量の肥料を要し、経済性低い。また、バナナ萎縮病ウィルスの蔓延し、バナナ栽培の継続が困難。
  - ➢代替生計手段がない中、土地の荒廃化と森林減少が続く。



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Japan
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現地での取組み

- 2007年より、森林再生とアグロフォレストリー開始
- 対象地
  - 177 ha（108区画）
  - 使用権の与えられた国有地（Integrated Social Forestry）
- モア・トゥリーズが活動を支援
  - ミッション：『森づくりを通じて、持続可能な地域活性を実現し、地球環境へも長期的に貢献する』
- 現地でのパートナー
  - People`s Organization（POs）
  - 環境天然資源省、キリノ州、マデラ市、ナグティプナン市
  - 地元NGO（PEDAI）
- 活動内容
  - 森林再生（荒廃した牧草地及び農地への自生種の植林）
  - アグロフォレストリー（かんきつ類等の果樹）
  - 苗畑管理、苗作り
  - POに対する能力開発（生計向上）
  - 年次評価会

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森林再生＆アグロフォレストリーの植林モデル

森林再生

樹種

- *Pterocarpus indicus* (Narra)
- *Vitex parviflora* (Molave)
- *Dracontomelon dao* (Dao)
- *Shorea palosapis* (Palosapis)
- *Toona calantas* (Kalantas)
- *Bishofia javanica* (Tuai)
- *Sapium luzonicum* (Balakat-gubat)

密度

- 3 x 3 m
- 間伐: 900 -> 700 -> 500 stems/ha

植付け年

- 2007, 2009, 2010

アグロフォレストリー

樹種

- *Citrus decumana* (Pomelo)
- *Lansium domesticum* (Lanzones)
- *Nephelium lappaceum* (Rambutan)

密度

- 8 x 8 m

植付け年

- 2007, 2009, 2010 (2011)

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森林再生＆アグロフォレストリー：活動

- 住民コンサルテーション
- 調査、マッピング
- 樹種決定
- 植林の準備
  - 草刈り
  - 穴堀り
  - 苗運搬
- 苗の植付け
- 定期的な世話
  - 雑草取り
  - 見廻り
  - 補植（生存率80%）
- 防火帯の管理
- 家畜侵入の防止
  - 既存の放牧地への移動
  - 違法な放牧の防止
  - 柵の設置

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苗の生産、苗畑管理


苗畑の様子：左、SUBEFO ； 右、STISFA


挿し木栽培のトレーニングの様子

- ❖ プロジェクトの苗
- ❖ 収入源

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POに対する能力開発（生計向上）

- 帳簿管理
  - 苗販売から売り上げを管理するめの口座を開設
- バナナチップ加工
  - 労働雇用省との協力でとトレーニングを実施
  - 女性グループの興味が高い
- 挿し木栽培
  - 現在は外部から購入している果樹の栽培技術を獲得し、収入源につなげることを目指し、トレーニングを実施
- 視察
  - 地元政府と共に、植林、コミュニティ林や水源地の保全で成功しているルソン島北端のカガヤン州の複数の組合を訪問。組合の目標や方針作り、運営方法、生計改善プロジェクトの実現等学習
  - 環境管理における先駆的存在として知られるキリノ州隣のヌエバ・ビズカヤ州のKalahan Educational Foundation を訪問

CONSERVATION INTERNATIONAL Japan 15

POに対する能力開発（生計向上）

- PEDAIから果樹の提供
  - 森林再生に取り組む各農家に20本の果樹の苗の提供。
- 生計向上プロジェクト
  - 本プロジェクトを核にして、POを外部支援（地方政府等）につなげることにより、実施
  - SUBEFO：アヒル飼育を開始。アヒル（25羽）は、Q-LIFE（州知事と副知事によるイニシアティブ）が提供
  - STISFA：高利貸に頼らざるを得ない現状への対応として、肥料等の農業のための投入のための低金利ローンを開始（Farm Input Loan）。初期原資は、苗の販売、会費、DENRのNational Greening Programからの収入を活用
  - DSAFA：バナナチップ生産が2014年度に開始

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年次評価会

- 定常的な対話に加え、年に一回評価会を開催
- 昨年の評価会で出された課題と解決策の一部：

課題	解決策
現在実施中の取り組み	
家畜の放牧	バランガイ法令、パトロール強化
肥料と苗の長距離運搬	農地と市場をつなぐ道路の改善等
野火	防火帯の管理の徹底
境界線をめぐる問題	MLGU（町レベルの自治体）の助けによる境界線の調査
その他	
追加の肥料と生計向上プロジェクト	Q-LIFEを通じてPLGUに有機肥料作成のトレーニング要請
CSCの失効	DENRから更新を要請
生計向上トレーニングの不足	追加のトレーニングを実施

CONSERVATION INTERNATIONAL Japan

17

森林プロジェクトと森林炭素プロジェクト

目的


＋

持続可能性（水、農業etc） 生物多様性 気候変動緩和

||（同じ）

現地での活動

＋炭素の定量化
＋権利の移転
＋etc

健全な生態系
気候変動への適応にも必須

＋財政面での継続性
＋規模の拡大

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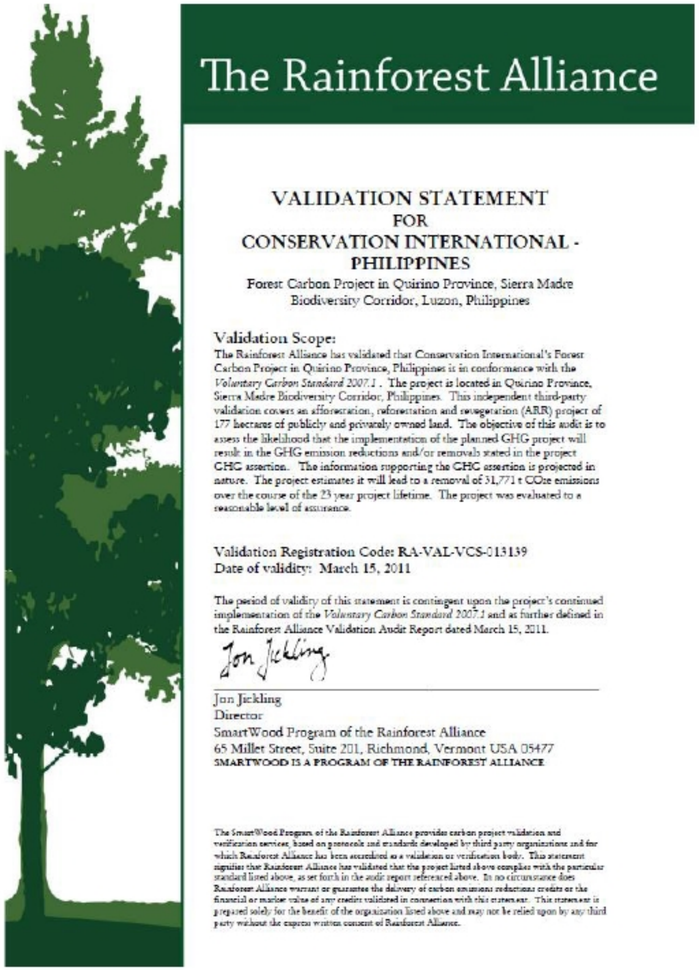
VCS＋CCBS

- ❑ Standard
  - ➢ 2010.6：CCBSゴールド
  - ➢ 2011.3：VCS
- ❑ アジア初のVCS/CCBSダブル有効化プロジェクト
- ❑ 有効化審査
  - ➢ バリデーター
    –Rainforest Alliance
  - ➢ 審査スケジュール

レビュー期間
2009/7/22-25
2009/11/8-10
2010/7/12-16
2011/2/16-17、3/2-3



The Rainforest Alliance

VALIDATION STATEMENT
FOR
CONSERVATION INTERNATIONAL - PHILIPPINES
Forest Carbon Project in Quirino Province, Sierra Madre Biodiversity Corridor, Luzon, Philippines

Validation Scope:
The Rainforest Alliance has validated that Conservation International's Forest Carbon Project in Quirino Province, Philippines is in conformance with the *Voluntary Carbon Standard 2007.1* . The project is located in Quirino Province, Sierra Madre Biodiversity Corridor, Philippines. This independent third-party validation covers an afforestation, reforestation and revegetation (ARR) project of 177 hectares of publicly and privately owned land. The objective of this audit is to assess the likelihood that the implementation of the planned GHG project will result in the GHG emission reductions and/or removals stated in the project GHG assertion. The information supporting the GHG assertion is projected in nature. The project estimates it will lead to a removal of 31,771 t CO2e emissions over the course of the 23 year project lifetime. The project was evaluated to a reasonable level of assurance.

Validation Registration Code: RA-VAL-VCS-013139
Date of validity: March 15, 2011

The period of validity of this statement is contingent upon the project's continued implementation of the *Voluntary Carbon Standard 2007.1* and as further defined in the Rainforest Alliance Validation Audit Report dated March 15, 2011.

Jon Jickling
Director
SmartWood Program of the Rainforest Alliance
65 Millet Street, Suite 201, Richmond, Vermont USA 05477
SMARTWOOD IS A PROGRAM OF THE RAINFOREST ALLIANCE

The SmartWood Program of the Rainforest Alliance provides carbon project validation and verification services, based on protocols and standards developed by third party organizations and for which Rainforest Alliance has been accredited as a validation or verification body. This statement signifies that Rainforest Alliance has validated that the project listed above complies with the particular standard listed above, as set forth in the audit report referenced above. In no circumstance does Rainforest Alliance warrant or guarantee the delivery of carbon emissions reductions credits or the financial or market value of any credits validated in connection with this statement. This statement is prepared solely for the benefit of the organization listed above and may not be relied upon by any third party without the express written consent of Rainforest Alliance.

CONSERVATION INTERNATIONAL
Japan

3. 炭素の定量化（森林再生）

自然を守ることは、人間を守ること。

CONSERVATION INTERNATIONAL

森林炭素クレジットの取引状況

MARKET*	Volume		Value		Average Price	
	2012	2013	2012	2013	2012	2013
Voluntary	22.3 M	29.0 M	$147 M	$140 M	$7.6	$4.8
California**	1.5 M	1.7 M	$12 M	$16 M	$8.2	$9.4
Australia CFI**	2.9 M	1.5 M	$38 M	$32 M	$13.3	$20.8
CDM/JI	0.5 M	0.0 M	$0.6 M	$0.2 M	$1.1	$6.0
NZ ETS	0.2 M	0.0 M	$1.9 M	-	$7.9	-
Other	0.6 M	0.4 M	$15.6 M	$3.9 M	$25.3	$9.8
Voluntary Total	27 M	29 M	$198 M	$140 M	$7.7	$4.8
Compliance Total	1 M	4 M	$18.1 M	$52.4 M	$10.5	$9.7
Grand Total	28 M	32.7 M	$215.8 M	$192.1 M	$7.8	$5.2
Primary Market	22 M	30 M	$137 M	$153 M	$7.5	$5.0
Secondary Market	6.3 M	2.2 M	$57 M	$16 M	$9.8	$6.9

Notes: Based on 32.7 $MtCO_2e$ in transactions reported by 136 forest carbon offsets project developers and retailers.
*See acronyms list for explanation of market abbreviations. Totals in this chart may not add up perfectly due to rounding.
**The California and Australia markets were pre-compliance in 2012 but transitioned to compliance in 2013.

Source: Forest Trends' Ecosystem Marketplace. *State of the Forest Carbon Markets 2014.*

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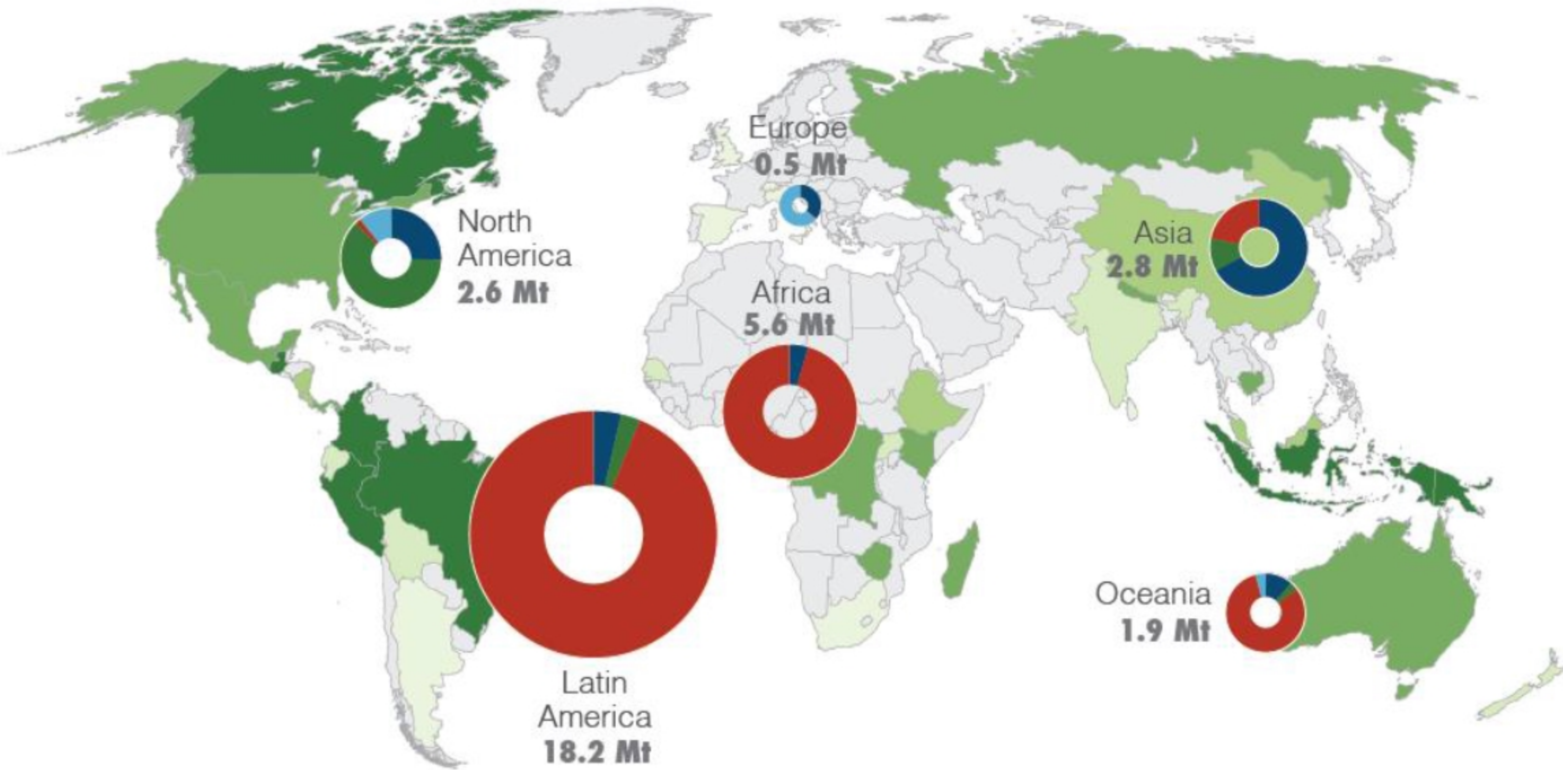
森林炭素クレジットの起源（場所、種類）

Figure 35: Hectares Impacted by Country Location, Total Regional Transaction Volume and Share by Project Type (Total Hectares by Country and % Share)



Map key: Hectares Impacted: 100+ 10,000+ 50,000+ 100,000+ 1,000,000+

Chart key: Transaction Volume and Share by Project Type: A/R IFM REDD SALM/Agroforestry

Notes: Based on responses associated with 30.1 million hectares of carbon project area and 29.4 $MtCO_2e$ transacted.

Source: Forest Trends' Ecosystem Marketplace. *State of the Forest Carbon Markets 2014.*

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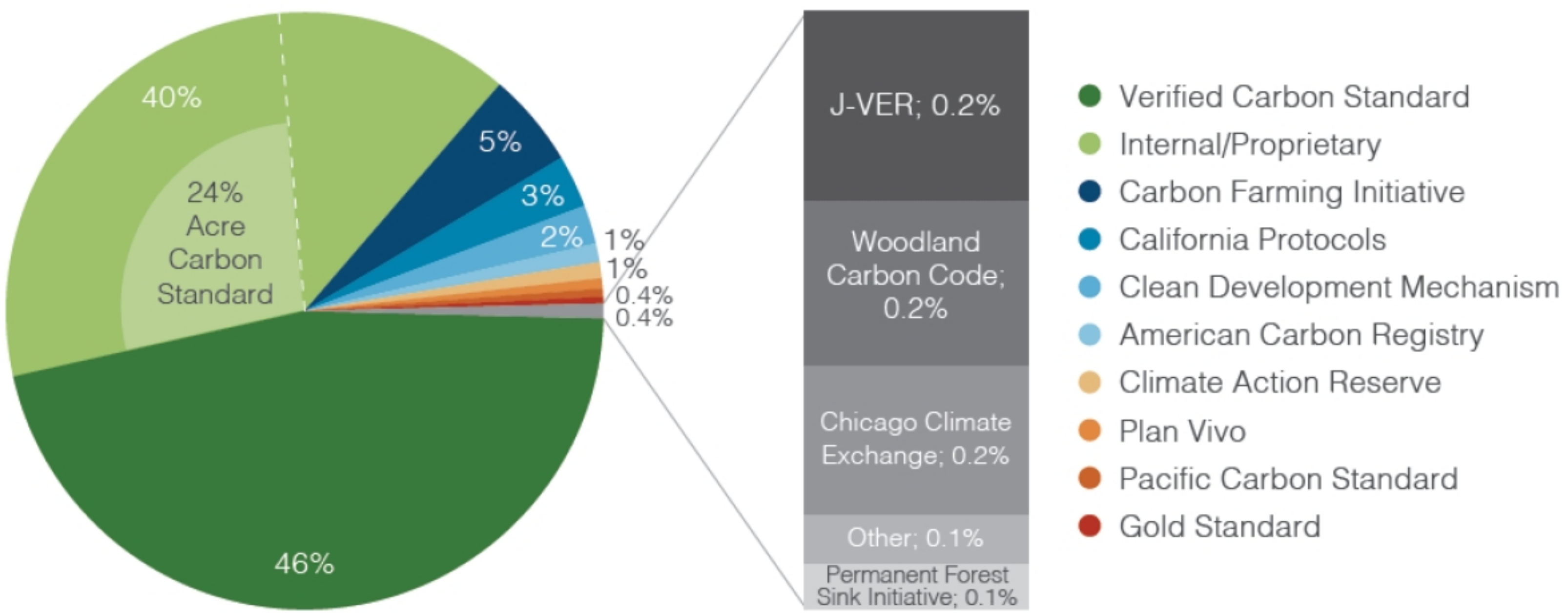
使われているスタンダード・認証

Figure 7: Market Share by Standard/Certification Type, All Markets 2013



Notes: Based on the 32.2 $MtCO_2e$ transacted under a standard in 2013.

Source: Forest Trends' Ecosystem Marketplace. *State of the Forest Carbon Markets 2014.*

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REDD+の活動種類と方法論

UNFCCC REDD+ activities	Specific VCS project activities
RED (Reducing Emissions from Deforestation)	APD (avoided planned deforestation)
	AUD (avoided unplanned deforestation)
REDD (Reducing Emissions from Degradation)	AUDD (avoided unplanned degradation)
	RIL (reduced impact logging)
	LtPF (logged to protected forest)
	ERA (extended rotation age)
REDD+ (Sustainable management of forests and enhancement of forest carbon stocks)	LtHP (low productive to high-productive forest)
	ARR (afforestation, reforestation and revegetation)
Non-REDD	Agricultural Land Management (ALM)
	Avoided Conversion of Grasslands and Shrublands (ACoGS)
	Peatland Rewetting and Conservation (PRC)

VCSで適用できる方法論
VCS方法論＋CDM方法論+Climate Action Reserve (CAR)方法論

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方法論への変更/逸脱

- Deviations
  - 方法論に定められた測定手法に関して変更を加えること。排出削減量の勘定の保守性に影響を与えない軽微な変更を想定している。PDに記載し、有効化審査の過程で審査を受ける。
- Revisions
  - Deviationとは認められない変更を加えること。新規方法論の申請と同じ手続きが必要とされる。

Deviation、Revision或いは新規方法論なのかの判断が難しい場合には、VCS等に問い合わせることが推奨される。

VCS方法論の概要

❑ プロジェクト開始日
- GHG排出抑制の活動が開始した日
- 2008年3月8日以降の開始の場合、5年以内にバリデーション完了

❑ クレジット期間
- 20年～100年（一部例外あり）
- ベースラインは10年ごとに再設定

❑ プロジェクト期間
- プロジェクト活動が継続する期間
- 最低30年

❑ リスク

Internal Risk	External Risk	Natural Risk
Project Management Financial Viability Cost Project Longevity	Land tenure Community engagement Political risk	Fire and disease outbreaks Extreme weather Geological risks Other natural risks

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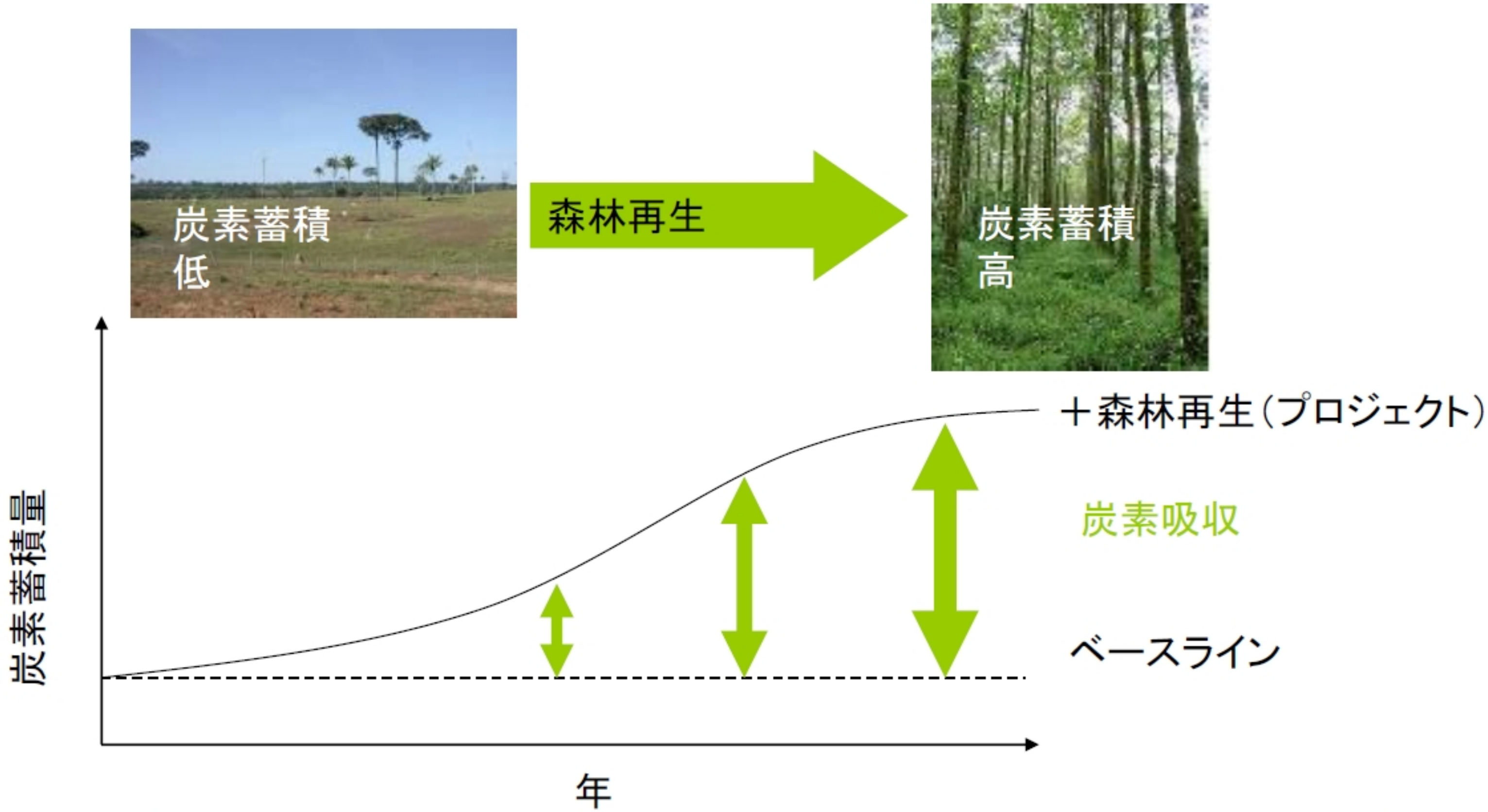

炭素クレジット= プロジェクト活動に由来する炭素吸収
－ベースライン吸収－プロジェクト排出－リーケージ

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森林再生プロジェクトにおける炭素クレジットの考え方

森林再生の場合の方法論

- AR-CDMの方法論
  - AR-AM0014：Afforestation and reforestation of degraded mangrove habitats --- Version 3.0
  - AR-ACM0003：Afforestation and reforestation of lands except wetlands --- Version 2.0
    - （Replaces: AR-ACM0001，AR-ACM0002，AR-AM0002，AR-AM0004，AR-AM0005，AR-AM0007，AR-AM0009，AR-AM0010，AR-AM0011，AR-AM0012，AR-AM0013）
  - AR-AMS0003：Afforestation and reforestation project activities implemented on wetlands --- Version 3.0
  - AR-AMS0007：Afforestation and reforestation project activities implemented on lands other than wetlands --- Version 3.0

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キリノプロジェクトの ベースラインシナリオ、プロジェクト活動

- ベースライン
  - 代替シナリオの特定
    - –炭素プロジェクトではない森林再生
    - –荒廃した放牧地、農地の継続
  - バリア分析
    - –投資バリアー、技術的バリアーにより、炭素プロジェクトではない森林再生プロジェクトは起こりえない
    - –荒廃した放牧地、農地の継続がベースライン
- プロジェクト活動
  - 植林（木を植える）
  - *家畜の排除*
  - *農地利用のための幼樹を含む植生除去の禁止*
- 検討が必要なリーケージ源
  - 放牧地の移転
  - 農地の移転

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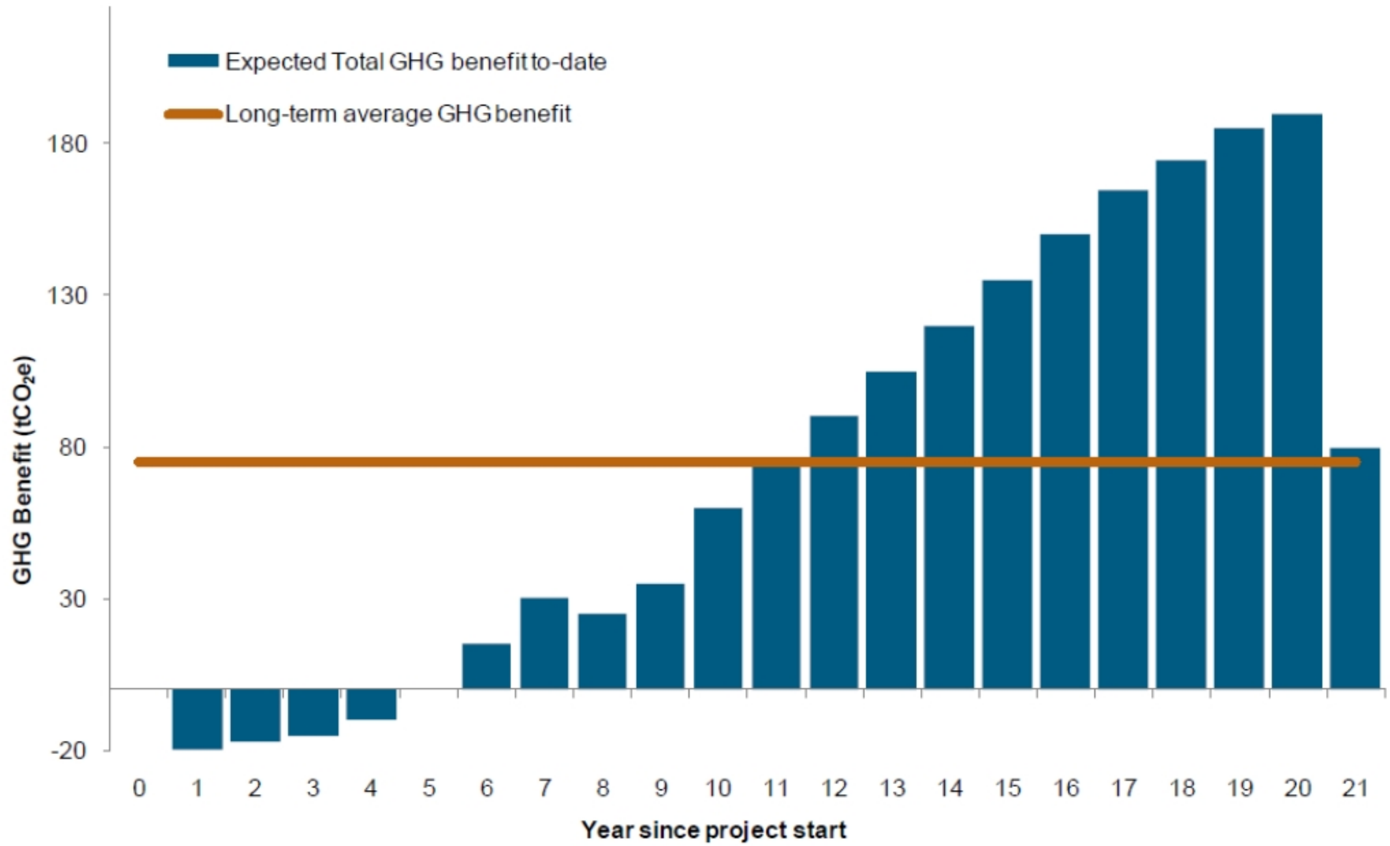
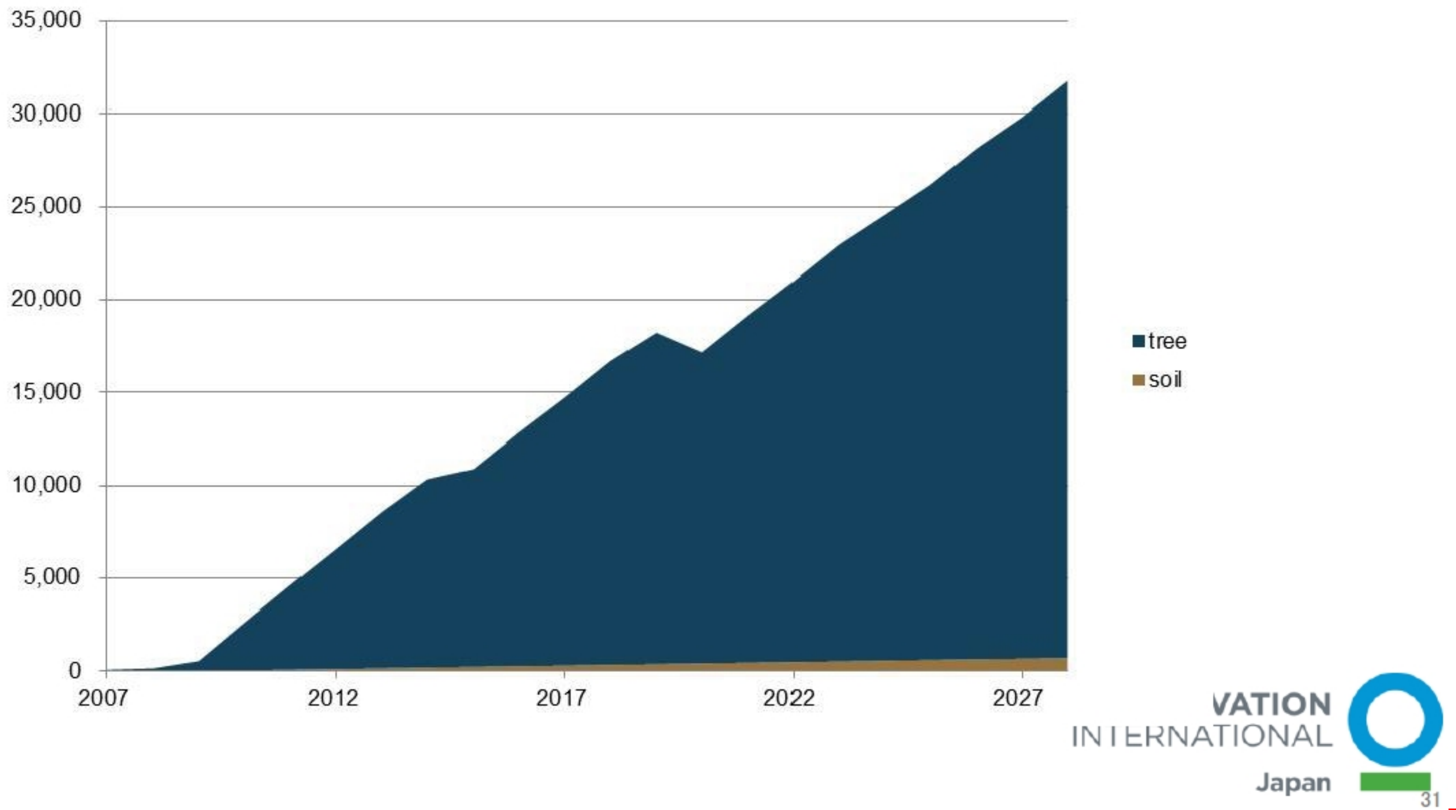
（参考）森林再生プロジェクトの場合の伐採（収穫）

- ❑ 木材の収穫が計画されている場合、Long-Term Average Carbon Stock（炭素蓄積量の長期的平均）が総クレジット量の上限となる



キリノプロジェクトの事前推定

- ❑ 基本的な考え方
  - ➢ 地上部年成長材積 x バイオマス拡大係数 x 密度 x 地上部地下部比（又はアロメトリー） x 面積



バリデーションで苦労した点と教訓

- 苦労した点
  - 使用するパラメータが保守的であることの論証
  - 植林プロジェクトの場合のプロジェクト期間の考え方がVCSのルール上あいまいであった（ver.3では明確化）ため、解釈が定まらず、土地所有者とのAgreementの修正が必要となった
  - クレジット販売からの収益を想定した設計のファイナンシャルリスクが高いと判断され、ドナーとの契約を変更した

- 教訓
  - バリデーターやVCS事務局とのコミュニケーションを有効に行う
    - ルールの解釈については、バリデーターやVCS事務局に確認する。
    - VCS事務局は、現場の経験に基づく助言を歓迎しているので、納得できないルールや記載については、真意を問い合わせ、改善案を提案すると良い。
  - 現地の担当者の理解度を上げ、また工夫して、一緒に作業できる環境をつくる
  - 可能な限り短時間でＰＤを完成させる
  - （常識は捨て、バリデーターが評価できる材料と論理を整えることに専念する）

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4. ペルーの事例：現地から

自然を守ることは、人間を守ること。

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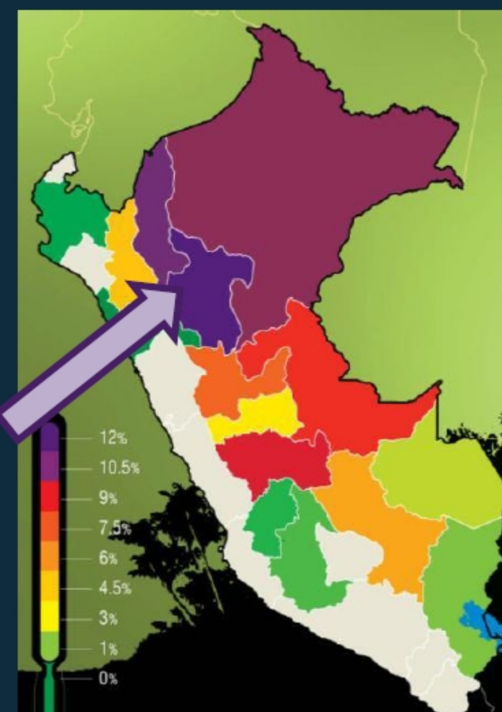
ペルーの事例

- ◆面積：日本の3.4倍 （129百万ヘクタール）
- ◆森林面積：53% （67百万ヘクタール）
- ◆年森林減少率1990–2000：0.2%=15万ha
- ◆2020年までに森林減少を止めることを宣言

- ◆サンマルティン州：
  高い森林減少率



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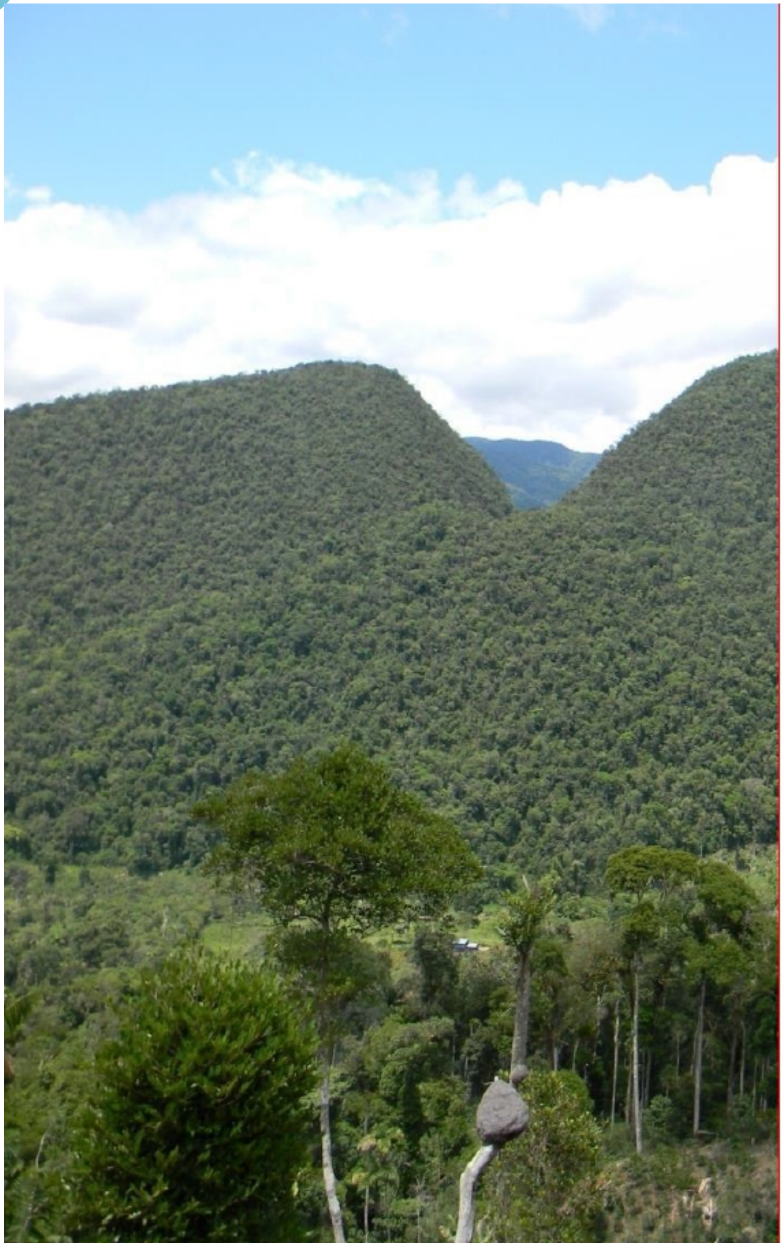
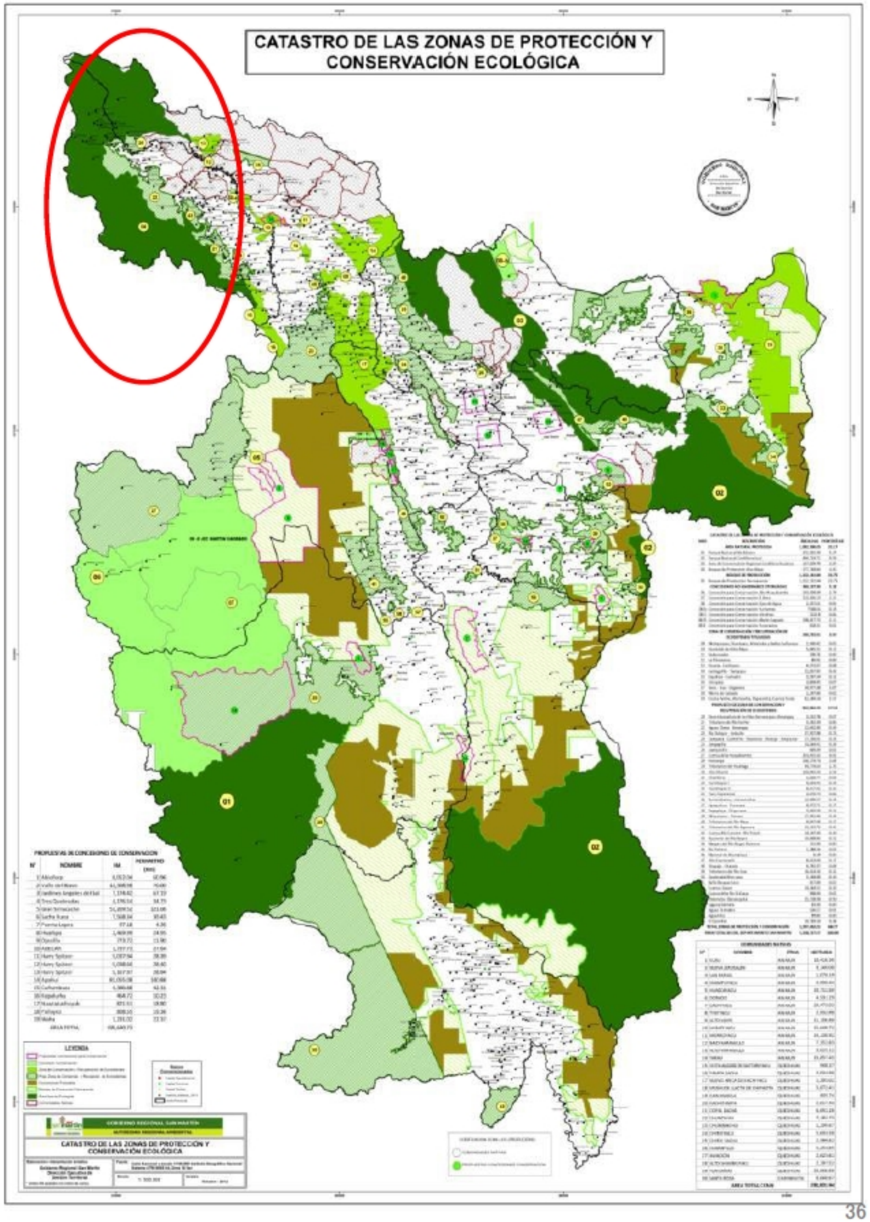
CIのペルーにおける取組み

国レベル
- 能力開発、REDDの準備プロセスの技術的サポート、生態系サービスと自然資本の評価

地域レベル
- サンマルティン州に注力（大西洋と太平洋を結ぶ大陸横断道路の影響緩和戦略と保全コリドー）
- REDD準備プロセスと森林減少モデル
- REDDラウンドテーブル
- 自然資本の定量化の試み

プロジェクトレベル
- アルト･マヨ自然保護区イニシアティブ (Disney and CSP)




CATASTRO DE LAS ZONAS DE PROTECCIÓN Y CONSERVACIÓN ECOLÓGICA
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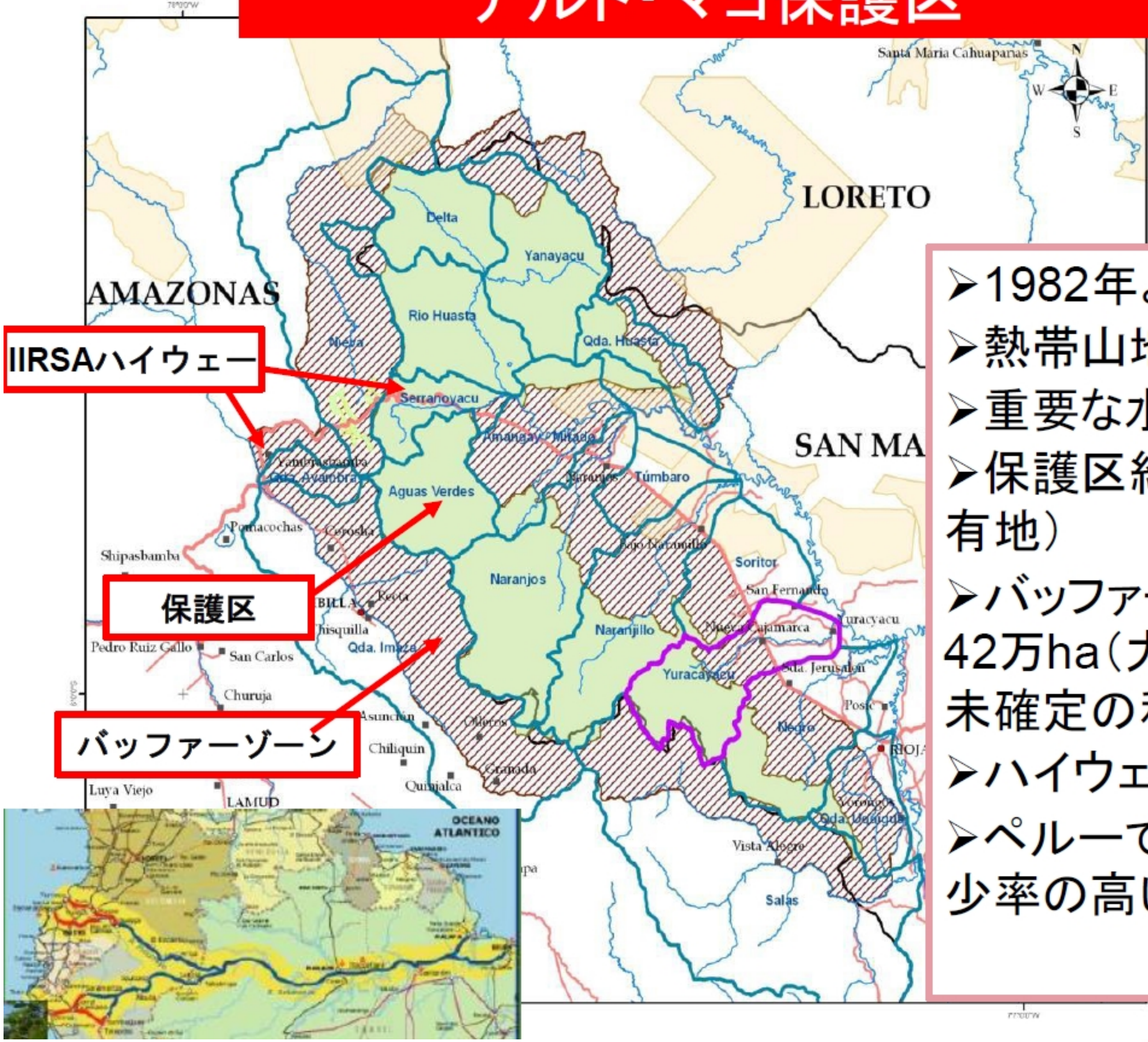
アルト･マヨ保護区



- 1982年より保護区
- 熱帯山地雲霧林
- 重要な水源地
- 保護区約18万ha（国有地）
- バッファーゾーン約42万ha（大部分は権利未確定の私有地）
- ハイウェー開通
- ペルーで最も森林減少率の高い保護区

アルトマヨ保護区で起きている事

- アンデス地域からの移住者が不法に定住
- 極めて貧しい。多くの場合、水道水、電気、学校、病院へのアクセスなし
- 農地を開拓するため、野焼きを実施。
- 技術を持たず、農地／農園の管理は粗野
  - アンデス地域での農法をそのまま適用（当地では不適切）
  - 肥料の利用が限定的
- 荒廃してしまった土地は放牧地への転換し、新たに森林を伐採、農地を開拓
- 貧困から抜け出すことは困難

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ペルーで最も森林減少率の高い保護区

持続的コーヒー生産により..

	粗野な生産	日陰 /肥料 (REDD+)
Year 1 Yield	30qq	10qq
Year 4 Yield	37qq (peak)	25qq
Year 7 Yield	17qq	35qq
Year 10	0qq	35qq
After Year 10	0qq (soil depleted)	35qq (indefinite)
CO_2 Released (t/10 years)	1784 (4ha)	0

現地での主な取り組み

- 持続的な経済活動を推進し、地元住民の生活を改善
  - 保全契約を通じた持続的なコーヒー生産の推進
    - 現在までに677以上の農家が契約
  - ツーリズムの推進等
- 国立公園管理の強化
- サンマルティン州へのスケールアップ
- 国レベルへのインプット

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プロジェクトの現地の体制

SERNANP/AMPF
国立公園局

Conservation International

AIDER
バイオマス調査

SPDA
法律関係の助言

ECOAN
保全契約の作成と締結、生物多様性、エコツアー等

保全契約

農民１　農民２　農民３　農民４　農民....

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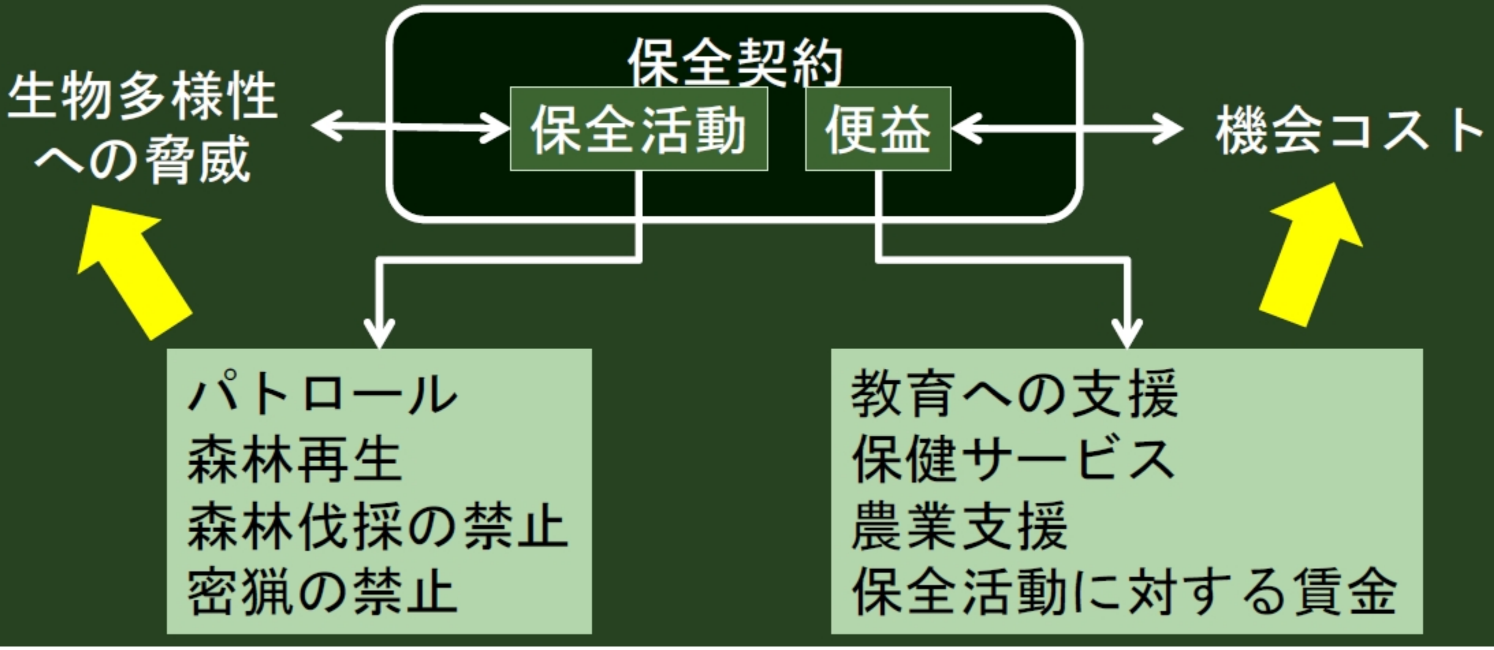
保全契約とは？

健全な発展を進めながら、
自然資源を自らの手で管理する社会づくり



アルト･マヨ保護区での保全契約の内容

保全活動

- ◆ 天然林の伐採の禁止
- ◆急傾斜地（>60%）での植生破壊の禁止
- ◆新たな移住者のコントロール
- ◆木材搬出の禁止

便益

- ◆コーヒー関係
  - ◆栽培技術、有機肥料とその作成、収穫後処理の機材と技術等
- ◆その他（女性の巻き込み）
  - ◆高効率かまど、天竺ネズミ飼育、家庭菜園（種子、肥料）集会所の建設
- ◆パトロールに対する賃金
- ◆生徒への奨学金

◇移住民からの信頼の獲得には時間が必要。。。
◇2011年133軒、2012年137軒、2013年407軒、現在677軒

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保全契約の締結

便益の農家への配布

- ✓ コーヒーの生産サイクルに合わせた配布スケジュールが組まれている。
- ✓ 農家は、保全契約で合意した内容を守っていることが求められる。

保全契約の実施
技術的な支援

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コーヒー苗の生産

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コーヒー残渣やその他材料を使った有機肥料の生産

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追加的な便益

改良型かまど

テンジクネズミの飼育

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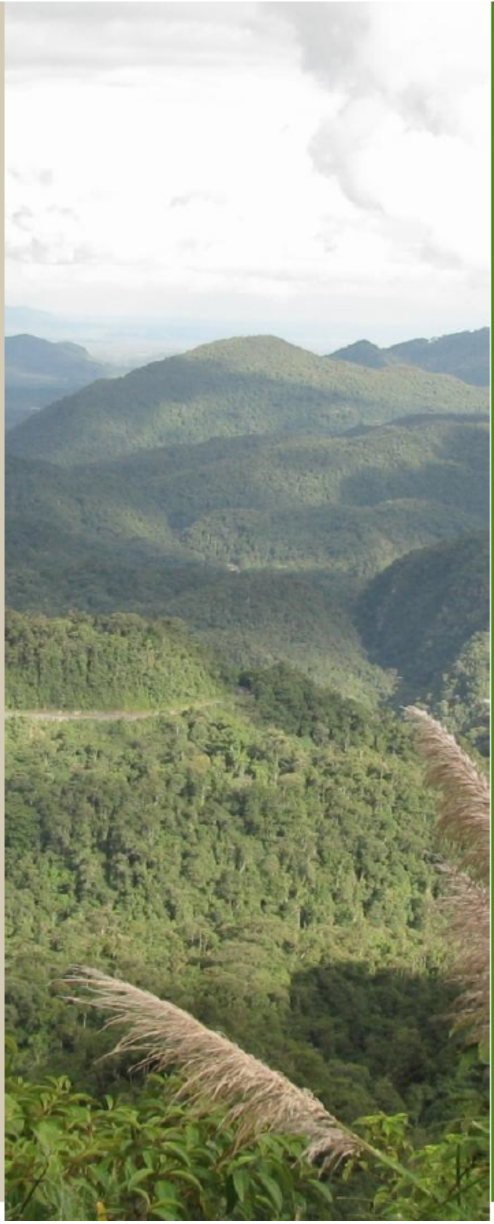

国立公園局の活動の強化

- 慢性的な財政不足
  - マスタープランの不在
  - レンジャー数が少なく、1ヶ月のうち、20日詰め所に滞在、10日休みという生活。給与は20日分のみの支払。
  - 詰め所の環境も劣悪

- CIを通じた資金支援
  - 2008年、マスタープランの採択
  - 2010年、スタッフ増強

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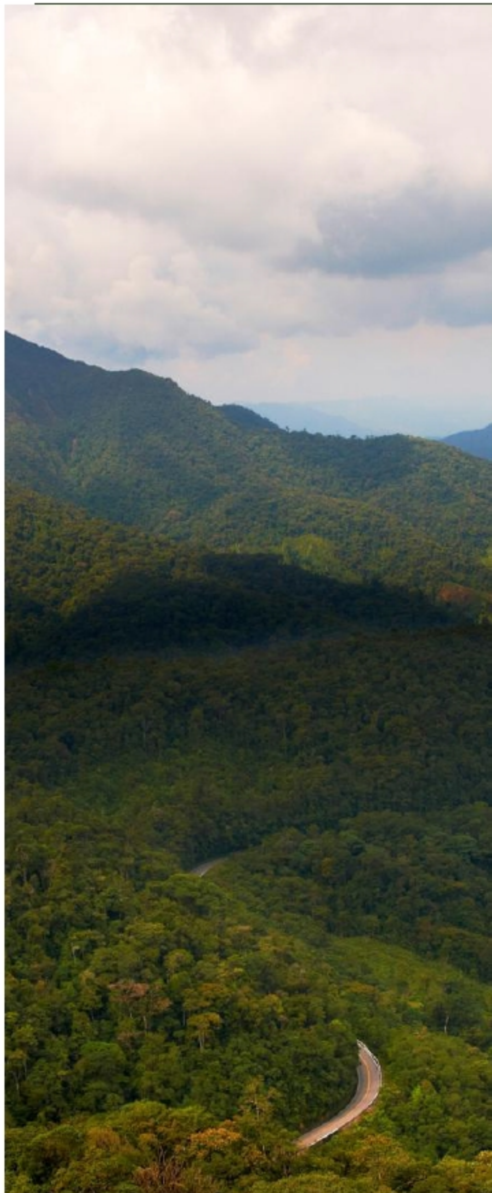

VCS VERIFIED CARBON STANDARD
A Global Benchmark for Carbon

CCB Standards
The Climate, Community & Biodiversity Alliance

- CIのREDDプロジェクトとして初めて検証
- 保護区内のREDDプロジェクトとして初めて検証
- REDDプロジェクトとして世界で5番目に検証
- 現在、2回目の検証作業中

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5. 炭素の定量化（森林保全）

自然を守ることは、人間を守ること。

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REDDプロジェクトのタイプ

❖ REDDプロジェクトのタイプ

<u>Deforestation vs Degradation</u>

- 森林減少：森林→非森林
- 森林劣化：森林→森林

<u>Planned vs Unplanned</u>

- 計画的：合法な計画に基づくな活動
- 非計画的：それ以外
  - 別々にベースライン設定が必要

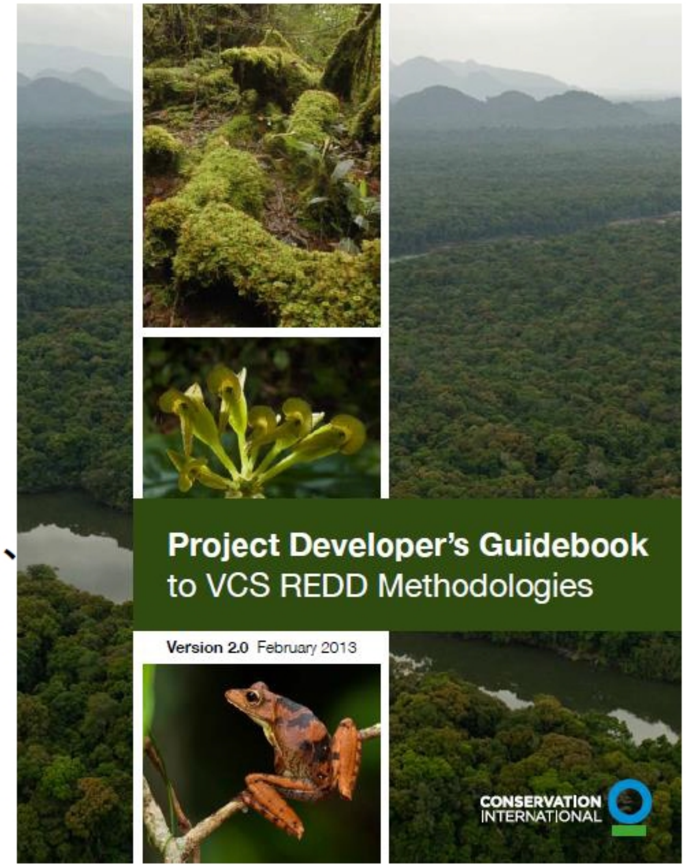
<u>Mosaic vs frontier</u>

- モザイク：域全体が均一のアクセス性を有し、パッチ状に森林減少。
- フロンティア：破壊のなかった森林の周辺部で、道路等の周辺で伐採。

❖ VCSの要件

<u>適格性</u>

- プロジェクト開始時で、過去少なくとも10年間100%森林



Source: Project Developer`s Guidebook to VCS REDD Methodologies

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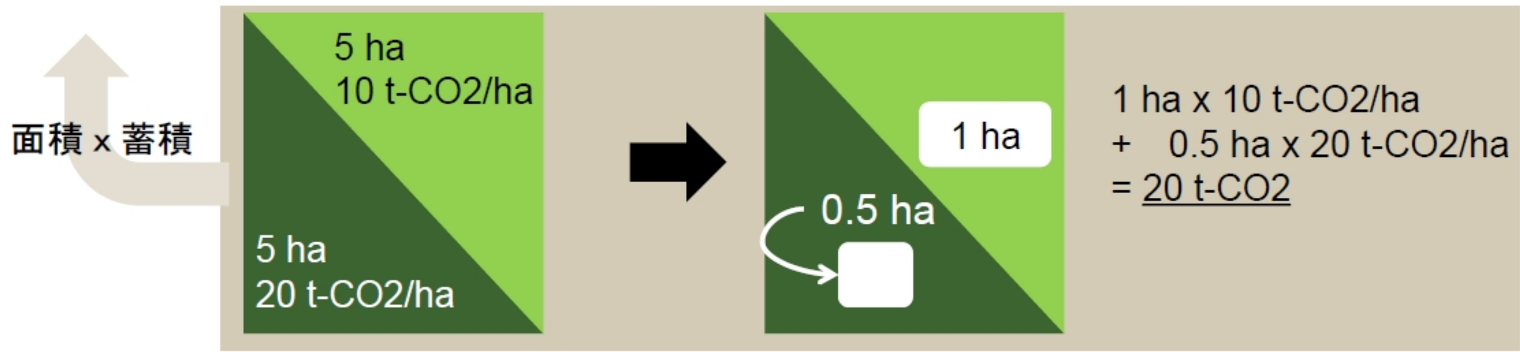
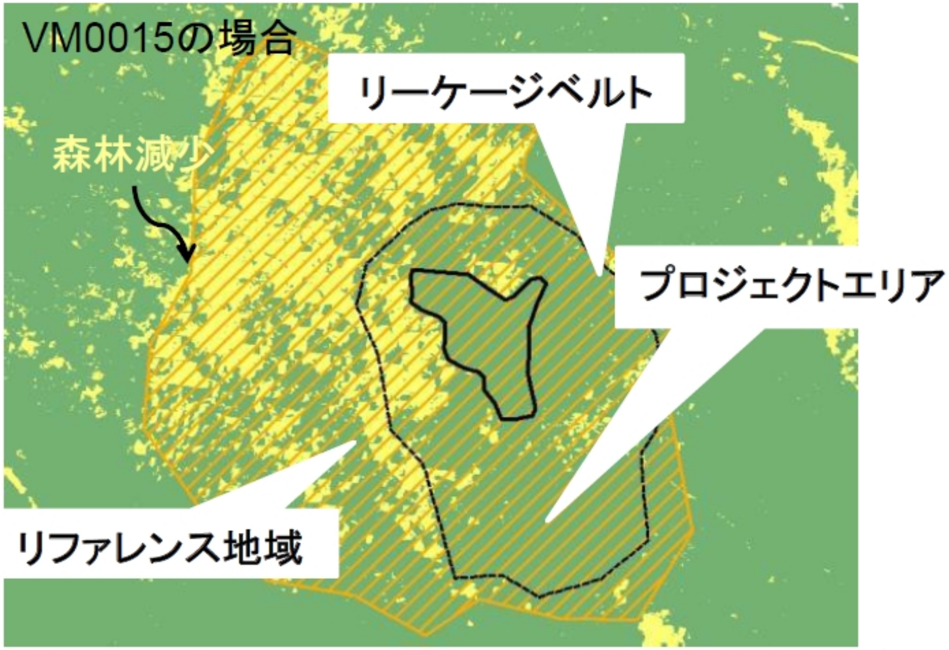
VCSの下で発行されるクレジット(VCUs)



VCUs = ベースライン排出量(事前推定) ープロジェクト排出量(事後推定)
ーリーケージ(事後推定)ー不確実性(事後推定)
ー非永続性リスクバッファー(事後評価)

プロジェクトエリア、リーケージベルト、リファレンスエリア

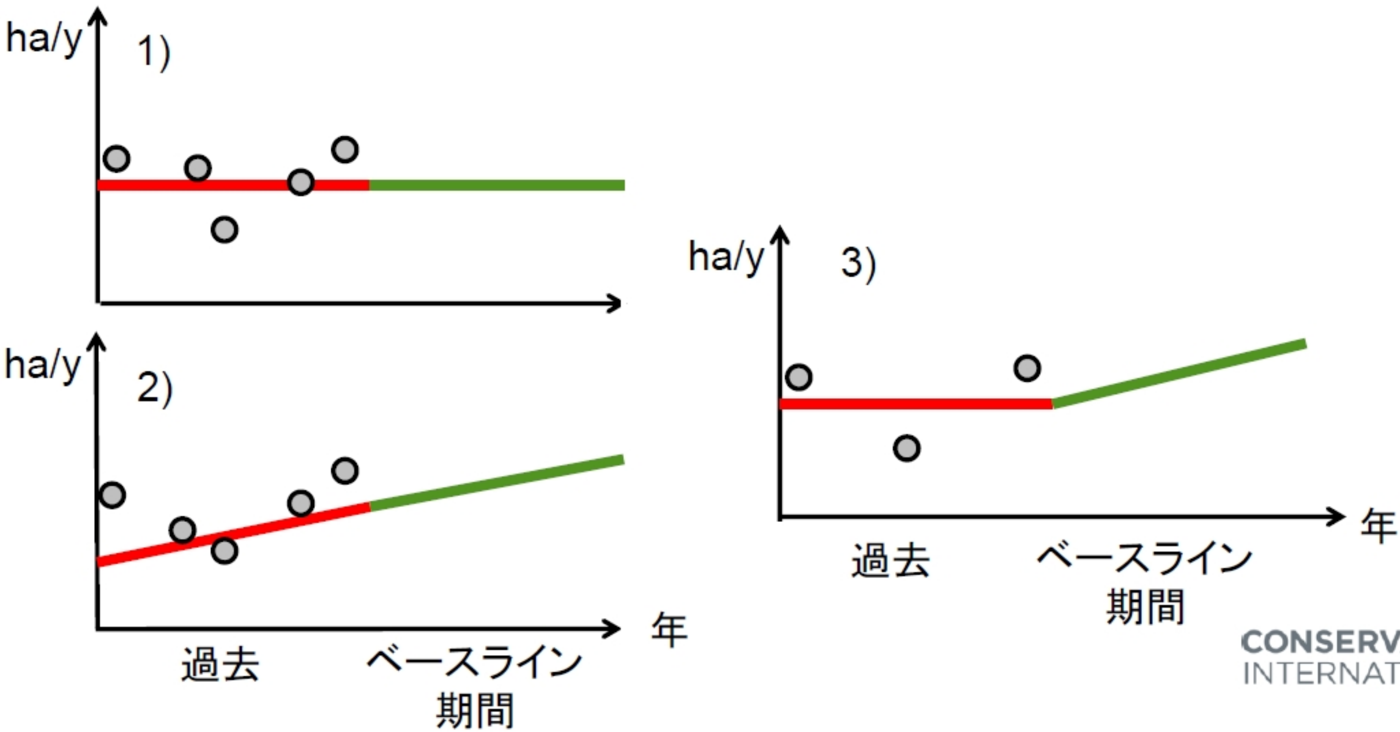


Source: Project Developer`s Guidebook to VCS REDD Methodologies

- ❑ プロジェクトエリア
  - ➢ プロジェクト活動によって森林が保護される地域
- ❑ リファレンスエリア
  - ➢ プロジェクトエリアと同様の条件下にあり、過去・現在の森林減少の対象となる地域
- ❑ リーケージベルト
  - ➢ リーケージが起こりえる地域

ベースラインでの森林減少面積の予測

- 衛星画像等を用いた森林減少率の計測
- 過去の森林減少率 (ヘクタール/年)に基づき予測
- ３つのアプローチ
    1) 過去の平均（多くの場合、最も保守的）
    2) 過去のトレンド
    3) モデル（例、火災発生率増加、ゴム需要増加、人口増加）



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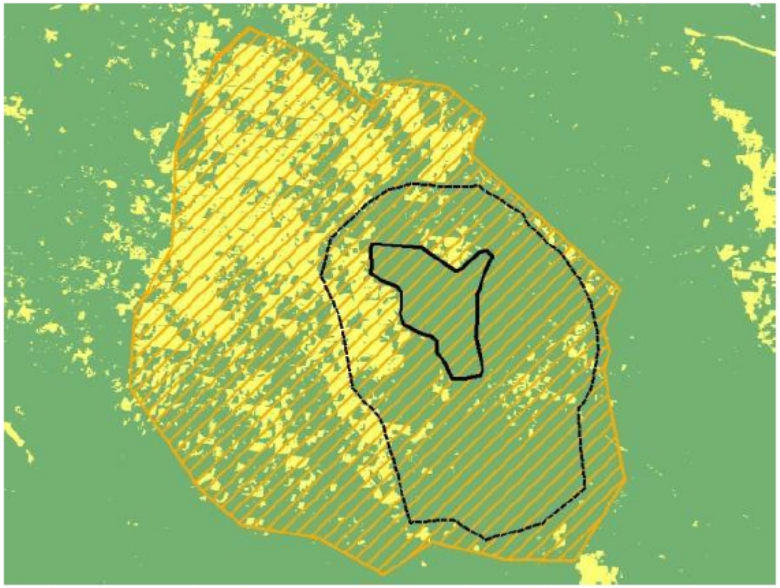
森林減少の発生場所、空間モデル

- VCSでは、フロンティアタイプ及びモザイクタイプの一部で、森林減少の発生場所の予測が求められる。
  - 森林保全の活動を行う地域（＝プロジェクトエリア）の多くは、周囲に比較して森林減少が現状で起こり難い（アクセスが悪い等）
  - リファレンス地域全体で同じように森林減少が進むという想定は、非保守的



Source: Project Developer`s Guidebook to VCS REDD Methodologies

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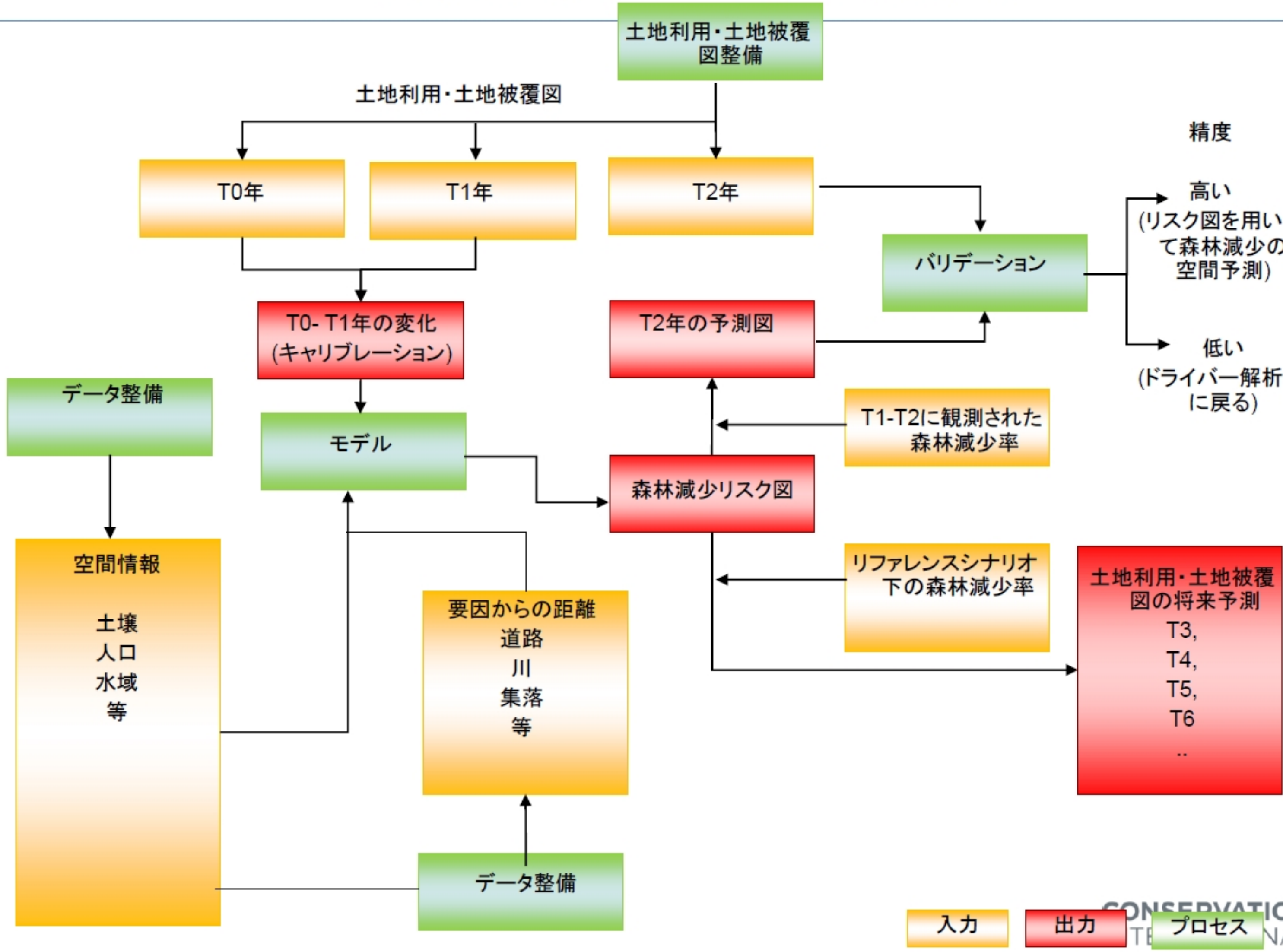
空間モデルの概念図


土地利用・土地被覆図整備
土地利用・土地被覆図
T0年
T1年
T2年
精度
高い
(リスク図を用いて森林減少の空間予測)
バリデーション
低い
(ドライバー解析に戻る)
T0- T1年の変化
(キャリブレーション)
T2年の予測図
データ整備
モデル
T1-T2に観測された森林減少率
森林減少リスク図
空間情報
土壌
人口
水域
等
要因からの距離
道路
川
集落
等
リファレンスシナリオ下の森林減少率
土地利用・土地被覆図の将来予測
T3,
T4,
T5,
T6
..
データ整備
入力
出力
プロセス

ベースライン排出量の推定

1. 過去のデータに基づき、森林減少率の推定
2. 森林減少の場所を推定→プロジェクトエリア内の森林減少面積推定
3. 森林タイプ毎の蓄積量の推定
4. 二酸化炭素排出量の推定

プロジェクト排出量の推定(事後)

1. 衛星画像を用いて、プロジェクトエリア内の森林減少面積を森林タイプ毎に計測
2. 二酸化炭素排出量を計算

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VCSのREDD方法論

- 現在、ＲＥＤＤでは、4つの方法論が有効

	VM0006	VM0007	VM0009	VM0015
計画的森林減少・森林劣化		○	○	
非計画的森林減少	○	○	○	○
非計画的森林劣化	○	○		
モザイク	○	○	○	○
フロンティア		○	○	○

Source: Project Developer`s Guidebook to VCS REDD Methodologies

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各方法論で認められるベースライン活動

	VM0006	VM0007	VM0009	VM0015
定置型農業	○	○	○	○
焼畑農業	○	○	○	○
工業型農業	○	○	○	○
多年性作物		○	○	○
販売目的の違法伐採		○	○	○
薪炭	○	○	○	○
森林火災	○	○	○	○
住居	○	○	○	○

Source: Project Developer`s Guidebook to VCS REDD Methodologies

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方法論選択

□ペルー アルトマヨ保護区の場合？

Project Name	Country	REDD Project Type	Methodology
Alto Mayo Conservation Initiative	Peru	AUDD	VM0015
Boden Creek Ecological Preserve Forest Carbon Project	Belize	APDD	VM0007
Bull Run Overseas Forest Carbon Project	Belize	APDD	VM0007
CIKEL Brazilian Amazon REDD APD Project	Brazil	APDD	VM0007
Floresta Santa Maria	Brazil	AUDD	VM0007
Kariba REDD+ Project	Zimbabwe	AUDD	VM0009
Madre de Dios REDD Project	Peru	AUDD	VM0007
REDD in Brazilian Nut Concessions in Madre de Dios	Peru	AUDD	VM0007
Reduced Emissions from Deforestation and Degradation in Community Forests—Oddar Meanchey	Cambodia	AUDD	VM0006
Rimba Raya Biodiversity Reserve Project	Indonesia	APD	VM0004
Rio Bravo Climate Action Project	Belize	APDD	VM0007
The Chocó-Darién Conservation Corridor REDD Project	Colombia	AUDD	VM0009
The Kasigau Corridor REDD Project, Phase 1	Kenya	AUDD	VM0009
The Kasigau Corridor REDD Project, Phase 2	Kenya	AUDD	VM0009
The Mai Ndombe REDD Project	Congo	APD	VM0009

Source: Project Developer`s Guidebook to VCS REDD Methodologies

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各方法論におけるベースラインの設定手法

	VM0006	VM0007	VM0009	VM0015
森林減少率	単純回帰（平均、トレンド）	単純回帰（平均、トレンド）、人口モデル	ロジスティック回帰	単純回帰（平均、トレンド）、モデル
空間モデル	必須	非計画・フロンティアでは必須 モザイクでも一部必須＊ 人口モデルを使った場合必須	プロジェクトアカウンティングエリアを設定＊＊	必須

Source: Project Developer`s Guidebook to VCS REDD Methodologies

＊モデルが不要となるのは、プロジェクトバウンダリの25%以上が新しい森林減少から50m以内にある場合（＝そこら中で森林減少がある場合）。
＊モデルを用いない場合には、森林炭素蓄積量の小さい場所から森林減少が起こる想定で、ベースラインを設定する。
＊＊ベースラインにおいて森林減少が予想される場所をプロジェクトエリア内で特定するひつ必要がある。

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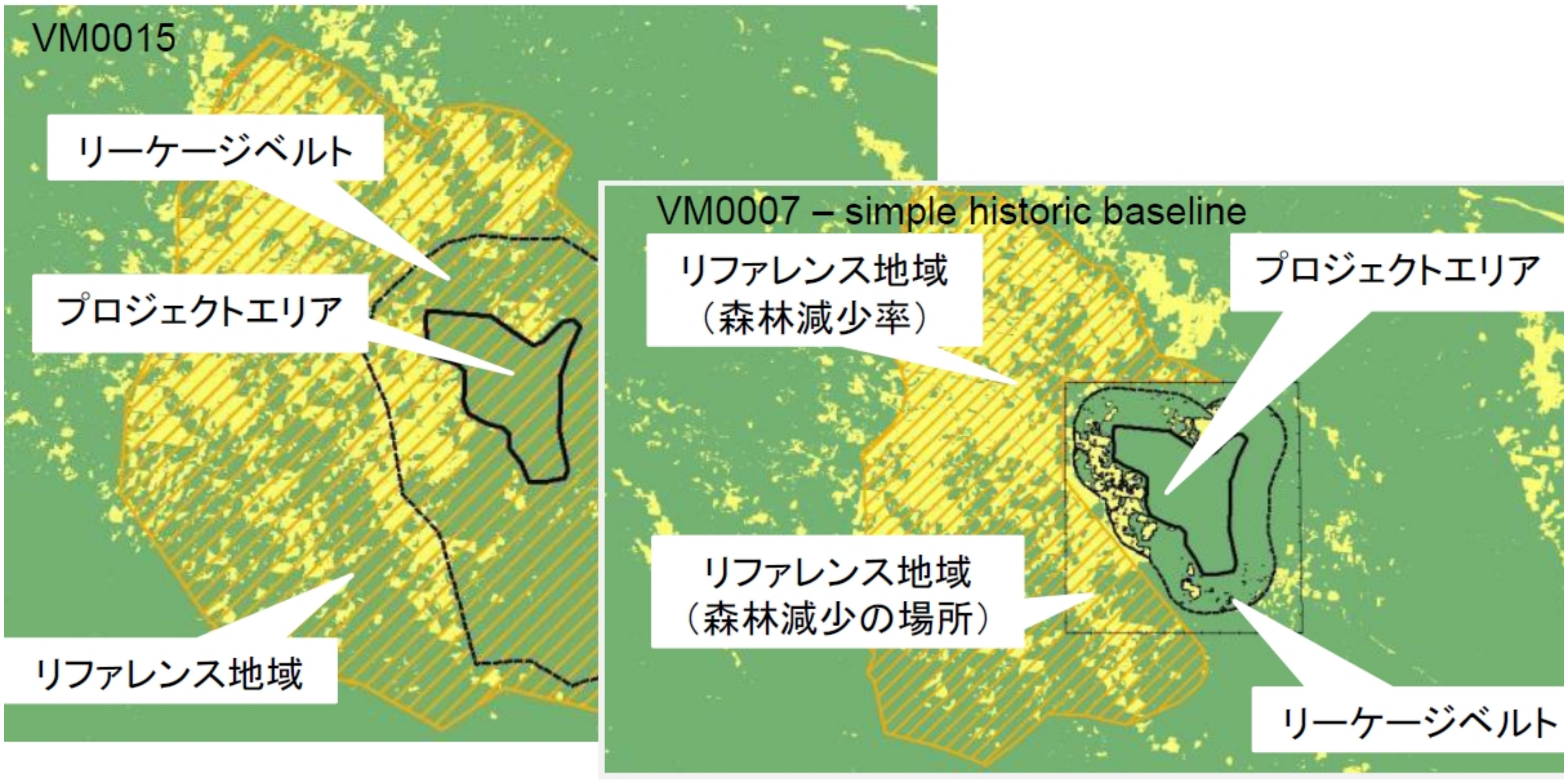
プロジェクトエリア、リーケージベルト、リファレンス地域



その他、要求精度、モニタリング、リーケージ等の要件を
検討し、方法論を選択する

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ペルーの事例：VCSのPDから

自然を守ることは、人間を守ること。

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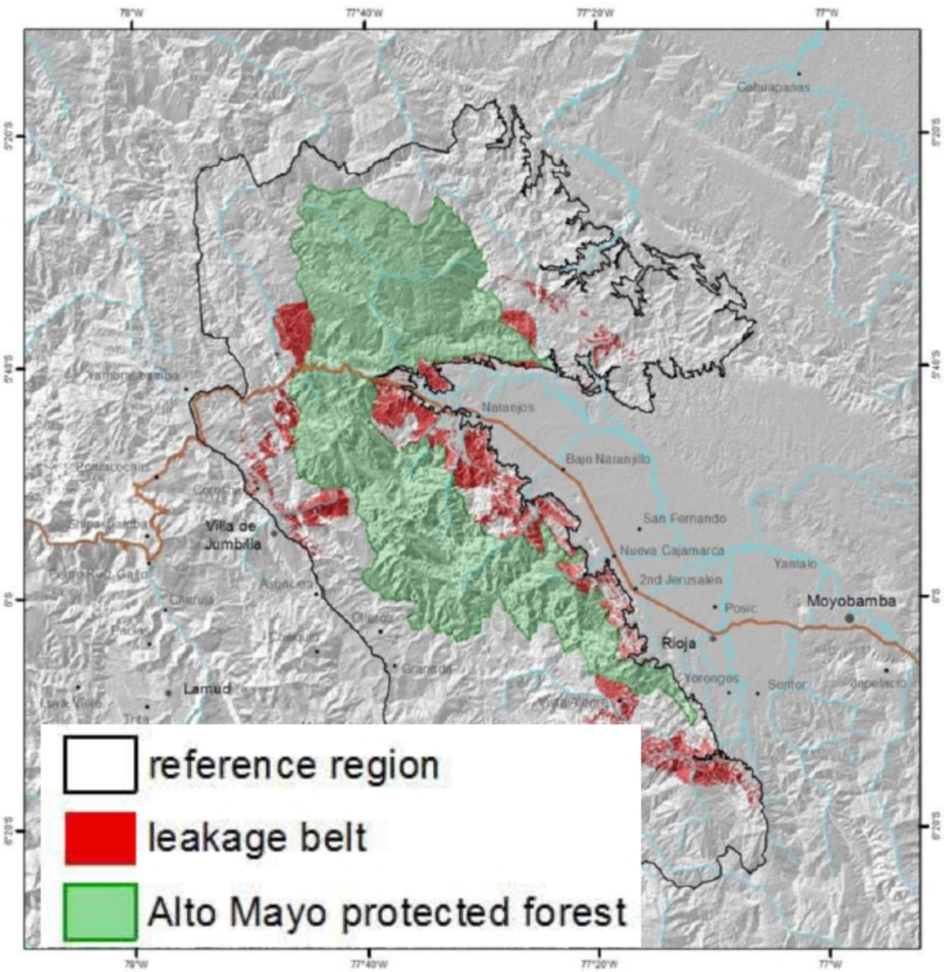
プロジェクトバウンダリー



- 炭素プール
  - 地上部
  - 地下部
- リファレンス期間
  - 1996
  - 2001
  - 2006
- 画像解析
  - Landsat 5/7（30m）
  - CBERS (2.5m)
  - RapidEye (5m)
  - 航空写真

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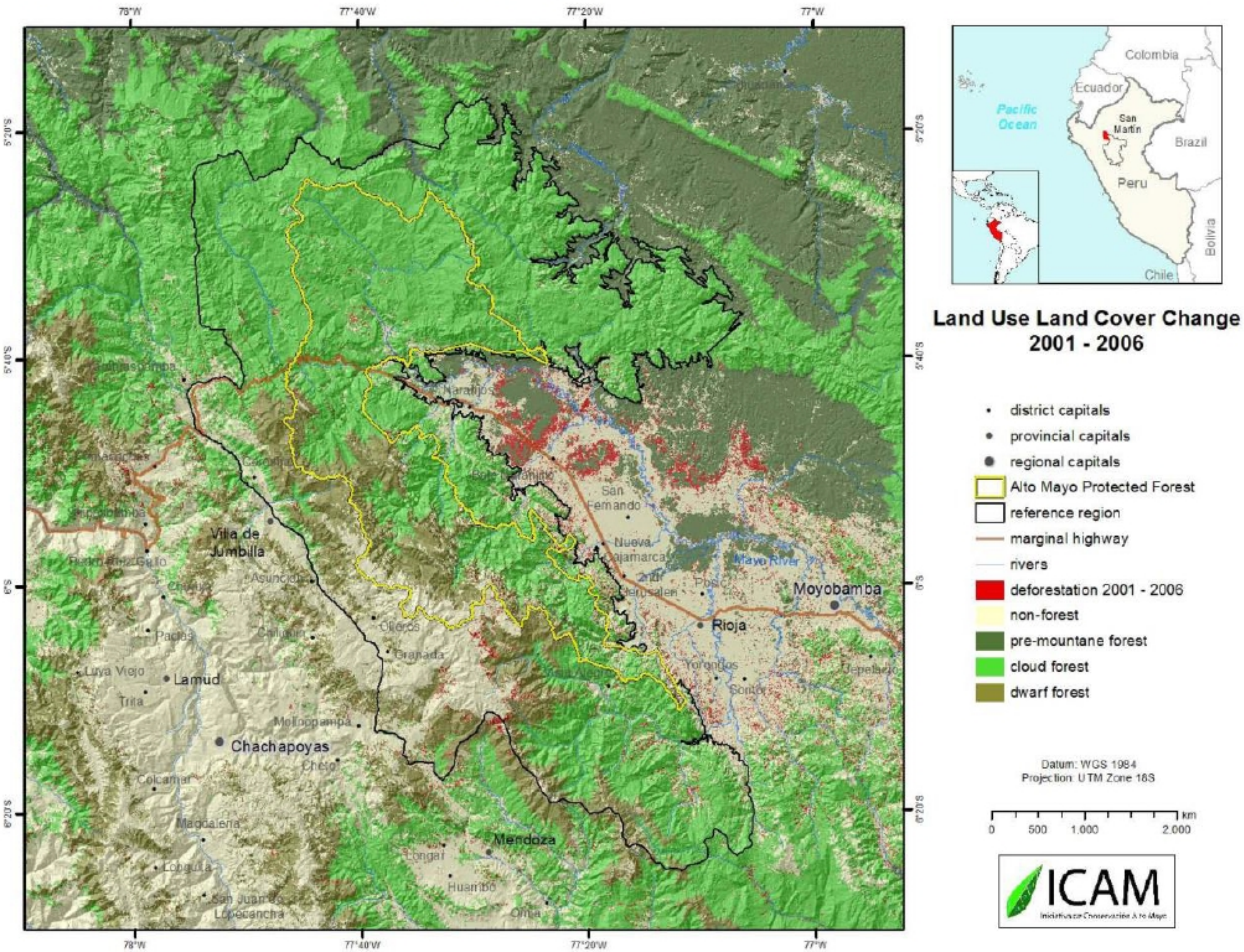
過去の森林減少（1996-2001-2006を解析）



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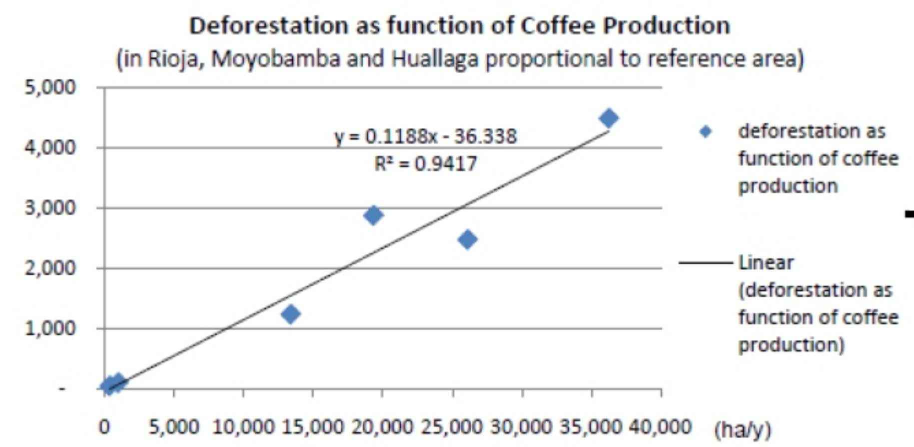
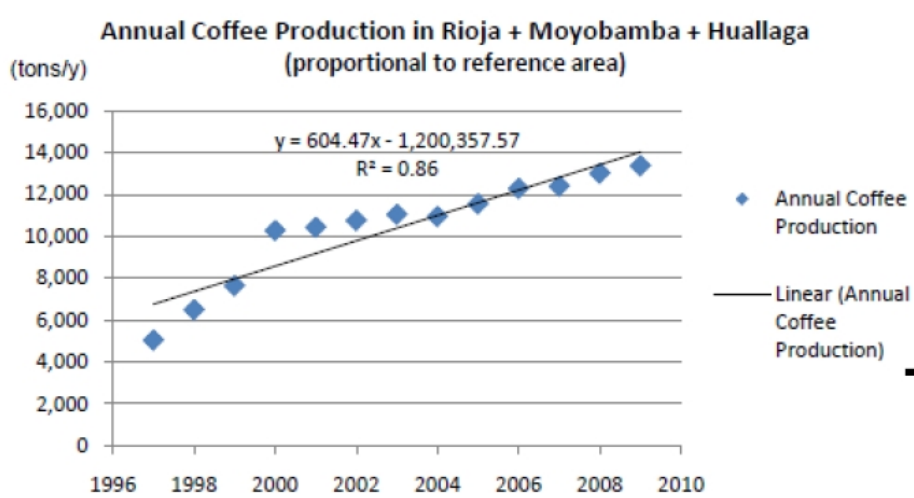
森林減少面積予測(モデルアプローチ)





Project year t	Stratum i in the reference region $ABSLRR_{i,t}$ ha
2009	3,543
2010	3,699
2011	3,855
2012	4,011
2013	4,167
2014	4,323
2015	4,479
2016	4,635
2017	4,791
2018	4,948

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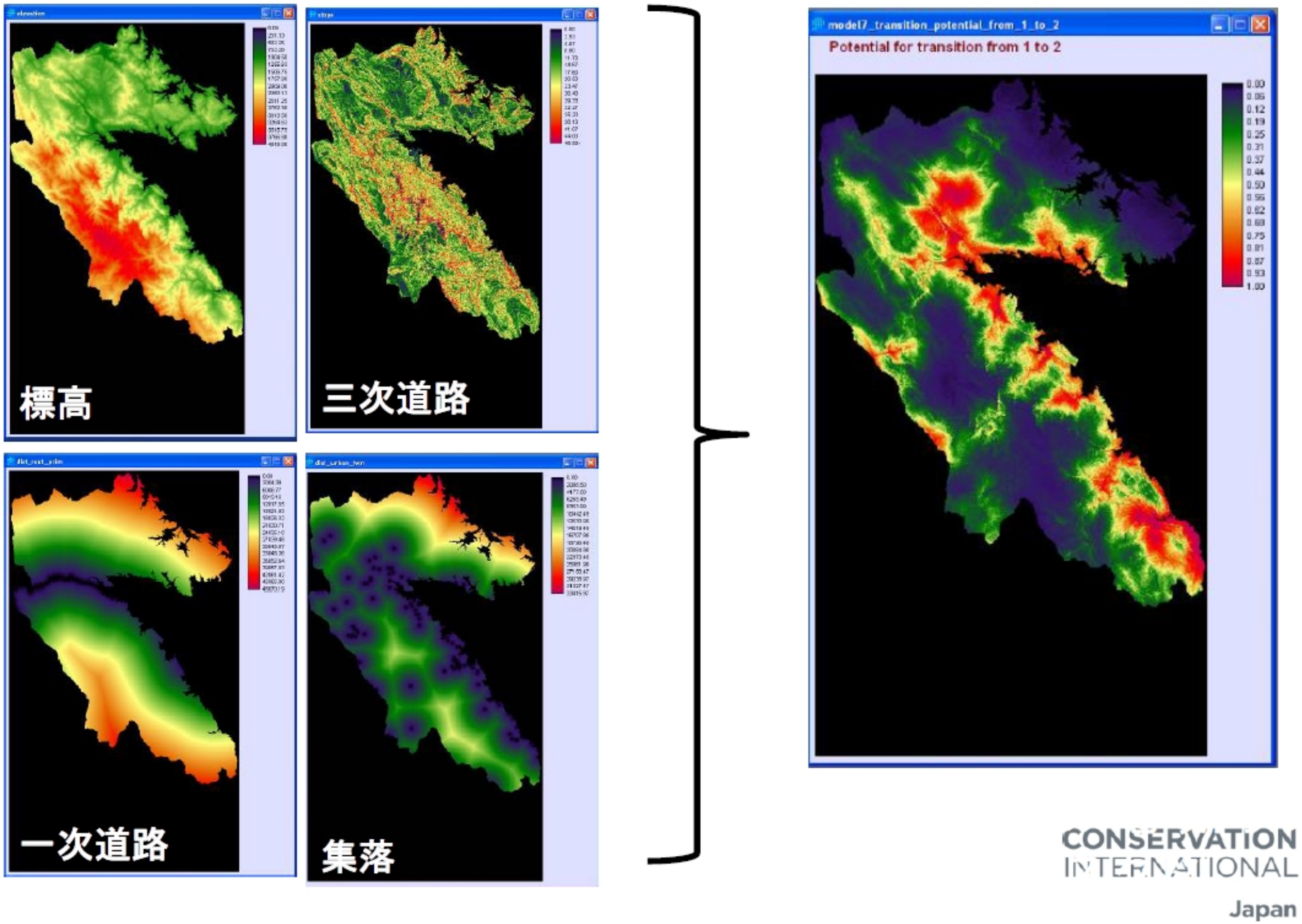
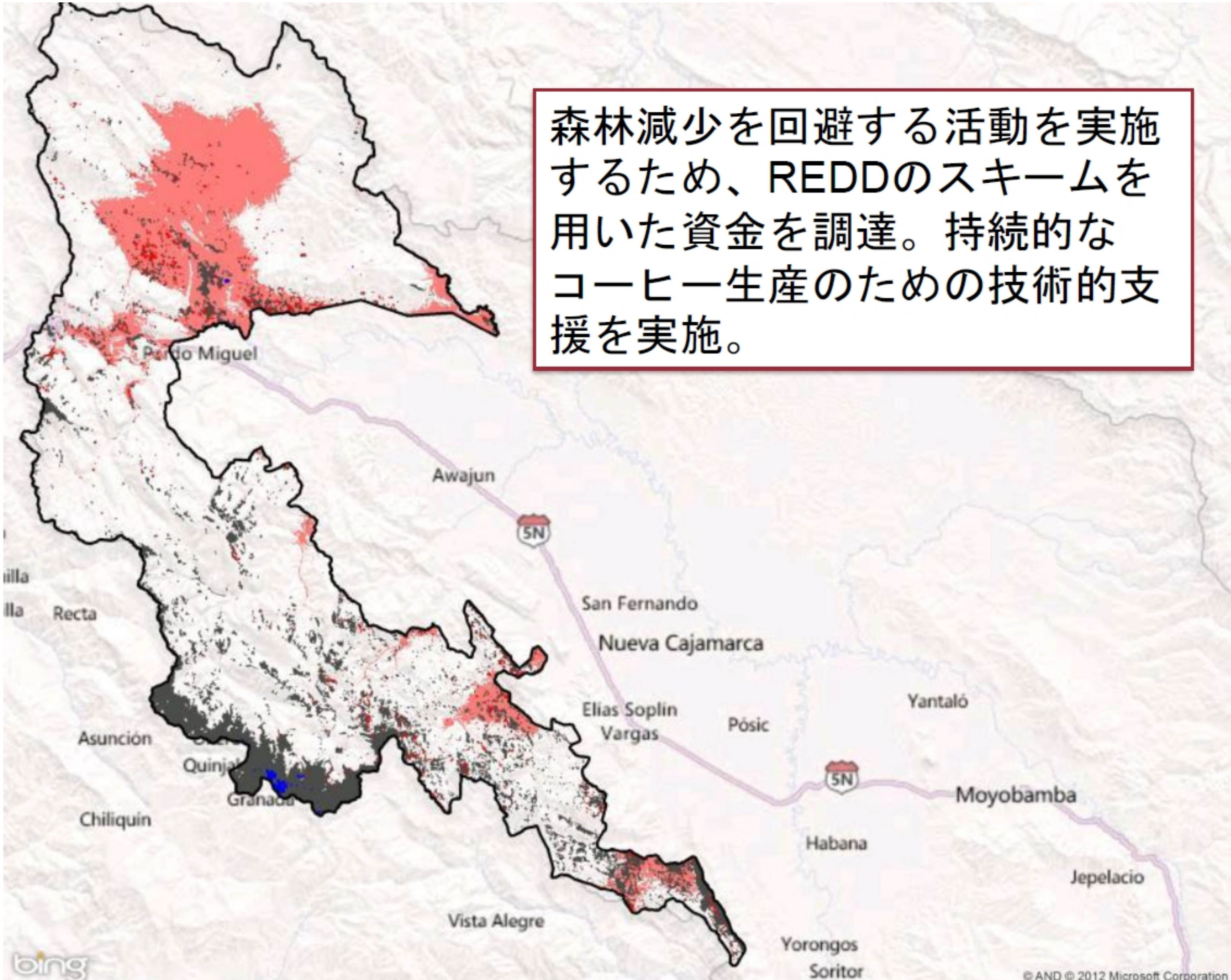
空間モデルを使った森林減少ポテンシャルの解析





森林減少を回避する活動を実施するため、REDDのスキームを用いた資金を調達。持続的なコーヒー生産のための技術的支援を実施。

森林タイプ毎の森林減少面積予測

Area deforested per forest class *icl* within the project area				Total baseline deforestation in the project area	
IDicl>	1	2	3		
Name >	pre-montane forest	cloud forest	dwarf forest	*ABSLPA$_t$* annual	*ABSLPA* cumulative
Project year *t*	ha	ha	ha	ha	ha
2009	40	1,806	0	1,846	1,846
2010	14	1,965	0	1,979	3,825
2011	8	2,108	0	2,116	5,941
2012	3	2,013	0	2,016	7,957
2013	2	1,986	0	1,987	9,944
2014	1	2,140	0	2,141	12,085
2015	2	2,076	0	2,078	14,163
2016	2	2,053	0	2,055	16,218
2017	1	2,120	0	2,121	18,339
2018	0	2,145	0	2,145	20,484

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森林炭素蓄積量

Estratos (Tipos de bosque)	Sub Estratos (Pisos altitudinales)	Superficie	Parcelas
Bosque de Neblina	1000 - 2500	170,056.1	97
Bosque Pre-Montano	500 - 1000	9,328.7	10
Bosque Enano	2500 - 3300	35,675.1	12
Purma	500 - 1000	6,729.3	9
Cultivos de café	500 - 1000	19,171.5	26
Pastos	500 - 1000	41,486.7	12
Pajonal	+ 2000	51,381.3	9
Nubes	-	52,505.5	-
Sombras	-	34,112.0	-
Lagos	-	306.6	-
Ríos	-	4,219.5	-
Infraestructura	-	433.4	-
Total		**425,405.6**	**175**

LU/LC class		Average carbon stock per hectare ± 90% CI					
		Cab_{cl}		Cbb_{cl}		$Ctot_{cl}$	
ID_{cl}	Name	average stock t CO_2e ha^{-1}	± 90% CI t CO_2e ha^{-1}	average stock t CO_2e ha^{-1}	± 90% CI t CO_2e ha^{-1}	average stock t CO_2e ha^{-1}	± 90% CI t CO_2e ha^{-1}
1	pre-montane forest	427.34	67.92	113.15	17.39	540.5	85.2
2	cloud forest	457.12	34.34	117.25	8.7	574.4	42.9
3	dwarf forest	184.95	61.83	46.34	16.23	231.3	78.0
4	non-forest	72.75	20.1	17.53	3.95	87.7	19.5

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ベースラインの推定結果

Project year t	Baseline carbon stock changes		*Ex ante* project carbon stock changes		*Ex ante* leakage carbon stock changes		*Ex ante* net anthropogenic GHG emission reductions		*Ex ante* VCUs tradable	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLPA_t$	$\Delta CBSLPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	ΔCLK_t	ΔCLK	$\Delta REDD_t$	$\Delta REDD$	VCU_t	VCU
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	861,442	861,442	(430,721)	(430,721)	(43,072)	(43,072)	387,649	387,649	344,577	344,577
2010	924,263	1,785,706	(462,132)	(892,853)	(46,213)	(89,285)	415,919	803,568	369,705	714,282
2011	988,339	2,774,045	(494,169)	(1,387,022)	(49,417)	(138,702)	444,753	1,248,320	395,336	1,109,618
2012	941,398	3,715,443	(423,629)	(1,810,651)	(37,656)	(176,358)	480,113	1,728,433	428,336	1,537,954
2013	928,040	4,643,483	(417,618)	(2,228,270)	(37,122)	(213,480)	473,301	2,201,734	422,258	1,960,212
2014	999,960	5,643,443	(399,984)	(2,628,253)	(29,999)	(243,479)	569,977	2,771,711	509,979	2,470,192
2015	970,589	6,614,032	(339,706)	(2,967,960)	(29,118)	(272,596)	601,765	3,373,476	538,677	3,008,869
2016	959,721	7,573,752	(287,916)	(3,255,876)	(19,194)	(291,791)	652,610	4,026,086	585,430	3,594,298
2017	990,999	8,564,751	(198,200)	(3,454,075)	(9,910)	(301,701)	782,889	4,808,975	703,609	4,297,907
2018	1,002,311	9,567,062	(100,231)	(3,554,307)	0	(301,701)	902,080	5,711,054	811,872	5,109,779

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ValidationとVerification

❑ Validation用書類

- PD、77ページ
- 方法論関係の別添、99ページ
- 補助的資料
  - ドライバー分析、35ページ
  - 機会コスト分析、128ページ
  - 歴史的土地被覆変化分析、8ページ
  - 炭素蓄積、99ページ

❑ Verification用書類

- モニタリングレポート (2008-2012) 、32ページ

	Baseline carbon stock changes		*Ex post* project carbon stock changes		*Ex post* net carbon stock changes		*Ex post* leakage carbon stock changes		*Ex post* net anthropogenic GHG emission reductions		*Ex post buffer credits**		*Ex post* VCUs tradable	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cum.ve	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLPA_t$	$\Delta CBSLPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	ΔCLK_t	ΔCLK	$\Delta REDD_t$	$\Delta REDD$	VBC_t	VBC	VCU_t	VCU
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	1,017,246	1,017,246	138,401	138,401	878,845	878,845	0	0	878,845	878,845	87,885	87,885	790,961	790,960
2010	964,620	1,981,866	138,401	276,803	826,219	1,705,064	0	0	826,219	1,705,064	82,622	170,506	743,597	1,534,557
2011	886,810	2,868,677	138,401	415,204	748,409	2,453,473	0	0	748,409	2,453,473	74,841	245,347	673,568	2,208,126
2012	843,650	3,712,327	138,401	553,605	705,249	3,158,722	0	0	705,249	3,158,722	70,525	315,873	634,724	2,842,849

*Ex-post buffer credits are calculated based on a 10% Risk Factor (RF) attributed to the project based on the VCS non-permanence risk tool

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5. Jurisdictional Nested REDD+

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Jurisdictional and Nested REDD+
（管轄の／行政区の）　（入れ子の）

□ 背景

- 将来的には、国レベルでの勘定の必要となる
- 様々な林地（管轄、目的、現状）が存在し、対応するREDD+のスケールにも幅が生じる
- 現地政府への移管を念頭に、能力開発や制度設計と同時に政府の関与・権限を拡大したい
- 複数プロジェクトが同じ州内に存在する場合もあり、整合性を保つための仕組みが必要
- プロジェクト－準国（州等）－国を入れ子状に扱うための技術的・制度的な検討が進められている＝JNR

□ 経過

- 2011年開始
- 2011/10 Technical Recommendationsの公表→ピアレビュー
- 2012/5 draft VCS Requirementsの公表→パブコメ
- 2012/10 Final VCS Requirementsの公表
- 2013/10 各種ツール等の公表
- パイロット実施中（アクレ州、コスタリカ、ペルー、DRC、チリ等）
  - アクレ州：ドイツ開発銀行（KfW）が$25milで支払い


ありがとうございました
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第４章

GHGプロジェクトの審査とREDD+プロジェクト ～留意点ならびに課題点の共有～

イー・アール・エム日本株式会社
サステナビリティ マネジメントチーム
仲尾　強

REDDプラスに係る森林技術者講習会
GHGプロジェクトの審査とREDD+プロジェクト

～留意点ならびに課題点の共有～

2015年1月22日
イー・アール・エム日本株式会社
サステナビリティ　マネジメントチーム
仲尾　強

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ERM

講師

仲尾 強
ERM日本 サステナビリティマネジメントチーム リーダー

- 1985年から日本鋼管(現JFEエンジニアリング)環境エンジニアリング本部にて、大型廃棄物処理プラントなどの環境関連設備に関するエンジニアリング業務や研究、開発に従事。
- 2002年からは外資系第三者機関にてCDM/JIプロジェクトの第三者審査手法の開発・実施に関わり、CDMの国連登録第1号案件であるノバジェラランドフィルプロジェクト(ブラジル)のバリデーションを行う。以来50件以上の温室効果ガス排出量削減プロジェクトの評価業務のプロジェクトリーダーを務める。
- 2009年からERM日本にて、気候変動やCSRに関わる様々なコンサルティング業務に従事。プロジェクトには経済産業省「地球温暖化対策技術普及等推進事業」において、インドネシアでのREDDに関するF/Sプロジェクト(2010年度)や、メキシコやモンゴルでの省エネ、ベトナムでの風力発電に関するJCMのためのF/Sプロジェクト(2011年～2014年度)でのMRVの開発やPDD(プロジェクト設計書)の作成を含む。
- その他、国内CO2削減プロジェクト検討委員会委員(経済産業省、2006-7)、J-VER制度方法論パネル委員会(環境省、2009-2012)、J－クレジット制度森林吸収小委員会(環境省、2013年度)、J-MRV(GREEN)アドバイザリーコミッティ(JBIC、2009-現在)など、温室効果ガス排出抑制に関する様々な制度作りのための委員を務める。

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内容

1. GHGプロジェクトの審査
2. GHGプロジェクトの審査の原則
3. バリデーションのアプローチ
4. ベリフィケーションのアプローチ
5. PDD審査のポイント
6. REDD+ 審査の際の留意点

GHGプロジェクトの審査

削減量の信頼性の確保

説明責任　MRV

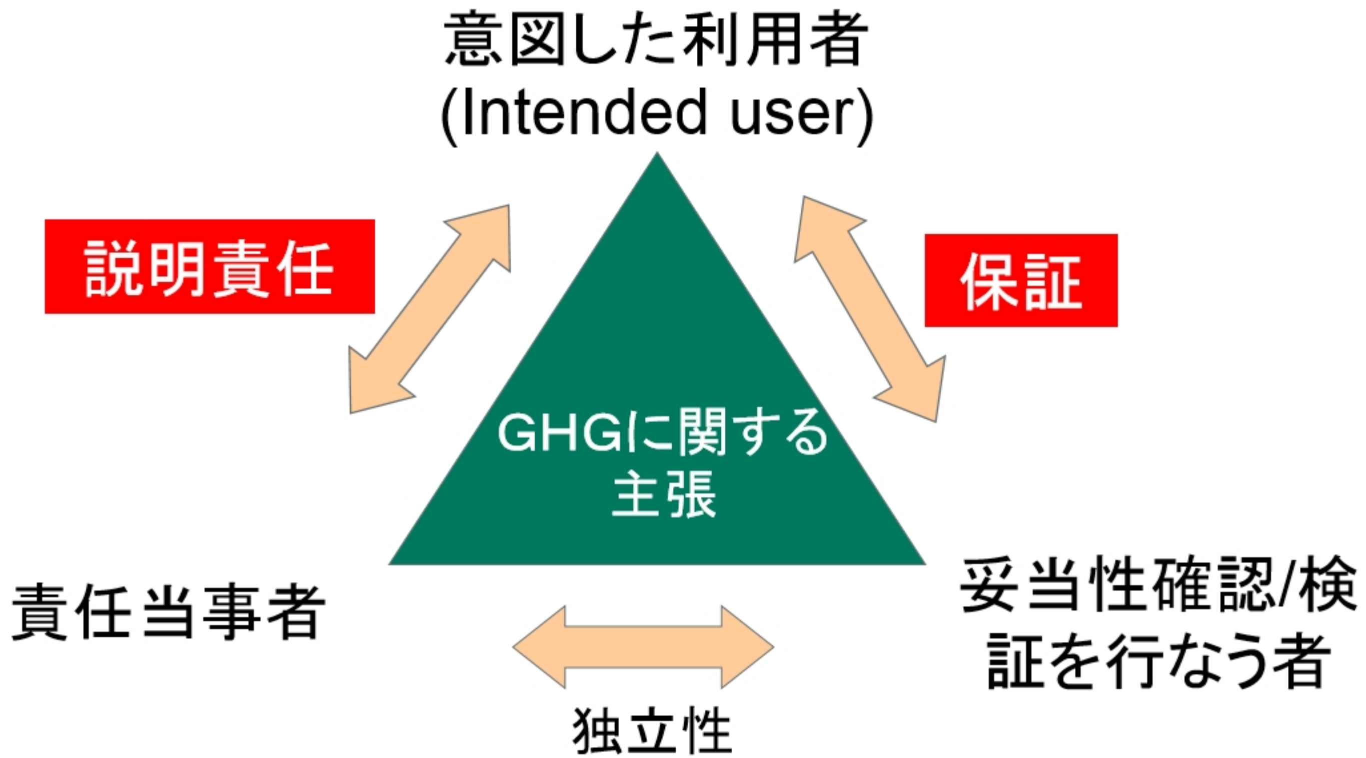
定量化と報告に対する要求

保証　MRV

審査に対する要求

(妥当性確認、検証)

削減量の信頼性の確保



ISO14064-3、図A. 1

審査とは？

参照基準 → **評価** → **報告**

参照基準
- ISO
- ASME
- EU 指令
- 社内規定、標準、手順書

評価
- システム
- プロジェクト
- 製品
- データ
- その他

報告
- 意見書
- 保証書
- 認証書
- CE マーク
- 検査報告書

GHG プロジェクトの審査とは？

MRV

温室効果ガス削減プロジェクトの審査⇒通常二種類

- ✓ プロジェクト実施前：バリデーション
- ✓ プロジェクト実施後：ベリフィケーション

CDM、VCSで実施。

ISO14064では望ましいとされている。

GHG プロジェクトの審査とは？

バリデーション

プロジェクト設計書の、独立した第三者機関による評価.

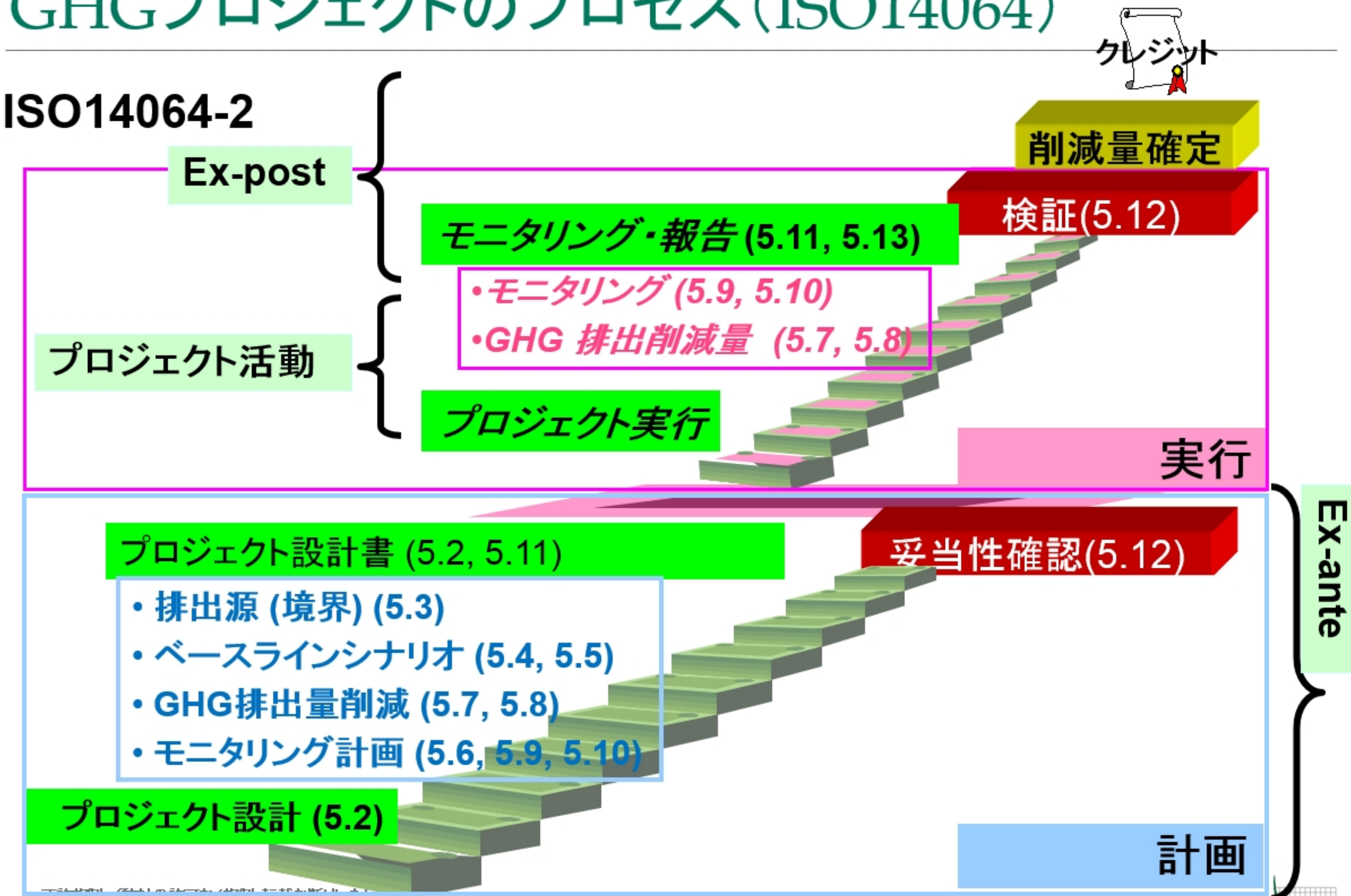
- 評価の実施はEx-ante (プロジェクト活動開始前)
  : 将来の予測に基づく

ベリフィケーション

プロジェクト実施によるパフォーマンスと削減量のレビューと確認

- 評価の実施はEx-post (プロジェクト活動開始後)
  : 実際のデータに基づく　–　検証可能な情報

GHGプロジェクトのプロセス（ISO14064）



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GHGプロジェクトのプロセス(JCM, CDM)

JCM	<各プロセスにおける主な活動主体>	CDM
プロジェクト参加者 / 各国政府また合同委員会により開発可能	提案方法論の提出	プロジェクト参加者
合同委員会	提案された方法論の承認	CDM理事会
プロジェクト参加者	PDDの作成	プロジェクト参加者
第三者機関(TPEs)	妥当性確認	指定運営機関(DOEs)
合同委員会	登録	CDM理事会
プロジェクト参加者	モニタリング	プロジェクト参加者
第三者機関(TPEs)	検証	指定運営機関(DOEs)
合同委員会が発行量を決定各国政府がクレジットを発行	クレジット発行	CDM理事会

二国間クレジット制度 (Joint Crediting Mechanism (JCM))の最新動向、日本政府資料、2013年10月

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バリデーション

GHG プロジェクトの計画書における
GHGに関する主張(**2.11**)を評価する
体系的で、独立し、かつ、文書化されたプロセス。

(ISO14064-3, 2.32)

合意された妥当性確認の基準(2.33)に照らして

(ISO14064-3, 2.32)

バリデーション

参照基準 → 評価 → 報告

参照基準
- スキームのルール
- 方法論
- その他

評価
- PDD

報告
- バリデーション報告書

ベリフィケーション

GHG に関する主張を評価する，
体系的で，独立し，かつ，文書化されたプロセス

合意された検証の基準（2.32）に照らして

ISO14064-1，2 用語及び定義

ベリフィケーション

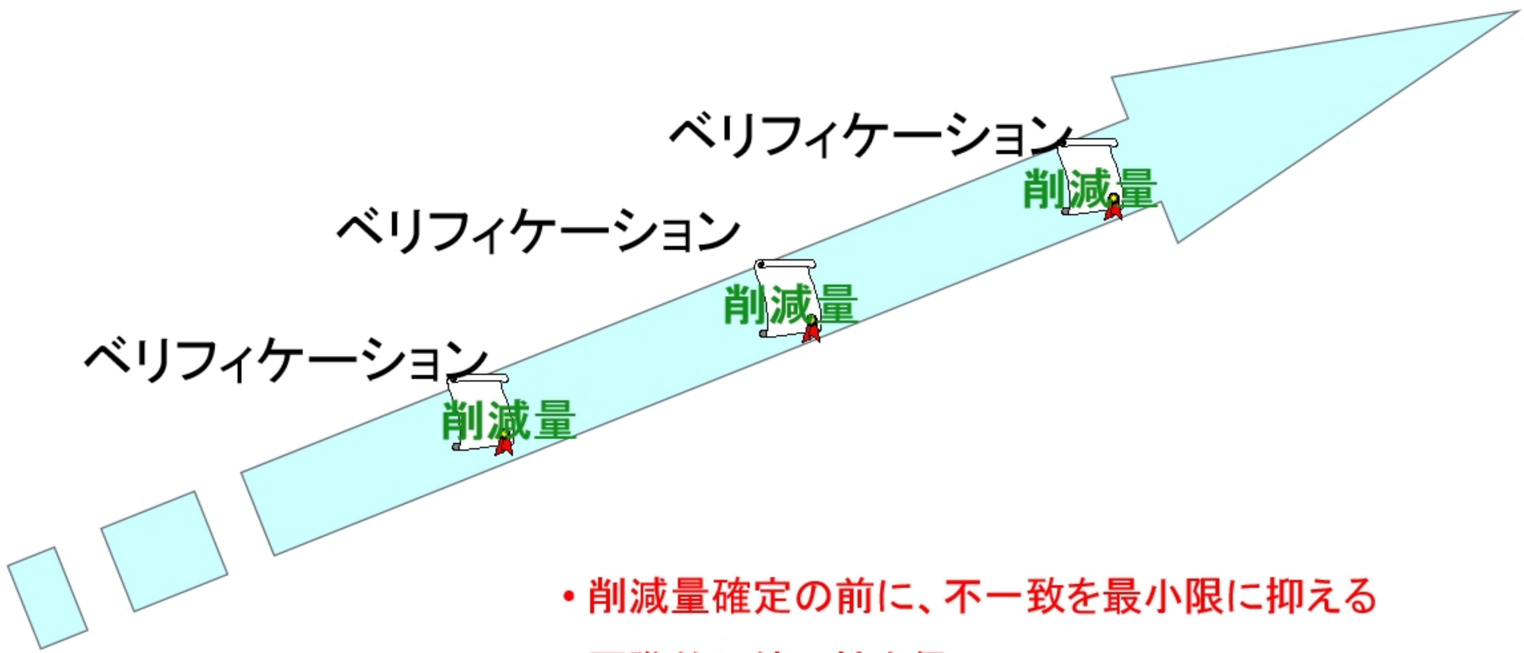
参照基準 → **評価** → **報告**

参照基準
- スキームのルール
- 方法論
- PDD
- その他

評価
- モニタリング報告書

報告
- ベリフィケーション報告書
- （認証書 ）

ベリフィケーション



- 削減量確定の前に、不一致を最小限に抑える
- 国際的に統一性を保つ

バリデーションとベリフィケーション

- **バリデーション:**
  - どちらかというと定性的な情報、推定、正当性などを評価。
  - ステークホルダーに対するインタビューを通して、結論に必要な多くの証拠を得る。

- **ベリフィケーション:**
  - どちらかというと定量的な情報、モニタリングの記録などを評価。
  - PDDやプロジェクト計画に沿って実施されていることを、確認する。

Question

審査とは？

参照基準 → **評価** → **報告**

参照基準
- ISO
- ASME
- EU 指令
- 社内規定、標準、手順書

評価
- システム
- プロジェクト
- 製品
- データ
- その他

報告
- 意見書
- 保証書
- 認証書
- CE マーク
- 検査報告書

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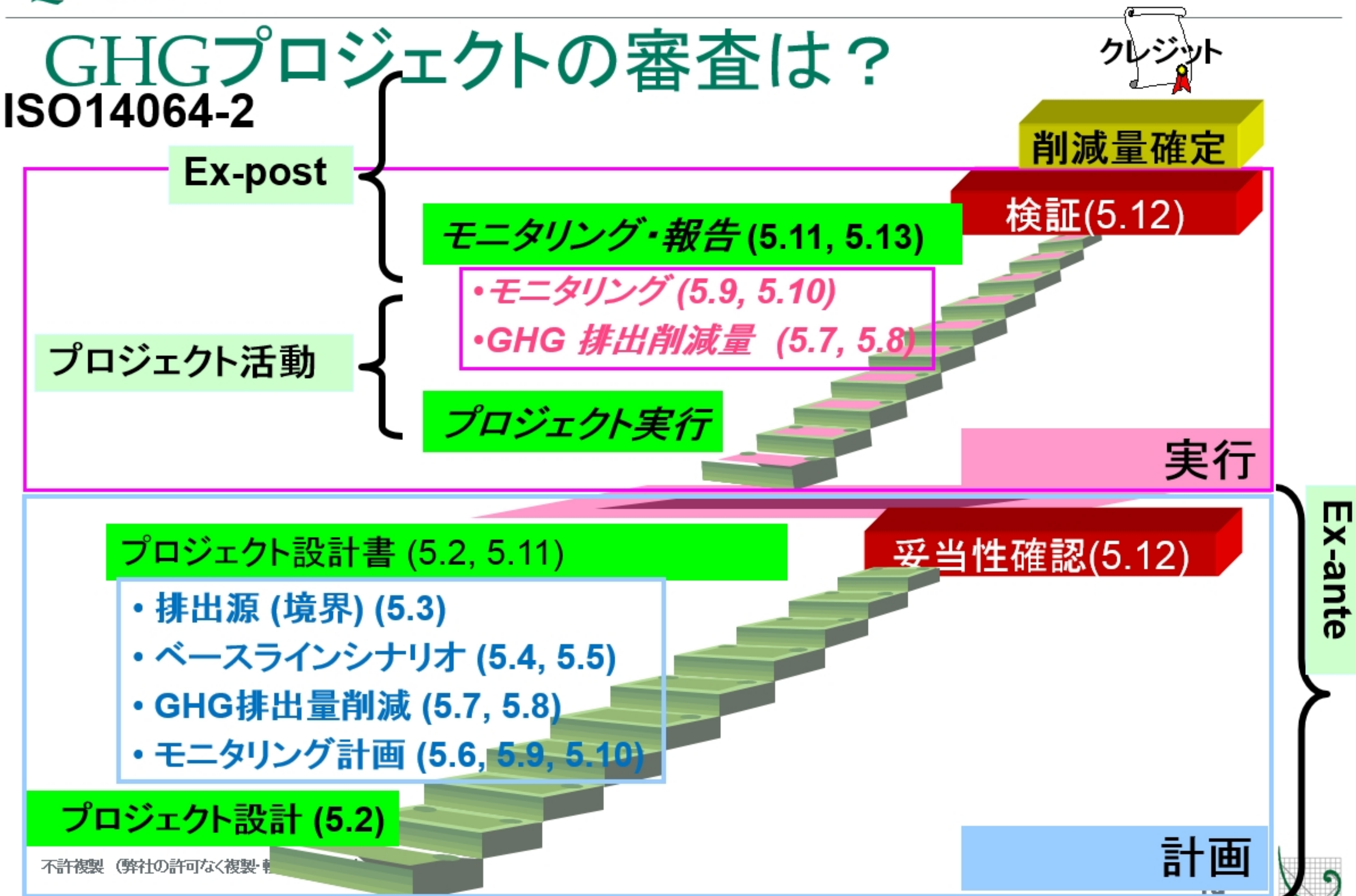
Question

GHGプロジェクトの審査は？



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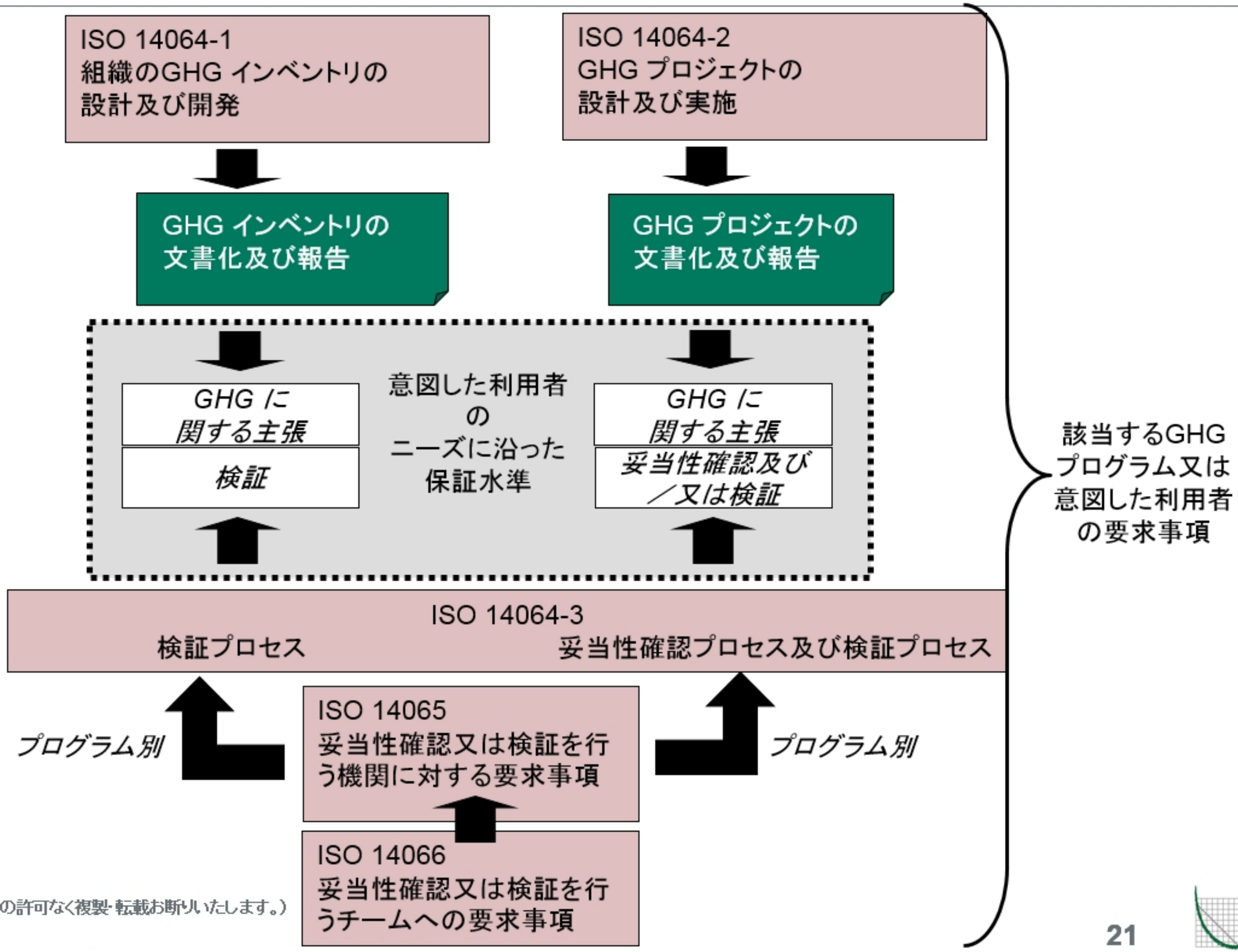
GHG削減プロジェクトの審査の原則

14064 規格群の各部間の関係



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ISO14064と他の規格

ISO14064-2：原則

適切性
- 意図した利用者のニーズに適したGHG の排出源，GHG の吸収源，GHG 貯蔵庫，データ及び方法論を選択する。

完全性
- 適切なGHG の排出量及び吸収量の全てを含める。基準及び手順を支える全ての適切な情報を含める。

一貫性
- GHG 関連の情報について，有意義な比較を可能にする。

ISO14064-2：原則

正確性
- 実行可能な限りバイアス及び不確かさを減らす。

透明性
- 意図した利用者が合理的な確信をもって判断を下せるように，十分かつ適切なGHG 関連の情報を開示する。

保守性
- GHG の排出量の削減又は吸収量の増加が過大に評価されないことを確実にするように，保守的な仮定，数値及び手順を使用する。

審査での判断：6原則

**適切性, 完全性, 一貫性,
正確性, 透明性**

1. Project Details
2. Application of Methodology
3. Quantification of GHG Emission Reductions and Removals
4. Monitoring
5. Environmental Impact
6. Stakeholder Comments

リスクを減らす

情報の追加　　**保守性の原則**

審査での判断：重要性（Materiality）

適切性、完全性、一貫性
正確性、透明性、保守性

主張する際の原則

＋

重要性

保証を行なう際

ISO14064

審査での判断：重要性（Materiality）

誤り，脱漏，不実表示

影響を及ぼすか？？

- GHG に関する主張
- 意図した利用者

許容可能な重要性

妥当性確認を行う者，検証を行う者又はGHGプログラムが決定

閾値：5%
(JCM、VCS)

5%超える不一致 ：不適合

審査での判断：重要性（Materiality）

重要性の判断
- ・定量的な側面　⇒閾値で対応
- ・定性的な側面　⇒専門家としての判断

定性的な判断が要求される項目の例

- 保全活動の有効性
- 温暖化以外へのインパクト
- セーフガードの確認

Question

6原則とは？

**適切性, 完全性, 一貫性,
正確性, 透明性**

1. Project Details
2. Application of Methodology
3. Quantification of GHG Emission Reductions and Removals
4. Monitoring
5. Environmental Impact
6. Stakeholder Comments

リスクを減らす

情報の追加　　**保守性の原則**

Question

重要性とは？

重要性の判断
- ・定量的な側面 ⇒閾値で対応
- ・定性的な側面 ⇒専門家としての判断

定性的な判断が要求される項目の例

- 保全活動の有効性
- 温暖化以外へのインパクト
- セーフガードの確認

バリデーションのアプローチ

リスクベースアプローチ

ステークホルダー
NGOs

プロジェクト設計
ベースライン（レファレンス）
モニタリング計画
排出削減量
環境影響評価
ローカルステークホルダーコミュニケーション

PDD

リスクの明確化:
推定・仮定
情報源

適切性?
完全性?
一貫性?
正確性?
保守性?
透明性?

現地訪問

重要な不確実性:
詳細な調査

バリデーション報告書
意見書

PDDのリスクとは？

1. ルール違反
2. 削減量に関する誤った報告の可能性
3. 報告原則に反する可能性
   - ✓ 適切性
   - ✓ 完全性
   - ✓ 一貫性
   - ✓ 正確性
   - ✓ 透明性
   - ✓ 保守性

バリデーション

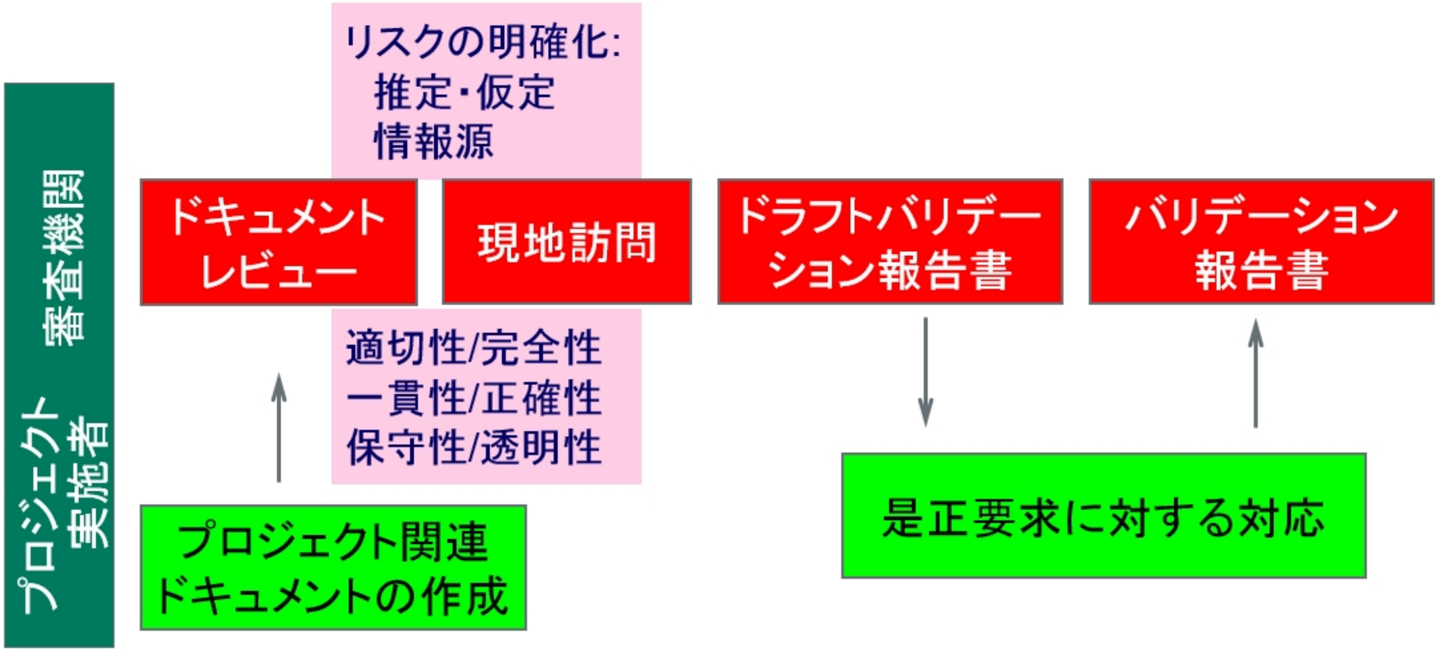
コンプライアンス

- PDDの記述内容が、スキームのルールに従っていること確認。
- 採用している方法論の適合性を評価。

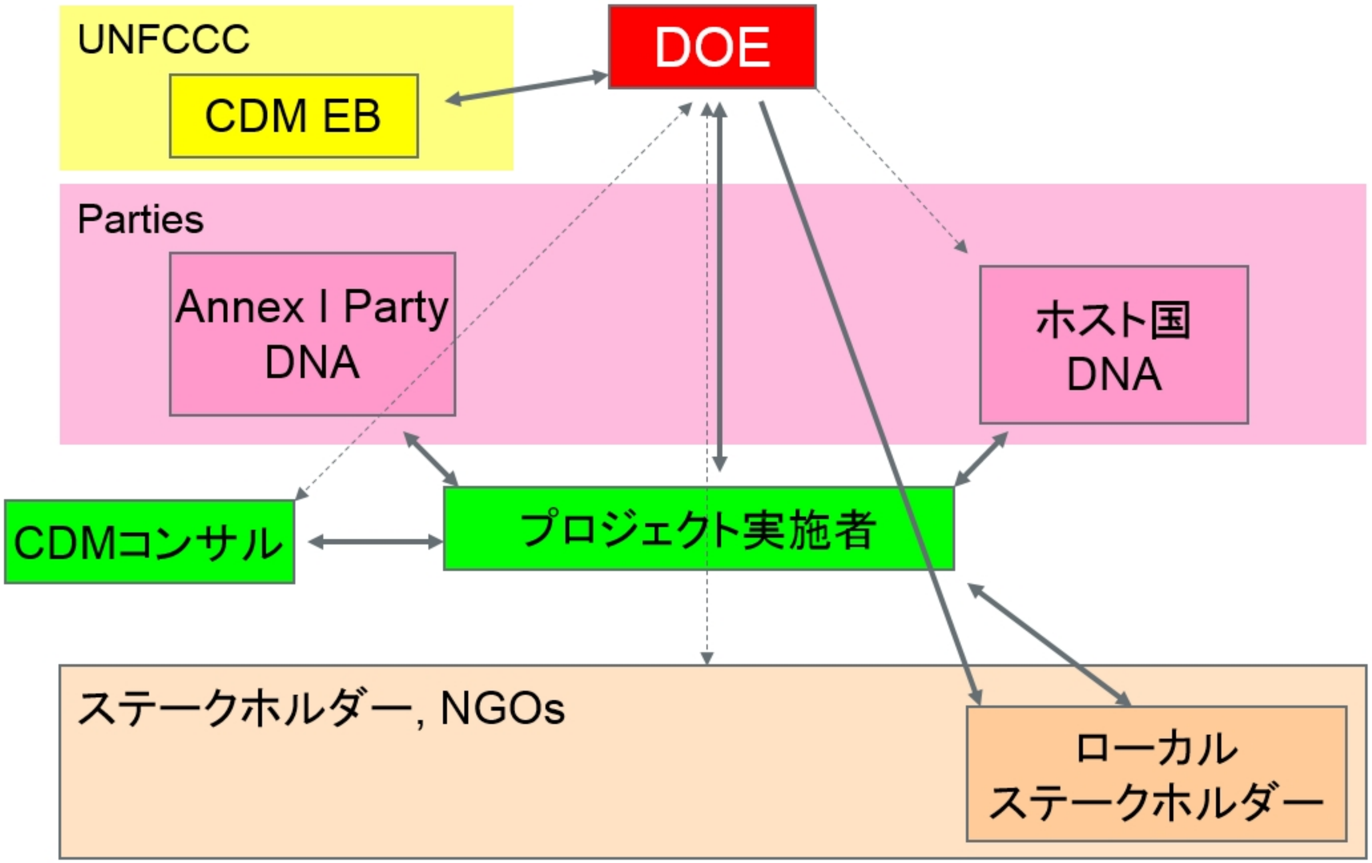
情報の評価

- PDDに示されている情報の適切性、完全性、一貫性、正確性、透明性及び様々な推定に対する保守性を、証拠に基づいて評価。

バリデーションのプロセス



バリデーションの関係者（CDMの例）



CDMの場合

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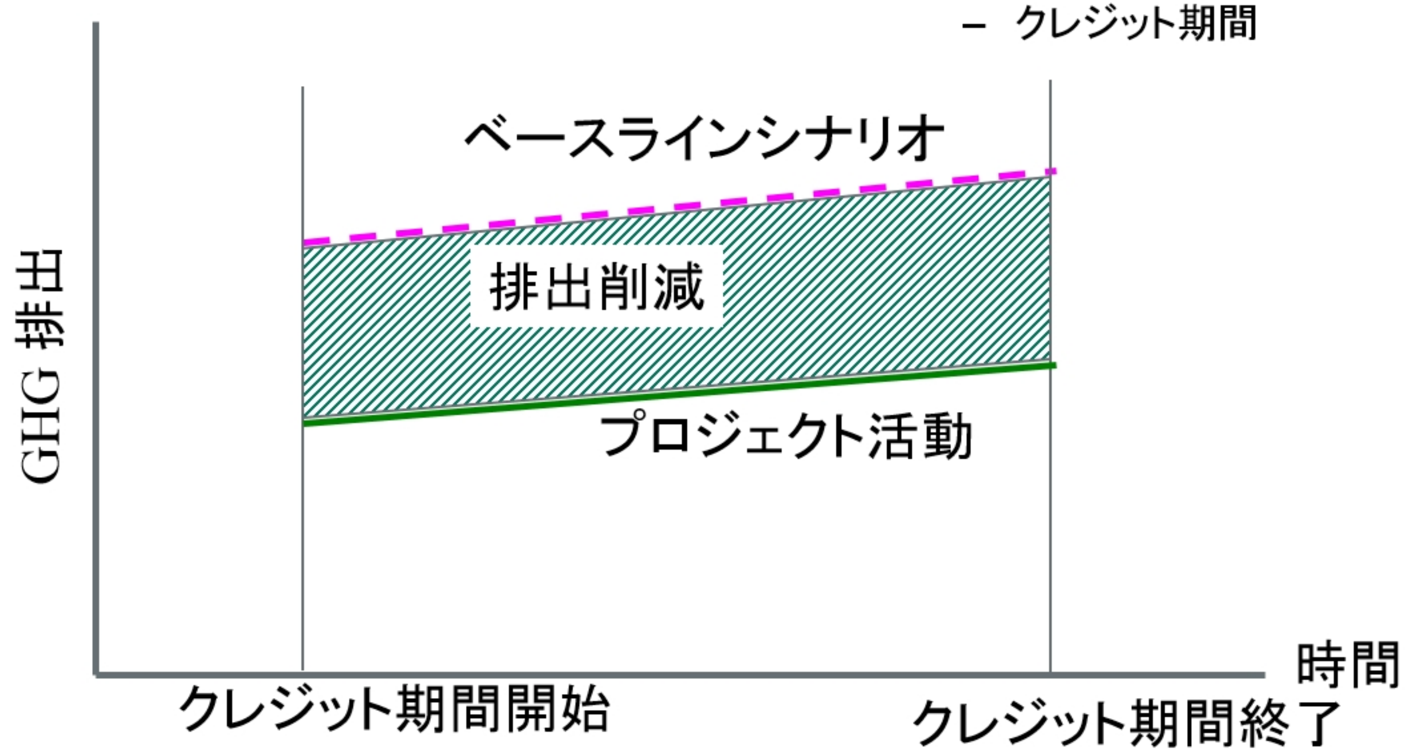
バリデーションの検討項目の例：ベースラインと追加性

排出削減は以下の二つで決定;
- ベースラインレベル
- クレジット期間



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バリデーションの検討項目の例：ベースラインと追加性

ISO14064-2, 5.4

プロジェクトの推進者は，プロジェクトが，ベースラインシナリオで生じると仮定されるものに追加されている（additional）GHG の排出量の削減又は吸収量の増加をもたらすことを実証するための基準及び手順を選択するか又は確立し，正当な根拠を示し，かつ，適用しなければならない。

- ベースライン方法論
- 追加性

バリデーションの検討項目の例：ベースラインと追加性

•シナリオの想定
- BAU
- ホスト国の政策、法律、経済、環境、社会を考慮
- エネルギーセクターへの影響を考慮
- 代替技術/燃料の選択
- ベースライン/プロジェクトの時間的なものを考慮

•最も経済的なものを選択

•プロジェクトが無い場合とある場合の比較

従う → ベースライン方法論

むなしい議論を避ける

バリデーションの検討項目の例：ベースラインと追加性

保守性の適用

適切性, 完全性, 一貫性,
正確性, 透明性

1. Project Details
2. Application of Methodology
3. Quantification of GHG Emission Reductions and Removals
4. Monitoring
5. Environmental Impact
6. Stakeholder Comments

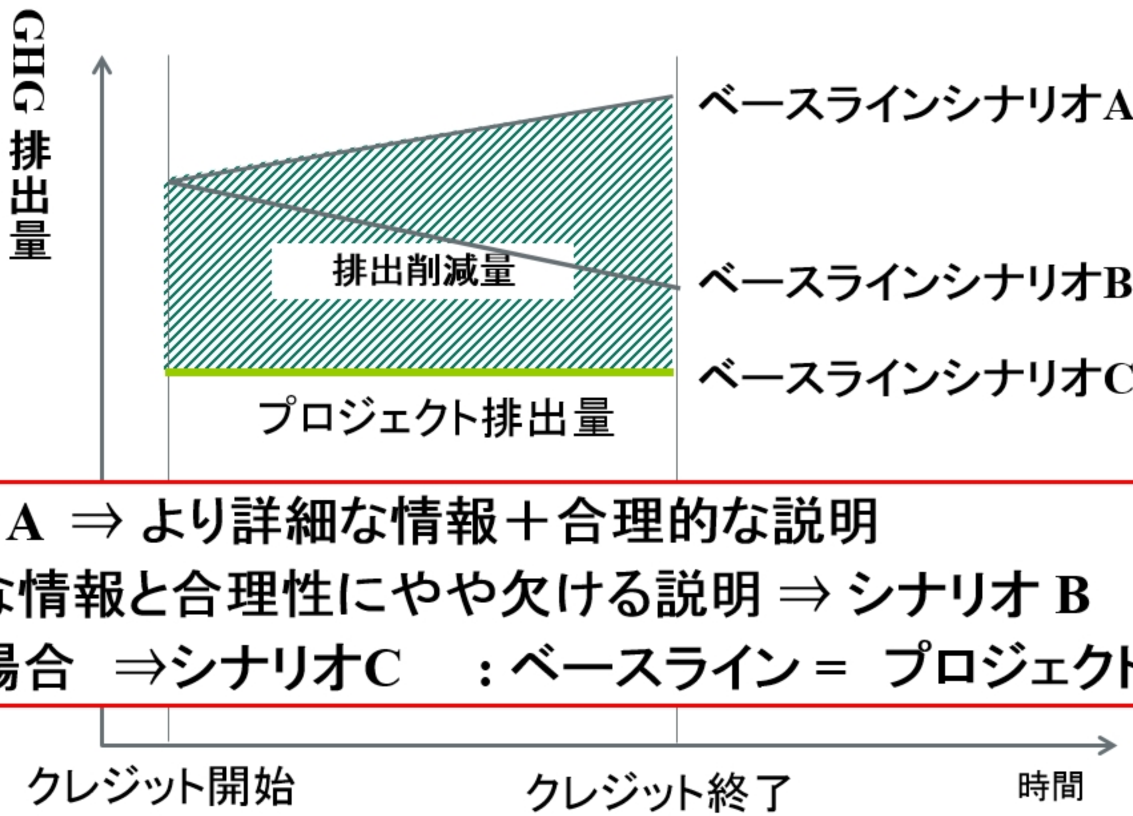
リスクを減らす

情報の追加

保守性の原則

バリデーションの検討項目の例：ベースラインと追加性

ベースラインスタディ



- シナリオ A ⇒ より詳細な情報＋合理的な説明
- 大雑把な情報と合理性にやや欠ける説明 ⇒ シナリオ B ？
- 最悪の場合 ⇒シナリオC ：ベースライン = プロジェクト

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バリデーションの検討項目の例：削減量の算定の評価

GHG排出削減量の算定

方法論に従う

一般に

GHG排出量 ＝ 活動量 × 排出係数

- 出典が明確
- GHG排出源、吸収源に対して適切
- 最新情報
- 不確実性を考慮し、正確で再現性のある方法で計算
- 他の係数との一貫性

バリデーションの検討項目の例：削減量の算定の評価

不確実性の高いデータや情報が使用されている場合、過度な排出削減量にならないように配慮する。

↓

保守性の原則

バリデーションの検討項目の例：削減量の算定の評価

不確実性の高いデータや情報が使用されている場合、過度な排出削減量にならないように配慮する。

適切性, 完全性, 一貫性,
正確性, 透明性

1. Project Details
2. Application of Methodology
3. Quantification of GHG Emission Reductions and Removals
4. Monitoring
5. Environmental Impact
6. Stakeholder Comments

リスクを減らす

情報の追加

保守性の原則

Question

バリデーションのプロセスは？

審査機関

プロジェクト実施者

リスクの明確化:
推定・仮定
情報源

ドキュメントレビュー

現地訪問

ドラフトバリデーション報告書

バリデーション報告書

適切性/完全性
一貫性/正確性
保守性/透明性

プロジェクト関連ドキュメントの作成

是正要求に対する対応

Question

リスクアプローチとは？

1. ルール違反
2. 削減量に関する誤った報告の可能性
3. 報告原則に反する可能性
   - ✓ 適切性
   - ✓ 完全性
   - ✓ 一貫性
   - ✓ 正確性
   - ✓ 透明性
   - ✓ 保守性

ベリフィケーションのアプローチ

ベリフィケーションのアプローチ

情報の評価

モニタリング報告書		スキームオーナーへの開示 一般公開
算定記録	削減量計算 他の分析、計算	情報は開示されない
活動記録	電力の請求書 燃料消費記録 ラボテスト記録 生産記録 他の記録類	情報は開示されない

ベリフィケーションのアプローチ

プロジェクト実施者

量的な情報

質的な情報

モニタリング報告書

適切性	透明性
完全性	一貫性
保守性	正確性

審査チーム

1. コンプライアンス
2. 情報の質
3. データマネジメント

Risk Based Approach

4. 重要性

ステークホルダー

意見書

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ベリフィケーションのアプローチ

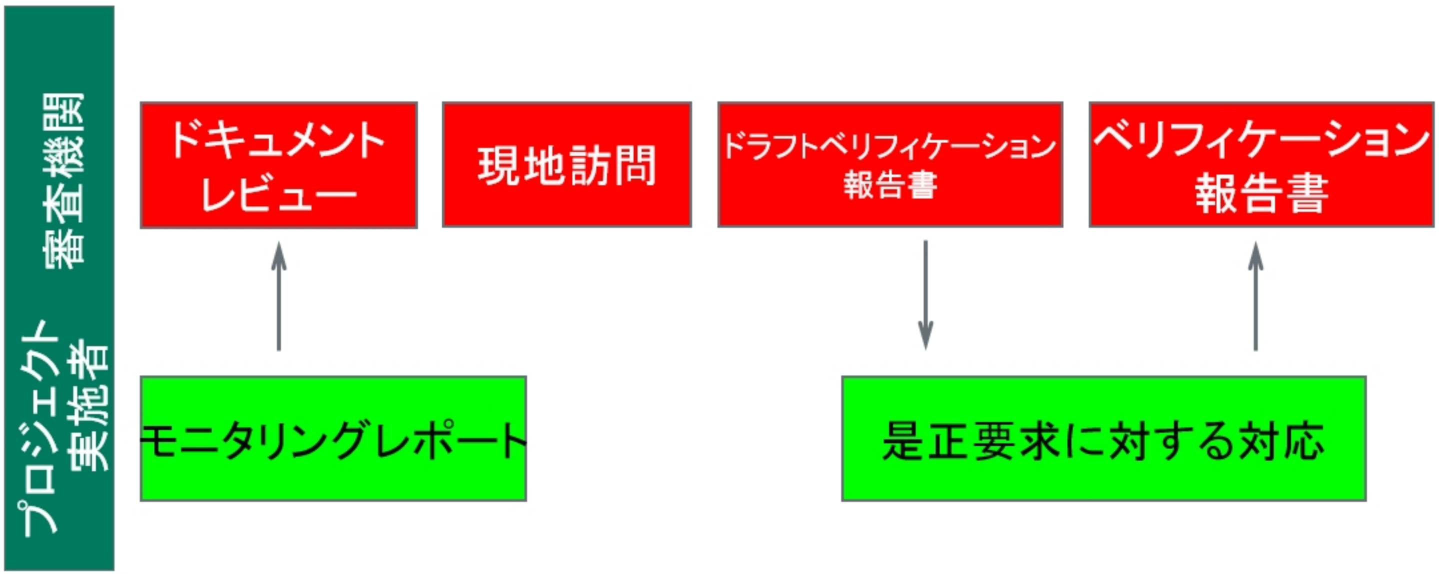
コンプライアンス

- PDDに従ってプロジェクトが実施され、物理的特徴が記述通りであることを確認する。
- モニタリングシステムや方法が、モニタリングプラン（PDD）や承認された方法論に従っていることを確認する。

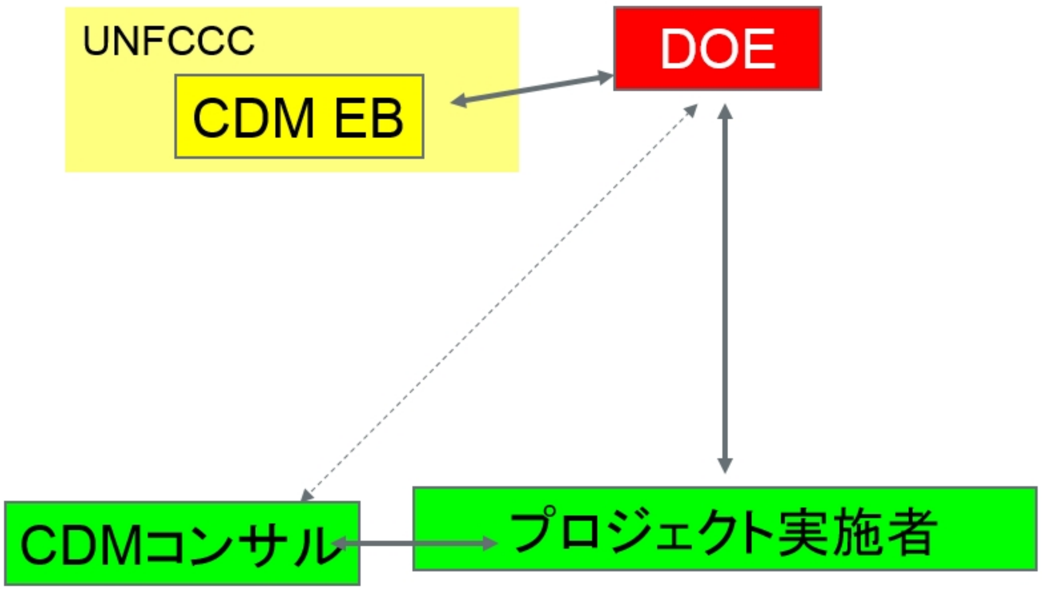
情報の評価

- モニタリング報告書やその補助文書類は完全であり検証可能であることを確認し、評価する。
- モニタリング計画で示されている記録や、補完されているデータを確認・評価する。

ベリフィケーションのプロセス



ベリフィケーションの関係者（CDMの例）



ベリフィケーションのアプローチ

■ 情報の評価

証拠に基づき評価する。

証拠の質
審査証跡.
(a) 十分な証拠
(b) 情報源

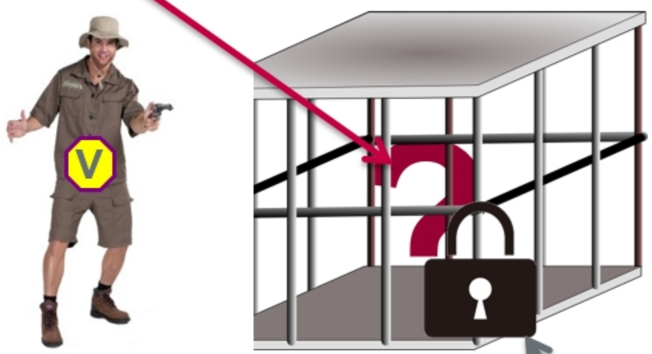
潜在的な誤り、漏れや誤った報告の程度を評価。

リスク：潜在的な誤り、漏れや誤った報告

リスクベースアプローチ

固有リスク(Inherent Risk)
重大な不一致が発生するリスク

プロジェクトの複雑さ
排出源の特徴(タイプ, 数など)



発見リスク(Detection Risk)
重大な不一致を, 妥当性確認を行う者又は検証を行う者が発見できないリスク

統制リスク(Internal control)～管理上のリスク
GHG プロジェクトの管理策によって、重大な不一致を予防又は発見できないリスク

ベリフィケーションの手法と関係
審査チーム内の専門化の有無

モニタリング機器の管理
データマネジメントシステム

リスクベースアプローチ

リスクベースアプローチ

1. 固有リスクと統制リスクを評価
2. 高いリスク分野を重点的に審査

- 総ての情報の評価の実施は、非効率的。
- 審査の時間を有効に使用。
- 発見リスクを最小限に抑える。

リスクベースアプローチ

固有リスクの評価の例

- プロジェクト活動の特質
- 排出源の特質(数、タイプなど)
- 適用方法論
- 情報
  - 合計した排出量に対する割合。
  - 前回の値との比較。大きな変化の有無。
  - 排出量の変化を示す別の指標。
    (例えば、プロジェクト活動の変化など)

リスクベースアプローチ

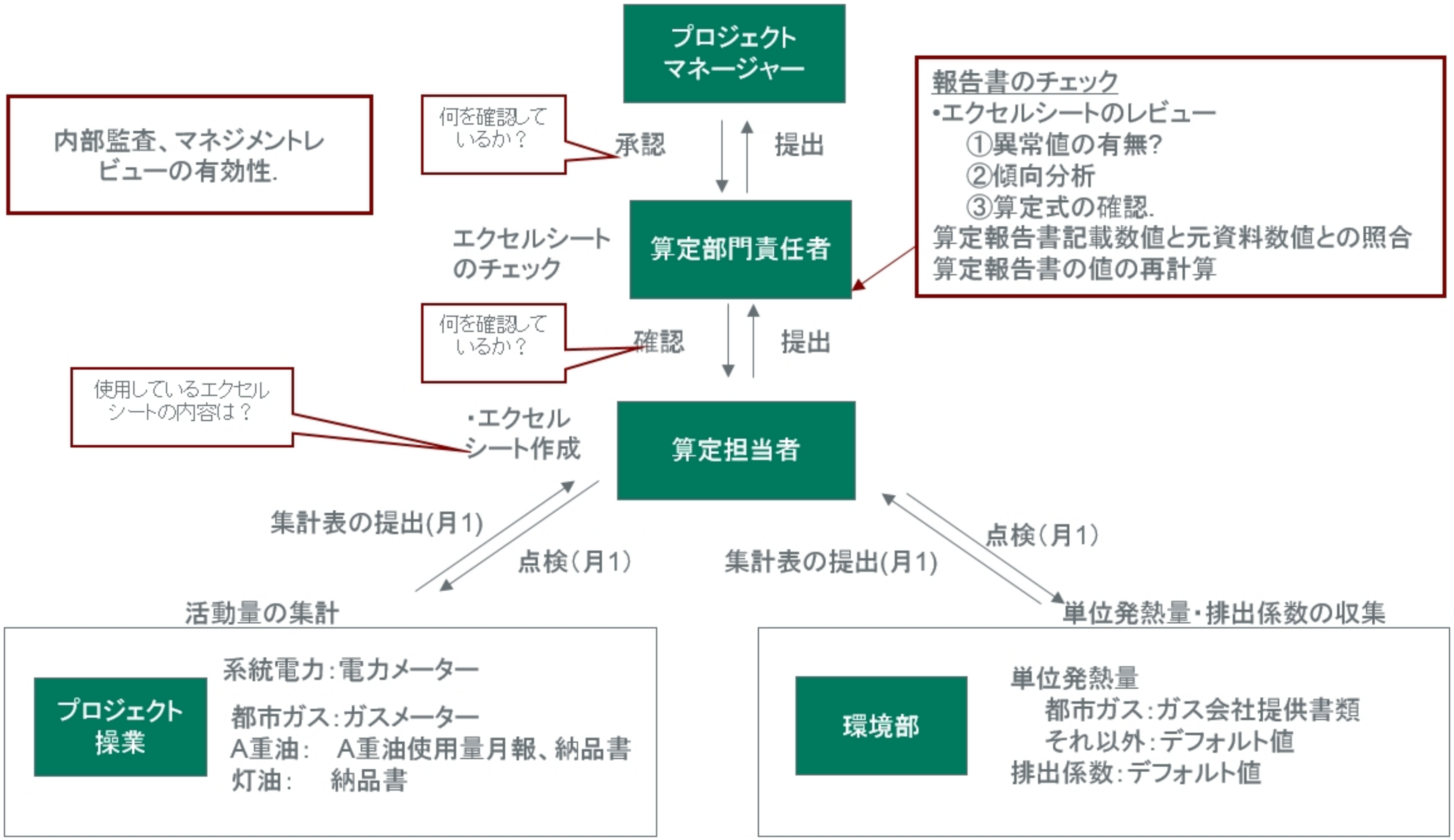
固有リスクの例

リスクベースアプローチ

統制リスクの評価の例

- データの収集、計算、報告のプロセル
- モニタリング機器のメンテナンス、キャリブレーション
- 重要な記録へのアクセス方法
- 情報のレビューや更新の方法
- 是正処置の方法
- 記録や文書類の管理方法
- 内部監査
- マネジメントレビュー

リスクベースアプローチ



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リスクベースアプローチ

6原則に従ってリスク評価を行う。

6 原則
- 適切性
- 完全性
- 一貫性
- 正確性
- 透明性
- 保守性

リスクベースアプローチ

6原則に従ったリスク評価の例

a) 完全性の欠如：
例えば，重大な排出源の除外，誤って設定された境界，リーケージの影響

b) 正確さの欠如：
例えば，ダブルカウント，大量の主要なデータの手書きによる転記，排出係数の不適切な使用；

c) 一貫性の欠如：
例えば，前年まで用いていたGHG の排出量又は吸収量の算定方法から変更したことが報告されていない

（ISO14064−3, A.2.4.6.2）

Question

ベリフィケーションのプロセスは？

審査機関

ドキュメントレビュー

現地訪問

ドラフトベリフィケーション報告書

ベリフィケーション報告書

プロジェクト実施者

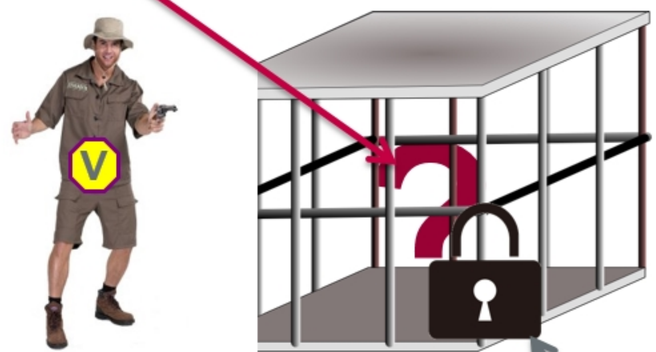
モニタリングレポート

是正要求に対する対応

Question　リスクアプローチとは？

固有リスク（Inherent Risk）
重大な不一致が発生するリスク

プロジェクトの複雑さ
排出源の特徴 (タイプ, 数など)



発見リスク（Detection Risk）

重大な不一致を，妥当性確認を行う者又は検証を行う者が発見できないリスク

ベリフィケーションの手法と関係
審査チーム内の専門化の有無

統制リスク（Internal control）
～管理上のリスク

GHG プロジェクトの管理策によって、重大な不一致を予防又は発見できないリスク

モニタリング機器の管理
データマネジメントシステム

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ERM

PDD (Project Description)のデスクレビューのポイント

Project Description (CDMではPDD)

VCSの場合

1. Project Details
2. Application of Methodology
3. Quantification of GHG Emission Reductions and Removals
4. Monitoring
5. Environmental Impact
6. Stakeholder Comments

VCS PROJECT DESCRIPTION: VCS Version 3

VCS Project Description Template

Instructions for completing the project description:

TITLE PAGE: All items in the box at the bottom of the title page must be completed using Arial 10pt, black, regular (non-italic) font. This box must appear on the title page of the final document. Project descriptions may also feature the project title and preparers' name, logo and contact information more prominently on the title page, using the format below (Arial 24pt and Arial 11pt, black, regular font).

PROJECT DESCRIPTION: Instructions for completing the project description can be found under the section headings in this template. All sections must be completed using Arial 10pt, black, regular (non-italic) font. Sections which are not applicable may be left blank but should NOT be deleted from the final document.

All instructions, including this introductory text, should be deleted from the final document.

PROJECT TITLE

Logo (optional)

Document Prepared By (Individual or entity)

Contact Information (optional)

Project Title	Name of project
Version	Version number of this document
Date of Issue	DD-Month-YYYY this version of the document issued
Prepared By	Individual or entity that prepared the document
Contact	Physical address, telephone, email, website

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PDDのレビュー

参考とする文書類:

1. ガイドライン: 例えばVCSの場合
   - VCS Standard
   - Agriculture, Forestry and Other Land Use (AFOLU) Requirements V3.4
   - Jurisdictional and Nested REDD+ (JNR) Requirements V3.1
   - その他、VCSのプログラムドキュメント

2. 他の文書類
   - 適用する方法論
   - その他の文書類や情報。

PDDのレビュー

1. Project Details
2. Application of Methodology
3. Quantification of GHG Emission Reductions and Removals
4. Monitoring
5. Environmental Impact
6. Stakeholder Comments

1.プロジェクトの内容

- 採用する技術、タイプ、スコープ
  - プロジェクト (何が行なわれるか?)
  - プロジェクト活動以前の既存シナリオ (今何が行なわれているか?)
  - 排出削減量
- 関係する国と参加者
- プロジェクト、クレジット期間
- ダブルカウント

PDDのレビュー

2. 方法論の適用

方法論の適用性.

- 登録済みの方法か？
- 適用条件(Applicability conditions)と正当性。
- 同じ方法論を採用した、別のプロジェクト。

PDDのレビュー

2. 方法論の適用

ベースライン

- プロジェクト境界 (排出源と温室効果ガス)
- ベースラインシナリオ
- ベースラインの決定
  - 追加性
  - 保守的で適切な決定

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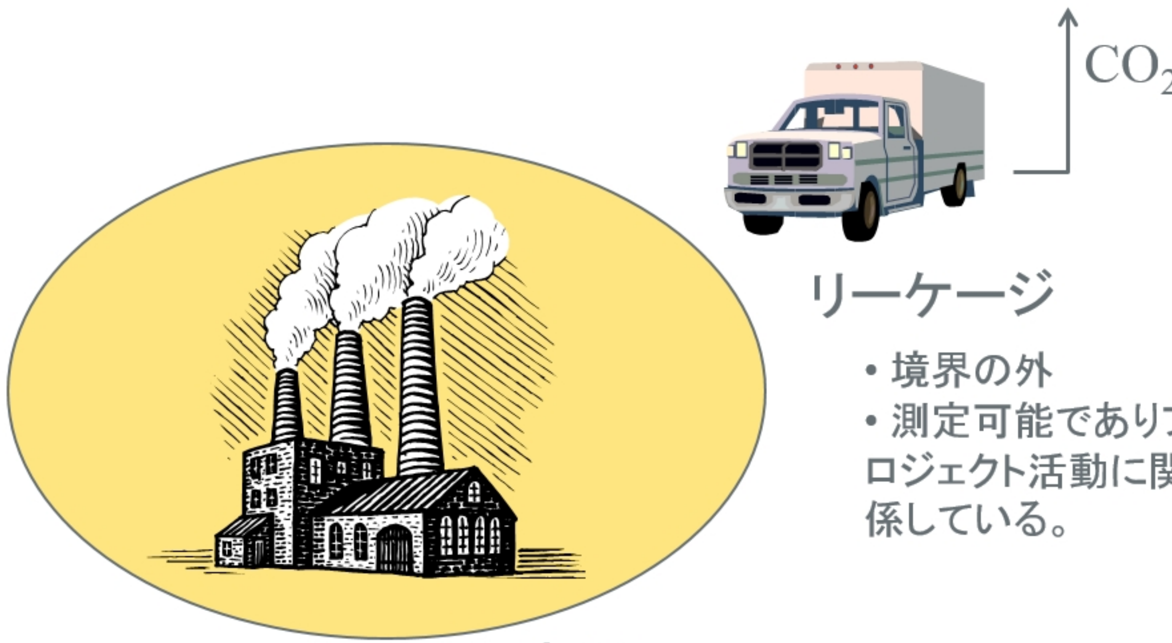
バウンダリー

全ての排出源を含むこと

- コントロールされている排出源
  影響を及ぼし、測定可能
- 重要かつﾌﾟﾛｼﾞｪｸﾄ活動に起因する。

Glossary of CDM terms

バウンダリー



境界

リーケージ

- 境界の外
- 測定可能でありプロジェクト活動に関係している。

PDDのレビュー

ベースラインスタディと追加性

追加性の正当性 ：バリア（実施上の障壁）分析

- 投資上のバリア
- 技術上のバリア
- 習慣上のバリア
- 他のバリア：

方法論に従がっているか？

PDDのレビュー

3　排出削減量の算定

- 境界の設定は適切か?
- 全ての排出源は考慮されているか?
- 全ての6ガスを考慮しているか?
- リーケージは?
- 合理的で保守的な仮定の下で、全ての排出量は算定されているか?
- 現時点での削減量の推定("ex ante" の計算)

PDDのレビュー

4 モニタリング計画 (“*ex post*” での測定)

- クレジット獲得できる算定システムとなっているか。
- 選択した方法論に沿っていること。
- 排出量を導く
  - ベースライン排出量
  - プロジェクト活動排出量
- 適切なマネジメントシステム
- 実際のプロジェクトに沿っていること。

情報マネジメント

貧弱 → 良質 or 貧弱 → 貧弱

良質 → 貧弱 → 貧弱

良質 → 良質 → 良質

データ源　マネジメントシステム　モニタリング報告書

情報マネジメント

情報マネジメントシステム、確認事項の例

- プロジェクトマネジメントの責任・権限は明確か？
  （測定・計算・報告書作成・レビュー等）
- 要員の教育・訓練の手順は考慮されているか？
- 緊急時対策は考慮されているか？
- 測定機器の管理・校正の手順と妥当性は考慮されているか？
- 文書・記録類の取り扱い、維持の手順は考慮されているか？
- 内部監査・パフォーマンスレビューのしくみはあるか？
- 是正処置の手順は考慮されているか？

PDDは検証の際の参照資料となる

PDDのレビュー

1. Project Details
2. Application of Methodology
3. Quantification of GHG Emission Reductions and Removals
4. Monitoring
5. Environmental Impact
6. Stakeholder Comments

4. 環境影響

- EIAは必要か?
- 特定された潜在的な環境への影響?
- 越境する影響を含む

5. ステークホルダーのコメント

- 適切なステークホルダーが選定されているか?
- 適切なコミュニケーション手法がとられているか?

REDD+　審査の際の留意点

REDD+の留意点

削減プロジェクトのレベル

バウンダリー

参照レベル

算定方法

モニタリング体制

保全活動の有効性

温暖化以外へのインパクト

セーフガード

どこまで審査で見るべきか？

判断基準は？

REDD+の留意点1：レベル

XX国

地域A

地域B

…

プロジェクトA

プロジェクトB

プロジェクトC

プロジェクトD

…

国レベル

準国レベル

プロジェクトレベル

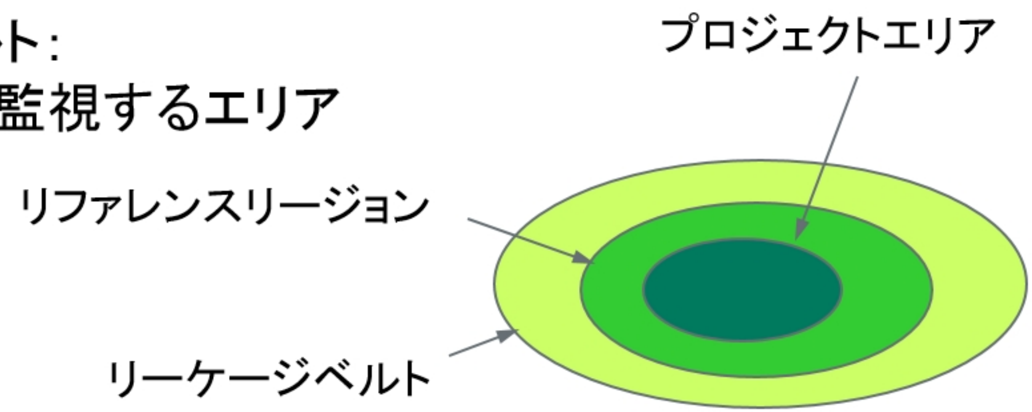
一貫した定量化・報告方法

標準化のレベル

REDD+の留意点2：バウンダリー

通常三つのバウンダリー

- プロジェクトエリア：
  プロジェクト活動の境界
- リファレンスリージョン（参照エリア）：
  リファレンスレベル（ベースライン）を決定する際に用いるエリア
- リーケージベルト：
  リーケージを監視するエリア



REDD+の留意点2：バウンダリー

リモセンや公的データ（例えば行政区画など）で決定。

不確実性の評価（例えばリモセンの解像度など）。

REDD+の留意点2:バウンダリー

◆ プロジェクトエリア

活動実行可能なバウンダリー設定か？
複数のサイトが点在しているときのサンプリングは？
衛星画像の解像度の判断は？
バウンダリー確認のためのサイトを、どのように回るか？

◆ リファレンスリージョン

プロジェクトエリアより広く、類似性のある地域
- 森林へのアクセス/ 土地利用/ 森林減少の要因
- その他

◆ リーケージベルト

森林削減活動が移転する可能性を分析し、エリアを特定
- 生産物の生産コスト/ 生産物の消費方法/ 輸送コスト
- その他

REDD+の留意点3:参照レベル

参照レベル（Reference revel）

REDDプロジェクトが実施されない場合、GHGの排出はどうなるか。

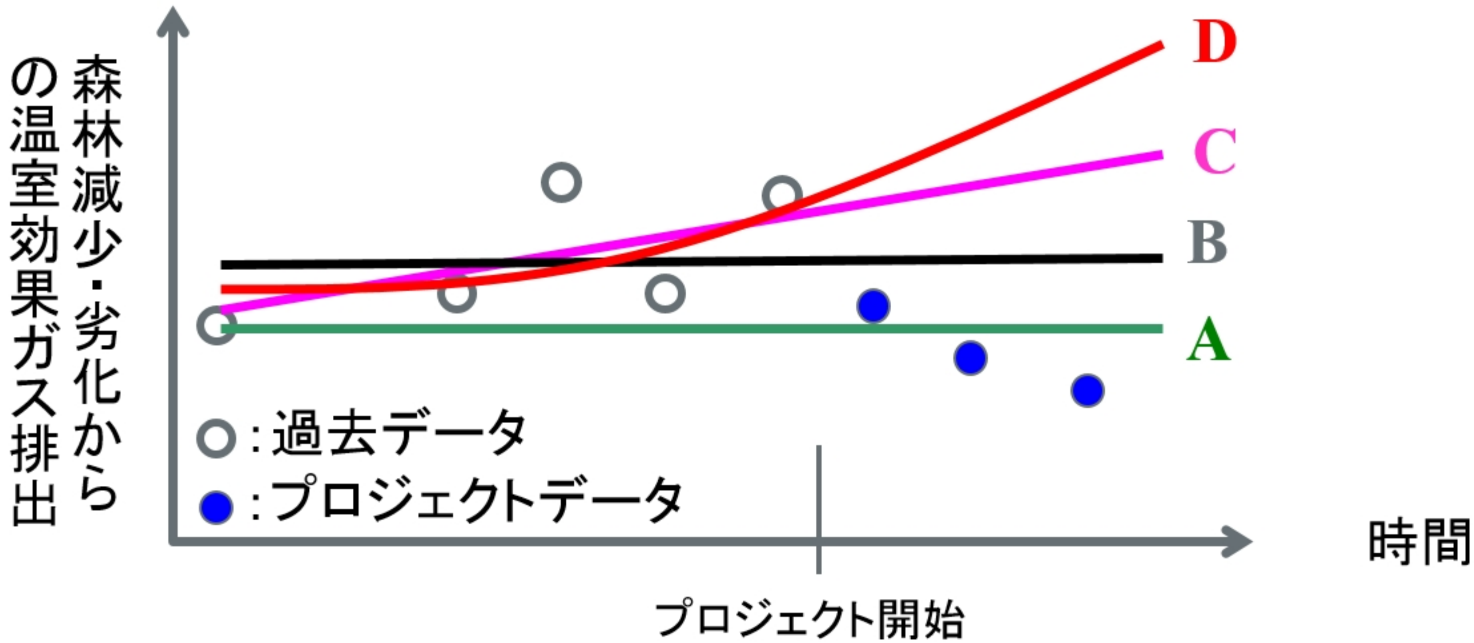
これまでの森林伐採とGHG排出量の傾向からの推定。

↓

GHG削減プロジェクトのベースライン

REDD+の留意点3：参照レベル

定量化、モニタリング、報告の原則を満たすシナリオの選択



国レベル、準国レベル、プロジェクト毎に設定？？

REDD+の留意点3:参照レベル

- 森林減少・劣化の原因の明確化と、選択したシナリオとの整合性。
- 対象国や地域の状況との整合性。
- 国、準国レベルとの整合性

REDD+の留意点4:算定方法

$$E_{harvest,it} = \left(\frac{44}{12} \cdot \left(C^{extracted}_{BH,it} - C^{woodproduts}_{BH,it}\right)\right) + E_{BH,BiomassBurn,it}$$

$$R_{B,growth,it} = R_{ARB,it} \cdot A^{planted}_{it} \cdot \frac{44}{12}$$

$$\Delta C_{B,AG,it} = E_{timber,it} + E_{B,BiomassBurn,it} - R_{B,growth,it} + E_{harvest,it}$$

$$E_{B,drainage,it} = A_{B,drain,it} \cdot ME_{B,dd,it}$$

$$+ \quad E_{B,p,it} = E_{B,Drainage,it} + E_{B,PeatBurn,it}$$

$$E_{timber,it} = \left(C^{extracted}_{B,it} - C^{woodproduts}_{B,it}\right) \cdot \frac{44}{12}$$

$$E_{B,PeatBurn,it} = E_{B,PeatBurn,CO2,it} + E_{B,PeatBurn,CH4,it}$$

$$E_{B,BiomassBurn,it} = E_{B,BiomassBurn,CO2,it} + E_{B,BiomassBurn,N2O,it} + E_{B,BiomassBurn,CH4,it}$$

VM0004より抜粋

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REDD+の留意点4:算定方法

- 多くの式と係数
- 様々なサンプリング手法
- サンプリング結果からの推定方法
- ・・・・ 方法論との整合性。
- 基本はIPCCのはず。

REDD+の留意点4:算定方法

保守性の適用

適切性, 完全性, 一貫性,
正確性, 透明性

A. General description of project activity
B. Application of a baseline and monitoring methodology
C. Duration of the project activity / Crediting period
D. Environmental impacts
E. Stakeholders' comments

リスクを減らす

情報の追加

保守性の原則

REDD+の留意点5:モニタリング体制

モニタリングに現地の住民の参加?

有効なモニタリング体制の構築

REDD特有の留意点6:保全活動の有効性

- 森林火災防止活動
- ステークホルダーへの啓蒙
- 農業支援活動
- 森林パトロール
- その他、様々な保全活動

活動の有効性は考慮せず、カーボンストックの変化のみをモニター、検証？

REDD特有の留意点7:温暖化以外へのインパクト

- ✓ 生物多様性やエコシステムへの影響
- ✓ 社会経済的影響
- ✓ 環境への影響
- ✓ プロジェクトバウンダリー外への上記の影響

CDM-VVM(v1.2)パラ159-161

社会経済的影響、生物多様性や自然エコシステムを含む環境への影響、プロジェクト境界外への影響の分析に関して、DOEは確認すること。

REDD特有の留意点8:セーフガードの確認

例えば以下のような事態への予防処置

- 天然林の人工林への転換
- 先住民族や地域住民への悪影響

REDD特有の留意点8:セーフガードの確認

セーフガードの項目(COP16, Annex I Para2):

(a) 国家森林プログラムや関連する国際条約・国際合意を補完し、整合性を保った活動;
(b) ホスト国の法令・主権を踏まえ、透明かつ効果的な国家森林ガバナンスを促進・支援;
(c) 先住民や地域住民の知見や権利の尊重;
(d) 先住民・地域コミュニティなど、関係するステークホルダーの参加;

(e) 天然林・生物多様性保全と整合性があり、社会・環境的便益の増強となる行動を促進・支援;
(f) 森林に蓄積された炭素の再放出予防の活動(非永続性);
(g) 排出の移転(リーケッジ)予防の活動

REDD特有の留意点8:セーフガードの確認

セーフガードの情報提供システム(COP17)

セーフガードへの配慮、具体的にとられた措置についての情報を定期的に提供すること(全活動実施期間)。

バリデーション、ベリフィケーションにおいて、評価すべきか???

Question

バリデーションの留意点

削減プロジェクトのレベル

バウンダリー

参照レベル

算定方法

モニタリング体制

保全活動の有効性

温暖化以外へのインパクト

セーフガード

どこまで審査で見るべきか？

判断基準は？

タイトルを入力

Any Questions?

ERM日本
サステナビリティ マネジメントチーム
仲尾 強

tsuyoshi.nakao@erm.com

第５章

VCSの概要について

一般社団法人　日本森林技術協会
宗像 和規

VCS とは

Verified Carbon Standard（VCS)

・自主的炭素市場における温室効果ガス排出量削減・吸収プロジェクト活動から発生するクレジットについて、しっかりとした<u>品質を保証するための基準を提供</u>することを目的とする。

・2005年に、NPO等によって設立された。
The International Emissions Trading Association（IETA）
World Economic Forum
The World Business Council for Sustainable Development（WBCSD）
The Climate Group

VCS の組織構成

VCS協会
（VCS Association）

VCS事務局
（VCS Secretariat）

レジストリ（登記）の管理・
運営等を担当

VCS委員会
（VCS Board）

認証基準の改定などを
議論する場

AFOULグループ
（Agriculture,Forestry and
Other Land Use）

農業・森林・その他の土地利用について技術的に支援

PDDからクレジット発行までの流れ

プロジェクト設計書の作成(PDD)	VCSの様式に基づきプロジェクト設計書を作成(PDD)を作成する。 また、GHG排出量の定量化を行うため、VCSで承認された方法論を選択する。
↓ プロジェクトの妥当性確認(Validation)	第三者検証機関等により、プロジェクト設計書の妥当性確認 を行う。
↓ プロジェクトの登録	第三者検証機関による審査を終え、VCS事務局にプロジェクトの登録を行う。
↓ モニタリング報告書の作成	プロジェクト設計書の計画に従いモニタリングを実施する。 VCSの様式に基づきモニタリング報告書を作成する。
↓ モニタリングの検証(Velification)	第三者検証機関等により、モニタリング報告書の検証を行う。
↓ クレジットの発行・登録・管理	第三者検証機関による審査を終え、VCS事務局がクレジットの発行を行う。 クレジットは、VCS Program RegistryでVCS事務局が登録・管理を行う。

VCS のプログラム

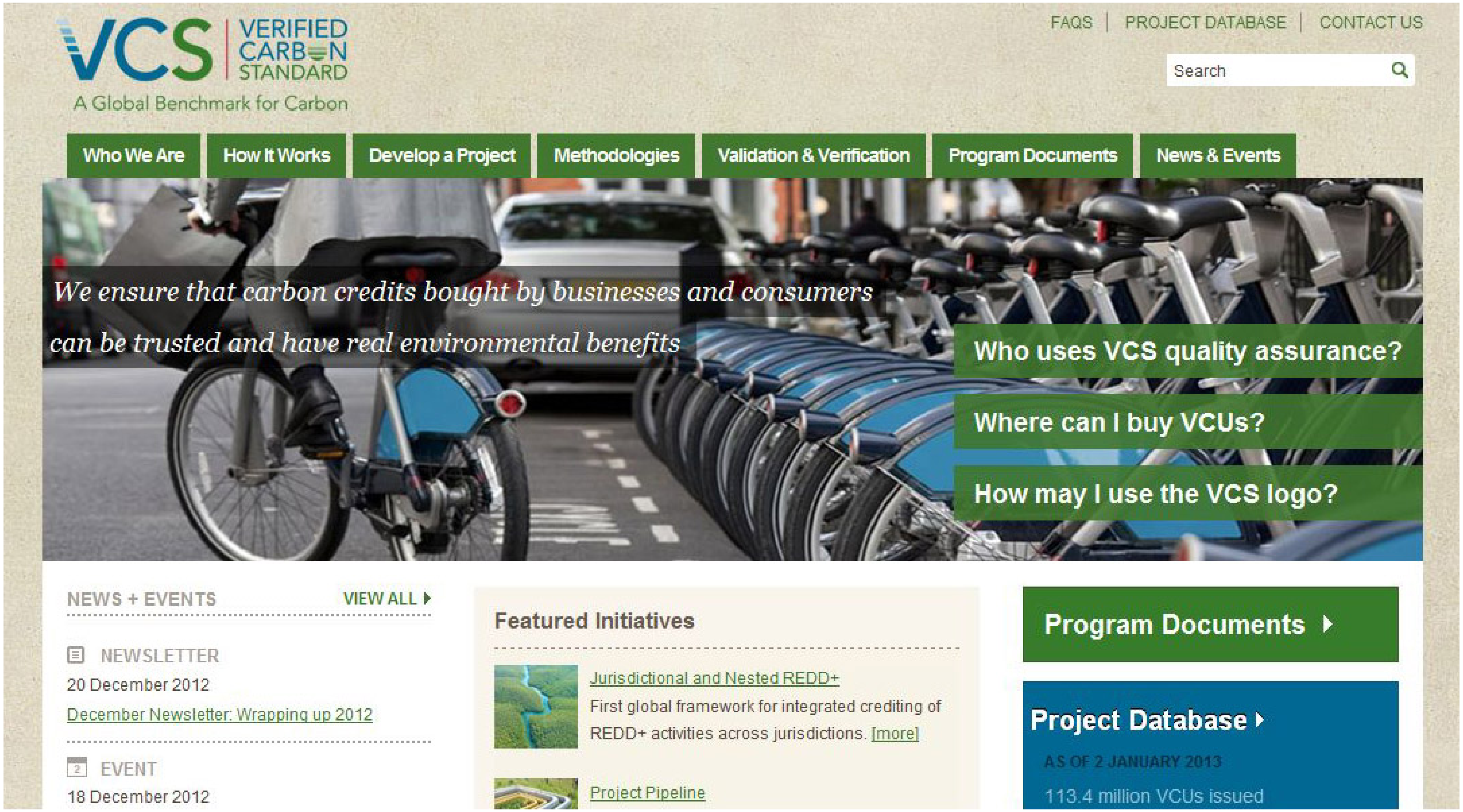
・VCSのプログラムには、認証された温室効果ガスの排出量削減とクレジットを発行するため、プロジェクト開発を行う手順、規則、要件などが示されている。

・プロジェクトの実施者は、プログラム文書に記載され、（実施するプロジェクトに）該当する全ての規則と要件を満たさなければならない。

・プログラム文書は、VCSのWebサイトから入手できる。

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

VCS のホームページ



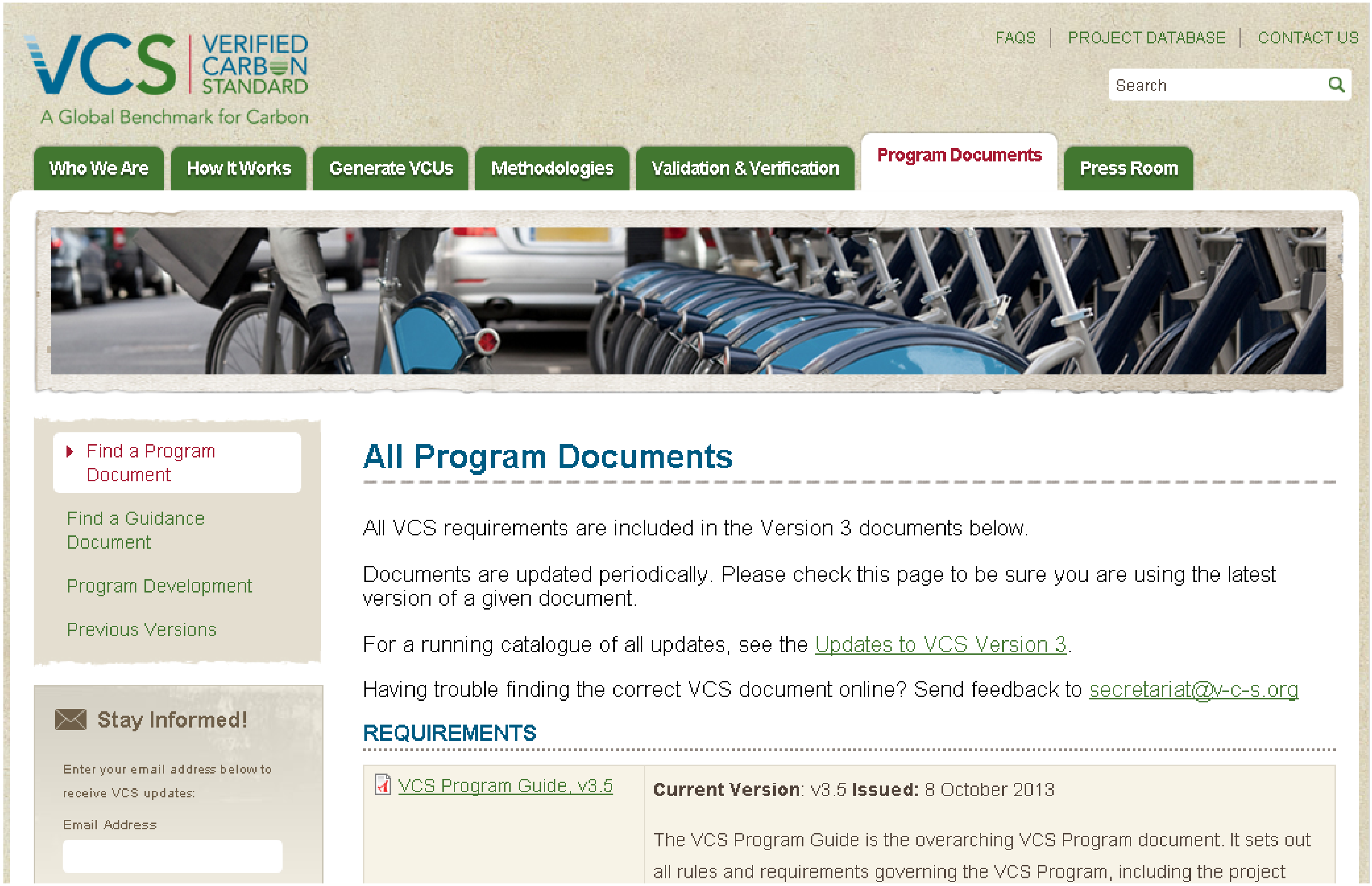
VCSのホームページより

VCSのプログラム文章

掲載されているプログラム文章の例

VCSプログラムガイドV3.5	包括的なVCSプログラムのドキュメント。 プロジェクトの登録、方法論、認証、検証機関の認定要件、レジストリシステムの機能など、VCSプログラムのルールと要件を記載。
VCSスタンダードV3.4	方法論、検証、モニタリング手法など、プロジェクトを実施する上での要件を記載。また、AFOLU(農業、林業及びその他の土地利用)やODS(オゾン層破壊物質）など、方法論の要件を踏まえた特定の側面から詳しく解説。
AFOLUの要件V3.4	AFOLU分野における方法論を開発するための詳細な要件を記載。
AFOLU非永続リスクツールV3.2	非永続リスクを評価するためのツール。プロジェクト実施者や、認証・検証機関が実施すべき具体的な手順が記載。
プロジェクトの説明V3.2	プロジェクトの説明（PD)のテンプレート
モニタリング報告書V3.3	モニタリング報告書のテンプレート
妥当性確認報告書V3.3	妥当性確認（Validation）報告書のテンプレート
検証報告書V3.3	検証報告書（Verification）報告書のテンプレート

VCS のプログラム文章



VCSのホームページより

VCS のプログラム文章

「プロジェクトの説明」
文書（テンプレート）
データ

PROJECT TEMPLATES & FORMS

Project Description, v3.2	**Current Version**: v3.2 **Issued:** 8 October 2013 Project description template
Monitoring Report, v3.3	**Current Version**: v3.3 **Issued:** 8 October 2013 Monitoring report template
Registration Representation, v3.2	**Current Version**: v3.2 **Issued:** 8 October 2013 Deed of representation issued in respect of the project
Registration Representation (multiple PPs), v3.2	**Current Version**: v3.2 **Issued:** 8 October 2013 Deed of representation issued in respect of the project with multiple project proponents
Issuance Representation, v3.3	**Current Version**: v3.3 **Issued:** 8 October 2013 Deed of representation issued in respect of GHG emission reductions or removals
Issuance Representation (multiple PPs), v3.3	**Current Version**: v3.3 **Issued:** 8 October 2013 Deed of representation issued in respect of GHG emission reductions or removals from projects with multiple project proponents
Listing Representation, v3.1	**Current Version**: v3.1 **Issued**: 4 October 2012

VCSのホームページより

VCS のプログラム文章

「プロジェクトの説明」
文書（テンプレート）

VCS VERIFIED CARBON STANDARD PROJECT DESCRIPTION: VCS Version 3

PROJECT TITLE

Logo (optional)

Document Prepared By (individual or entity)

Contact Information (optional)

Project Title	*Name of project.*
Version	*Version number of this document.*
Date of Issue	*DD-Month-YYYY this version of the document issued.*
Prepared By	*Individual or entity that prepared this document.*
Contact	*Physical address, telephone, email, website.*

v3.2 2

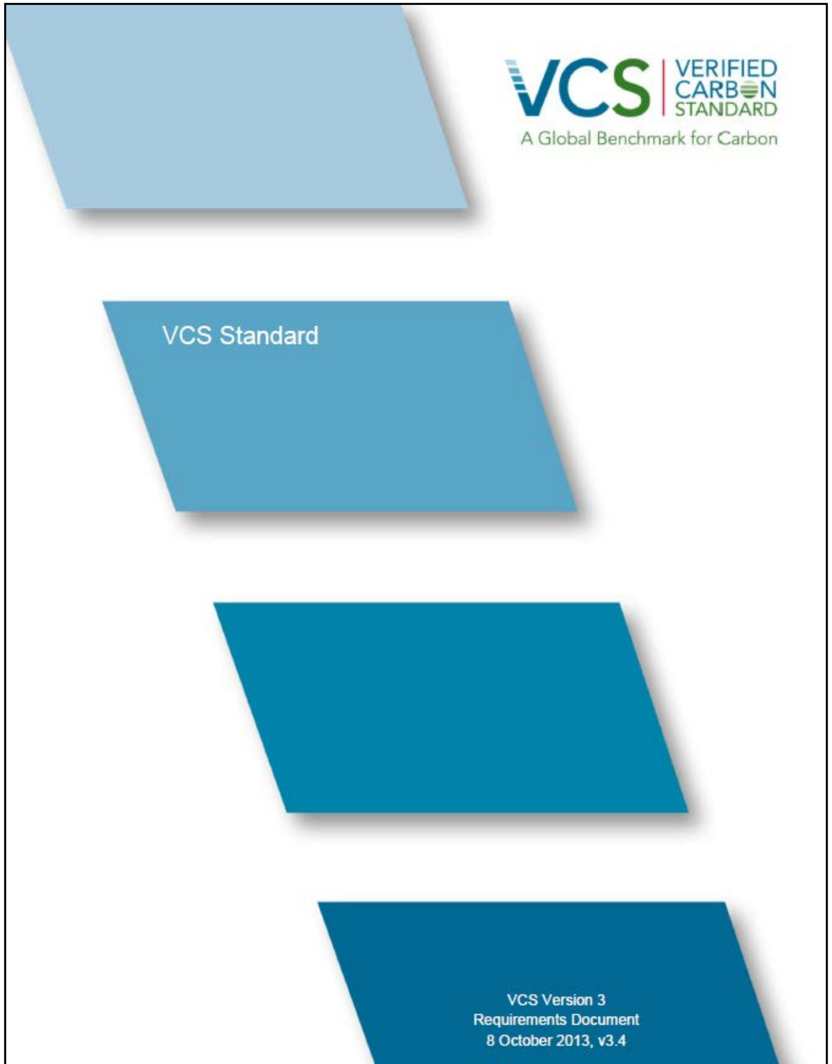
VCSのプログラム文章

「プロジェクトの説明」（PROJECT DESCRIPTION　v3.2）目次

プロジェクトのタイトル バージョン 発行日 作成者 問い合わせ 目次 1．プロジェクトの詳細 1.1プロジェクトの概要説明 1.2分野別の適用範囲及びプロジェクトの種類 1.3プロジェクトの提唱者 1.4プロジェクトに関与する他の存在 1.5プロジェクト開始日 1.6プロジェクトのクレジット期間 1.7プロジェクトの規模と温室効果ガス吸排出量の推定 1.8プロジェクト活動の説明 1.9プロジェクトの場所 1.10プロジェクト開始前の状況 1.11法律、法令及びその他の規制の枠組みへの準拠 1.12所有権およびその他のプログラム 1.12.1使用権 1.12.2排出権取引プログラムと他の拘束力のある制限 1.12.3その他の温室効果ガスプログラムへの参加 1.12.4環境クレジットの他のフォーム 1.12.5他の温室効果ガスプログラムによる拒否	1.12.6プロジェクトに関連する追加情報 的確性基準 リーケージの管理 営利上の機密情報 さらに詳しい情報 2.方法論の適用 2.1タイトルと方法論の参照 2.2方法論の適用性 2.3プロジェクト境界 2.4ベースラインシナリオ 2.5追加性 2.6方法論の逸脱 3.温室効果ガスの吸排出量の定量化 3.1ベースライン排出量 3.2プロジェクト排出量 3.3リーケージ 3.4温室効果ガスの純排出削減量と吸収量 4.モニタリング 4.1妥当性確認で使用可能なデータとパラメータ 4.2モニタリングのためのデータとパラメータ 4.3モニタリング計画 5.環境への影響 6.利害関係者の意見

VCS のプログラム文章

「VCS Standard」文書


VCS | VERIFIED CARBON STANDARD
A Global Benchmark for Carbon
VCS Standard
VCS Version 3
Requirements Document
8 October 2013, v3.4

VCS のプログラム文章

「VCS Standard v3.4」 目次

VCS プロジェクトの適用範囲

・VCSの対象となるプロジェクトは、鉱業、製造業、産業廃棄物処理、森林保全から再生可能エネルギーなどの多岐の分野にわたる。

VCSの分野別の適用範囲

1. エネルギー産業（再生可能/不可）	9. 金属の生産
2. エネルギー輸送	10. 燃料からの漏えい
3. エネルギー需要	11. 産業ガスからの漏えい
4. 製造業	12. 溶剤使用
5. 化学工業	13. 廃棄物の処理・処分
6. 建設	（AFOLU） 14. 農業、林業および他の土地利用
7. 運輸	15. 家畜と肥料の管理
8. 鉱業・鉱物生産	

AFOLUプロジェクトの分類

・農業、林業および他の土地利用(AFOLU)プロジェクトは、以下のカテゴリーに分類される。

- 植林、再植林及び緑化(ARR)
- 農地管理(ALM)
- 改善された森林管理(IFM)
- 森林減少と森林劣化に由来する排出の削減(REDD)
- 草原や潅木林への変換の防止(ACoGS)
- 湿地の保全と再生(WRC)

AFOLUの要件

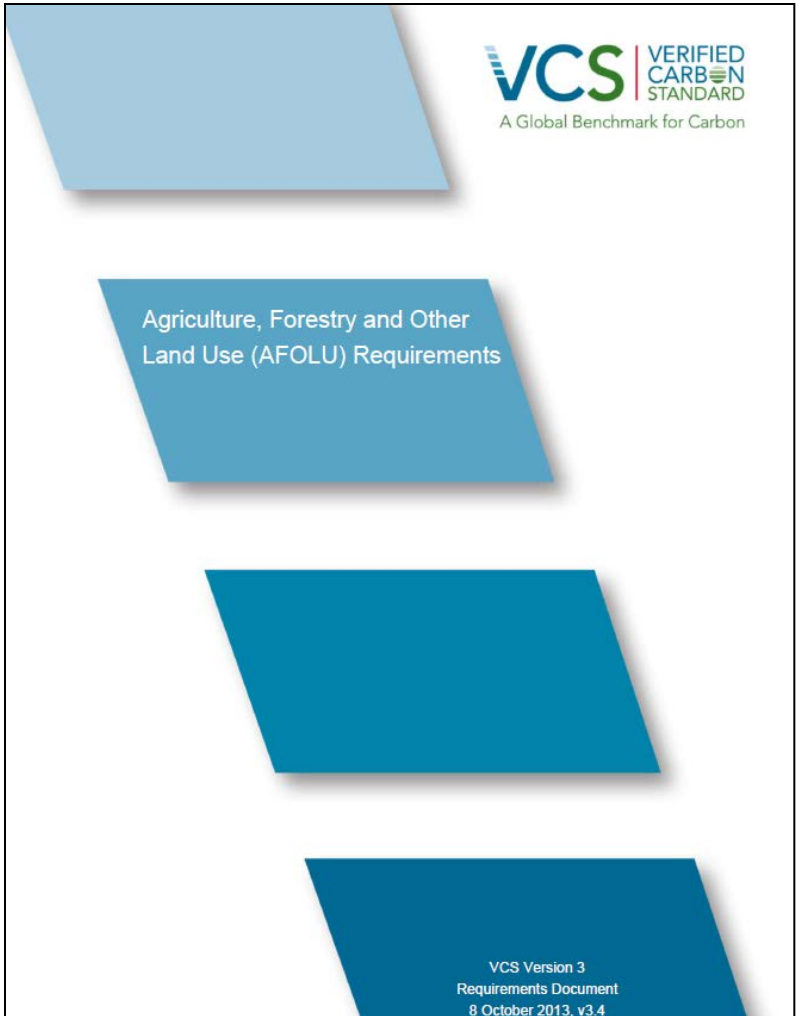
・VCSのAFOLU（Agriculture, Forestry and Other Land Use、農業・森林・その他の土地利用）プロジェクトが対象となる。

・VCSのプログラム文章、「AFOLU Requirements」として取り纏められ、AFOLUグループで定めた基準と定義について記載されている。

・プロジェクトは、原則的にプログラム文章の「VCS Standard」に沿って実施するが、AFOULで定めた基準（外部基準含）を踏まえて実施する。

「グッドプラクティスガイダンス」（IPCC 2003）
→炭素貯蔵量、GHG吸排出量の定量化
「ナショナルGHGインベントリー ガイドライン」（IPCC 2006）
→炭素プールの吸収量の定量化手順

AFOLUの要件



VCSのホームページより入手可

AFOLUの要件
〔 Agriculture, Forestry and Other Land Use (AFOLU) Requirements 〕

AFOLUの要件

「AFOLUの要件」（AFOLU Requirements v3.4）

目次

AFOLU 非永続リスクツール

・このツールは、AFOLU（Agriculture, Forestry and Other Land Use、農業・森林・その他の土地利用）プロジェクトに必要な非永続性のリスク分析およびバッファ決定を行うための手順を提供する。また、このツールは、リスクを評価し、適切なリスク評価を決定するために、プロジェクト実施主体や検証機関等に対する要求事項を定めている。

・評価されるリスクのカテゴリーは、「内部リスク」、「外部リスク」、「自然リスク」の3つに大別される。

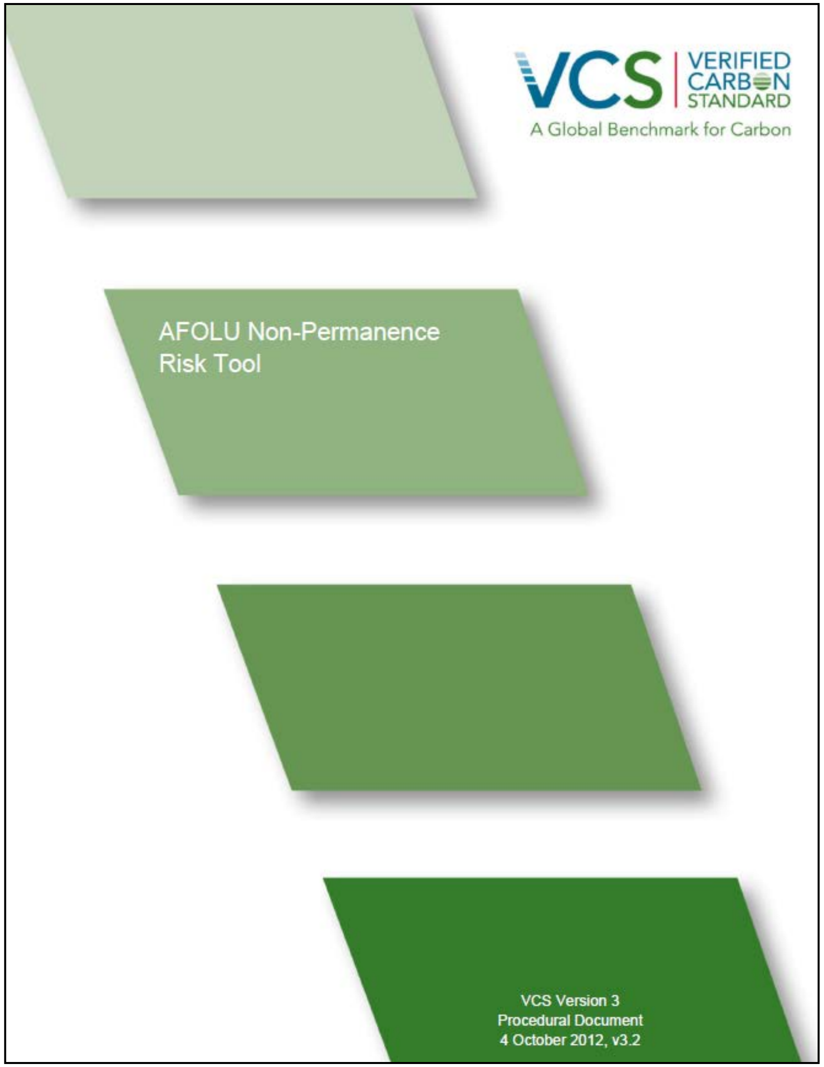
・それぞれのカテゴリーでリスクが点数化され、総合評点によりプロジェクトの全リスク評価を決定する。これにより非永続リスクのバッファークレジットが徴収される。

内部リスク	外部リスク	自然リスク
プロジェクト管理 財政的実行可能性 機会コスト※ プロジェクト寿命	土地保有 コミュニティ関与 政治的リスク	火災 病害虫の発生 極端な気象 その他の自然リスク

※プロジェクトを実施しなかった場合に得られる利益。

AFOLU 非永続リスクツール

「AFOLU Non-Permanence Risk Tool」文書



AFOLU 非永続リスクツール

「AFOLU Non-Permanence Risk Tool v3.2」 目次

VCSにおけるISOの規定

・VCSは、ISO14064-2:2006、ISO14064-3:2006及びISO14065:2007に規定された要件に基づいて実施されている。

ISO14064-2 :2006	【温室効果ガス−第2部：プロジェクトにおける温室効果ガスの排出削減・吸収量の定量化、モニタリング及び報告のための規格並びに手引】 ・温室効果ガス排出削減・吸収のためのプロジェクトに焦点 ・プロジェクトのベースラインを決定するための要求事項等が規定
ISO14064-3 :2006	【温室効果ガス−第3部：温室効果ガスに関する主張の妥当性確認及び検証のための規格並びに手引】 ・検証の計画、評価手順及び温室効果ガス報告書の評価の要求事項が規定 ・独立第三者機関が温室効果ガス報告書の検証する際に用いられる。
ISO14065 :2007	【温室効果ガス：認定及びその他の承認形式で試用するための温室効果ガスの妥当性確認及び検証機関に対する要求事項】 ・温室効果ガスの妥当性確認及び検証を行う機関に対する要求事項を規定

VCSの検証体制

・VCSでは、プロジェクトと独立した検証体制が品質保証の核

・VCS事務局は直接検証作業を行わない。VCS協会に認定された第三者検証機関が実施する。全てのプロジェクトは、検証を受ける必要がある。

・VCSの検証機関は、CDM理事会に認定されたDOE（CDMプロジェクトで検証を行う第三者検査機関）、ISO14065の審査機関、及びVCS事務局から認定された第三者検査機関が実施する。

「プロジェクトの説明」→妥当性確認（Validation）→プロジェクト登録
「モニタリング報告書」→検証（Verification）→クレジット発行

方法論について

・VCSの方法論は、それぞれのプロジェクトにおける温室効果ガス削減効果を定量化するため、詳細な要件を設定したものであり、実際の温室効果ガスの削減効果を定量化するための手順や方程式が示されている。

・プロジェクトの実施者は、温室効果ガスの削減量を定量化するために、VCSで承認された方法論を選択して使用するとともに、選択した方法論に完全に従わなければならない。
ただし、VCSの方法論だけではなく、国連のクリーン開発メカニズム（CDM）や気候行動リザーブ（CAR）で承認された方法論を使用することもできる。

・新たなプロジェクト開発において、既存の方法論がニーズを満たしていない場合、VCS協会に提案し、新たな方法論を開発することができる。

方法論について

・VCSのサイト上には、分野別に方法論が掲載されており、AFOULプロジェクトについては、4つのREDD+の方法論が示されている。

【方法論ID】

VM0004、VM0006、VM0007、VM0015

・また、各方法論を補完するために、モジュールとツールが掲載されている。

モジュール	特定のタスクを実行するために適用できる方法論の構成要素
ツール	解析を行ったり、モジュールや方法論を選択・使用するためのガイドラインや手順

方法論について

・REDDプロジェクトに係る方法論

方法論		概　要
VM0004	Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests	東南アジアの泥炭湿地林における計画的な土地利用転換を避ける保全プロジェクトのための方法論を示す。
VM0006	Methodology for Carbon Accounting for Mosaic and Landscape-scale REDD Projects	計画外の人為的なモザイク状森林伐採と劣化を減少させることを目的とする活動のための条件と炭素量計算方法を示す。
VM0007	REDD Methodology Modules	モジュール方式のREDD方法論であり、計画的な森林伐採、計画外の森林伐採、森林劣化というベースラインの状況に応じて適用させるモジュールを選択
VM00015	Methodology for Avoided Unplanned Deforestation	無計画な森林破壊を避けるための方法論を示す。モザイク状と面的な伐採の両方に適応可能。

方法論について

該当する分野を検索

VCSのホームページより

方法論について

Who We Are | How It Works | Generate VCUs | Methodologies | Validation & Verification | Program Documents | Press Room

Find a Methodology

Keywords

REDD

Sectoral Scope

14. Agriculture, Forestry, Land Use

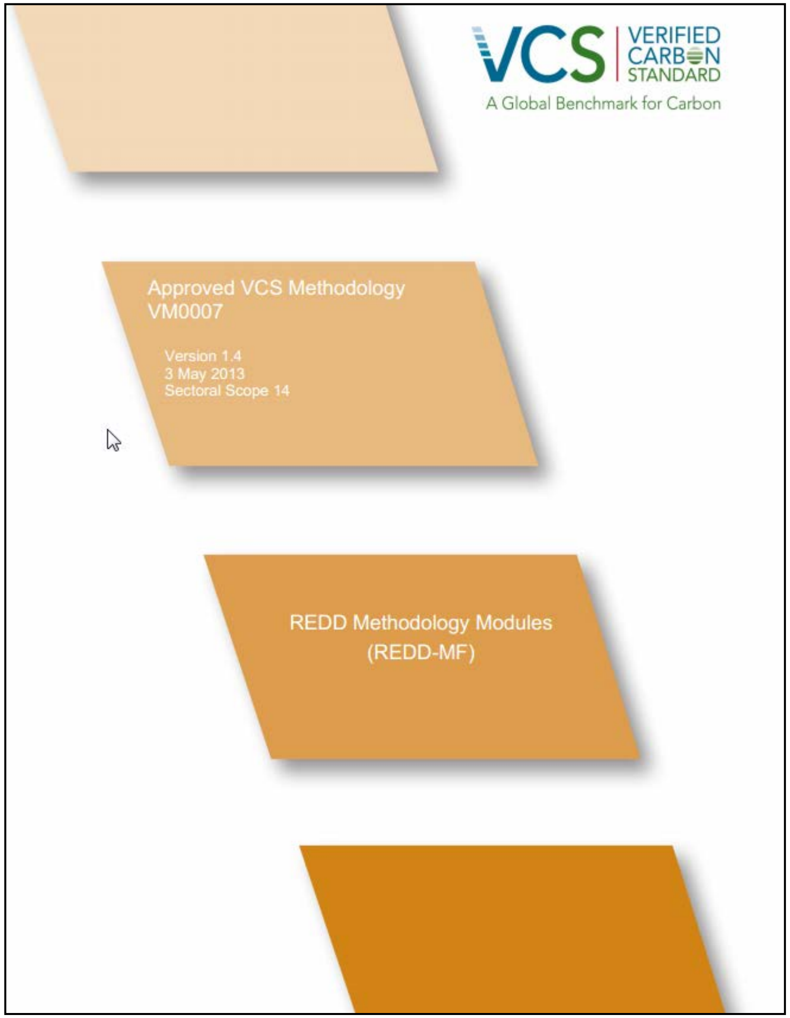
SEARCH

METHODOLOGIES

Sectoral Scope	ID	Available Methodologies
14. Agriculture, Forestry, Land Use	VM0004	Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, v1.0
14. Agriculture, Forestry, Land Use	VM0006	Methodology for Carbon Accounting for Mosaic and Landscape-scale REDD Projects, v2.1
14. Agriculture, Forestry, Land Use	VM0007	REDD Methodology Modules (REDD-MF), v1.4
14. Agriculture, Forestry, Land Use	VM0015	Methodology for Avoided Unplanned Deforestation, v1.1

VCSのホームページより

方法論について


VERIFIED CARBON STANDARD
A Global Benchmark for Carbon

Approved VCS Methodology
VM0007

Version 1.4
3 May 2013
Sectoral Scope 14

REDD Methodology Modules
(REDD-MF)

VCSのホームページより入手可

方法論：　VM0007
（REDD Methodology Modules）

方法論について

モジュール
ツール

VM0007, Version 1.4
Sectoral Scope 14

This Framework requires the use of the latest approved versions of the following modules and tools:

Carbon Pool Modules:

CP-AB "VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools"

CP-D "VMD0002 Estimation of carbon stocks in the dead-wood pool"

CP-L "VMD0003 Estimation of carbon stocks in the litter pool"

CP-S "VMD0004 Estimation of stocks in the soil organic carbon pool"

CP-W "VMD0005 Estimation of carbon stocks in the long-term wood products pool"

Baseline Modules:

BL-PL "VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation and planned degradation"

BL-UP "VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation"

BL-DFW "VMD0008 Estimation of baseline emission from forest degradation caused by extraction of wood for fuel"

Leakage Modules:

LK-ASP "VMD0009 Estimation of emissions from activity shifting for avoided planned deforestation and planned degradation"

LK-ASU "VMD0010 Estimation of emissions from activity shifting for avoided unplanned deforestation"

LK-ME "VMD0011 Estimation of emissions from market-effects"

LK-DFW "VMD0012 Estimation of emissions from displacement of fuelwood extraction"

Emissions Modules (applicable to baseline, project scenario and leakage):

E-BB "VMD0013 Estimation of greenhouse gas emissions from biomass burning"

E-FFC "VMD0014 Estimation of emissions from fossil fuel combustion"

E-NA "Estimation of direct N_2O emissions from nitrogen application" – latest CDM-EB approved version

Monitoring Module:

M-MON "VMD0015 Methods for monitoring of greenhouse gas emissions and removals"

REDD-MF - 5

VM0007, Version 1.4
Sectoral Scope 14

Miscellaneous Modules:

X -STR "VMD0016 Methods for stratification of the project area"

X-UNC "VMD0017 Estimation of uncertainty for REDD project activities"

Tools:

T-SIG "Tool for testing significance of GHG emissions in A/R CDM project activities" – latest CDM-EB approved version

T-ADD "VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" – latest VCS approved version

T-BAR "Tool for AFOLU non-permanence risk analysis and buffer determination" – latest VCS-approved version

REDD projects under the Methodology Framework are divided between three broad activity types: unplanned deforestation, planned deforestation and forest degradation through collection of wood for fuel and production of charcoal. A single project may include one, two or all three of these activity types. In table 1 the modules and tools are listed and it is indicated when use of modules/tools is mandatory under each activity type. The tool T-SIG must be used to justify the omission of carbon pools and emission sources.

Table 1. List of modules/tools and determination of when module/tool use is mandatory (M) or optional (O).

		Unplanned Deforestation	Planned Deforestation	Degradation (Fuelwood / Charcoal)
Always Mandatory	**REDD-MF**	M	M	M
	M-MON	M	M	M
	T-ADD	M	M	M
	T-BAR	M	M	M
	X-UNC	M	M	M
	X-STR	M	M	M
Baselines	**BL-UP**	M	-	-
	BL-PL	-	M	-
	BL-DFW	-	-	M
Leakage	**LK-ASU**	M	-	-

REDD-MF - 6

対応表

方法論： VM0007

方法論について

方法論:VM0007 目次

目　次	概　　要
1. ソース	
2. モジュールの概要説明	
3. 定義	用語の定義
4. 適用条件	「すべての活動タイプ」、「計画外の森林伐採」、「計画的な森林伐採」、「劣化」の適用条件
5. 手順	
純温室効果ガス排出量削減の評価	
ST0. 最適なVCS活動の識別	ディシジョンツリーによる最適な活動タイプの識別
ST1. プロジェクト境界の定義	地理的な境界、時間的な境界、炭素プール、温室効果ガスの排出源、リーケージの原因
ST2. 追加性の実証	プロジェクトシナリオにおける追加性の実証
ST3. モニタリング計画の開発	モニタリング計画の策定方法の概説
ST4. ベースラインの炭素ストックの変化と温室効果ガス排出量の推計	推計手法に対応したモジュール
ST5. 純温室効果ガス排出削減量の総推計	VCSバッファーの計算、不確実性の解析、検証済み炭素単位の計算
事後モニタリング	
TS1. モニタリング計画に沿ったモニタリング	主なベースラインドライバ、炭素ストック変化と温室効果ガス排出量、リーケージ
TS2. 将来のクレジット期間のベースライン改訂	エージェント、ドライバの等の変化に伴いベースラインを改訂
6. パラメータ	関連するパラメーター覧
7. 追加性	プロジェクトシナリオの追加性の証明
8. 参考資料やその他の情報	

環境及び社会的基準の認証

・VCSは特定のプロジェクトの吸収量及び排出削減量を算出する手順を認証するものであり、環境及び社会面の認証には別の基準が必要となる。

・一例として、CCB（Climate, Community and Biodiversity) Standardsは、土地利用プロジェクトの温室効果ガス削減の効果、地域コミュニティー支援および生態系の保護における効果などを評価するものである。排出削減量の算出方法を認証するものではないため、VCS等との併用が勧められている。
VCS+CCBプロジェクトの説明テンプレート（VCS+CCB Project Description Template）が用意されている。

VCSプロジェクトデータベース

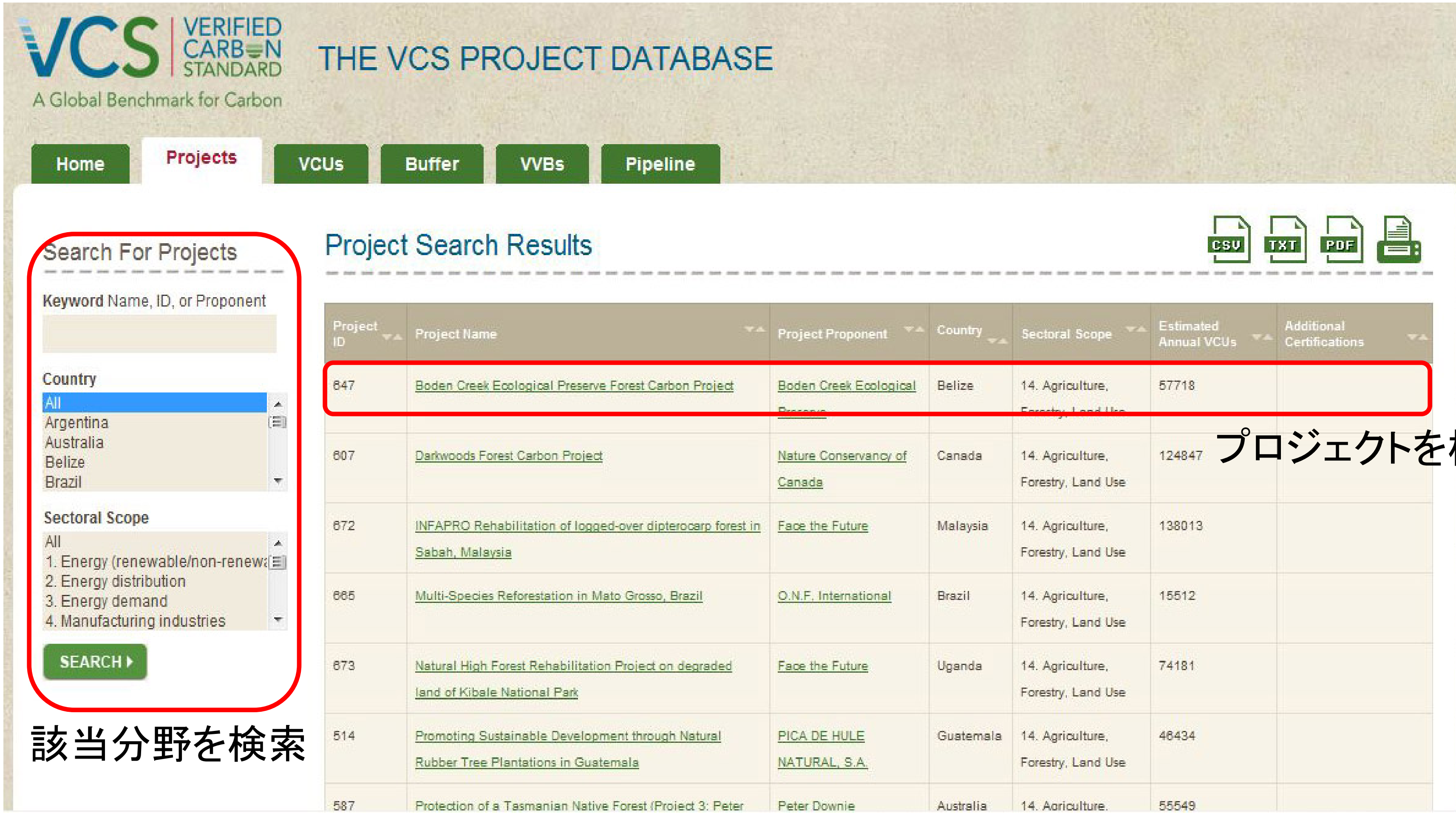
・ VCSでは、認証が完了したプロジェクトは、VCSプロジェクトデータベースに掲載される。

・データベースには、プロジェクトに係る全ての情報が掲載されている。（クレジットの発行、プロジェクトの説明、モニタリング報告書、妥当性確認報告書、検証報告書など）

・VCSデータベースは、以下のアドレスでアクセスし、検索・閲覧が可能。

http://www.vcsprojectdatabase.org/

VCSプロジェクトデータベース



プロジェクトを検索

該当分野を検索

VCSのホームページより

VCSプロジェクトデータベース

Boden Creek Ecological Preserve Forest Carbon Project,
BELIZE

Back to Search Results

Google Earth map

Exact project location coordinates are visible in Google Earth. Google Map pinpoints may be approximations.

The core objective of this project is to commercialize the forest carbon offsets at the Boden Creek Ecological Preserve near Punta Gorda, Belize, Central America. This property has been the site of a groundbreaking effort to use ecotourism as a funding source for land preservation. Due to the global economic downturn it is imperative that additional funding sources be secured to stabilize the operation. This land is currently under immediate threat of land conversion for agriculture, and it contains documented populations of internationally protected biodiversity.

Project ID
647

Project Proponent
Boden Creek Ecological Preserve

Project Status
Registered - VCUs Issued
View Issuance Records
View Buffer Pool Records

Sectoral Scope
14. Agriculture, Forestry, Land Use

Project Methodology
VM0007

Project Validator
Scientific Certification Systems, Inc. (SCS)

Registry
Markit

Estimated Annual VCUs
57,718

選択したプロジェクトのページ

VCSのホームページより

VCSプロジェクトデータベース

immediate threat of land conversion for agriculture, and it contains documented populations of internationally protected biodiversity.

Estimated Annual VCUs
57,718

REGISTRATION DOCUMENTS

Document	Upload Date
Project Proponent Registration Representation	18 Jul 2011 19:29:49 GMT
Project Description	18 Jul 2011 19:28:16 GMT
Validation Report	18 Jul 2011 19:29:29 GMT
Validation Statement	18 Jul 2011 19:29:40 GMT

「プロジェクトの説明」文書

ISSUANCE DOCUMENTS

Type	Link	Upload Date
Monitoring Report	MONIT_REP_647_01JAN2005_31DEC2010.pdf	27 Jul 2011 21:10:53 GMT
Project Proponent Issuance Representation	PP_ISS_REP_647_01JAN2005_31DEC2010.pdf	27 Jul 2011 21:12:00 GMT
Verification Report	VERIF_REP_647_01JAN2005_31DEC2010.pdf	27 Jul 2011 21:11:07 GMT
Verification Statement	VERIF_STA_647_01JAN2005_31DEC2010.pdf	27 Jul 2011 21:11:49 GMT

VCSのホームページより

VCSプロジェクトデータベース

VCS VOLUNTARY CARBON STANDARD

Boden Creek Ecological Preserve
Forest Carbon Project
June 15, 2011

Forest Carbon Offsets LLC
600 Cameron Street
Alexandria, VA 22314, USA
Technical Contact: Jeff Waldon, Chief Technical Officer
Phone: +1 540-230-2854, Email: jeffwaldon@forestcarbonoffsets.net
Web: http://www.forestcarbonoffsets.net

Cover Photo: Station #6 Boden Creek Trail, April 3, 3008 03:47h, jaguar likely pair (Miller and Miller 2008).

「プロジェクトの説明」文章

20150122

応用講習ｂ　グループ別実習の課題

【手順】

①　受講生をＡとＢ、2 つのグループに分ける。

②　グループごとに、配布したベリーズとケニヤの PDD を読み、下表に示す項目ごとに、2 つのプロジェクトの概要を記載し、それぞれの違いについてコメントする（下表参照）。

③　グループ別実習終了までに、模造紙や付箋紙等を用いて、下表を取り纏める（下図参照）。

③　グループ別実習後の総合討論で、各グループの代表者が、取り纏め内容を発表する。

【課題表】

項　　目	ベリーズ PDD	ケニヤ PDD	コメント欄
・プロジェクト概要			
・ベースライン・シナリオ			
・GHG 削減方策 （プロジェクト・アクティビティ）			
・モニタリング手法			
・その他			

※　「プロジェクト概要」については、PDD の「1. Project Description」の中から、面積、プロジェクト期間、クレジット期間と推定総排出量、森林の概要等、比較できる項目について概要を記載する。

※　「ベースライン・シナリオ」、「GHG 削減方策」、「モニタリング手法」については、記載されているページを探して概要を記載する。

※　「その他」については、時間が余った場合、項目を自由に選択して概要を記載する。

※　箇条書きで簡潔に記載すること（概要のみで OK）。

作業イメージ（H25 の実習より）

This Project Document is Dated January 25th, 2011, and conforms to the VCS PD Template dated 19th November 2007.

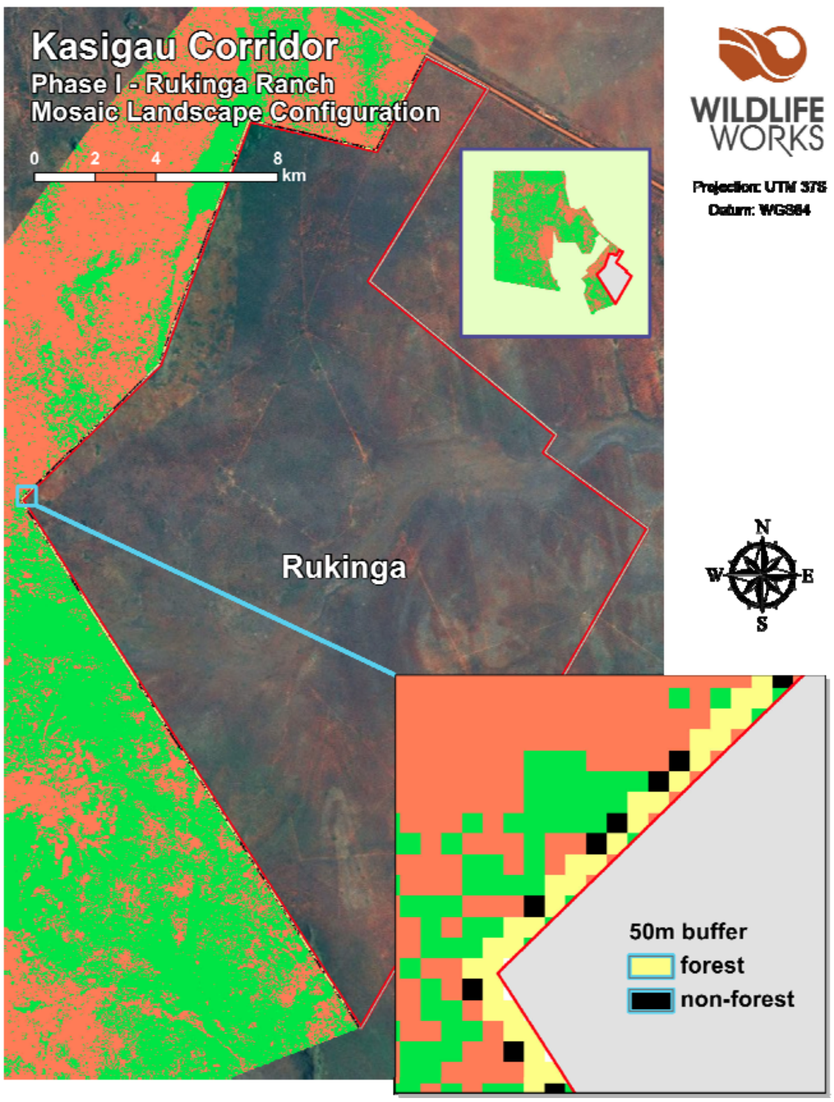
1. Description of Project:

1.1 Project title

The Kasigau Corridor REDD Project – Phase I Rukinga Sanctuary

1.2 Type/Category of the project

This project falls under VCS sectoral scope 14 Agriculture, Forestry and Other Land Uses, under project activities Reduced Emissions from Deforestation and Degradation (REDD) and most specifically Avoiding unplanned mosaic deforestation and degradation (AUMDD). This project falls into this category by the definition provided in the VCS Program Update of May 24th 2010, by virtue of the fact that > 25% of the boundary of the Project Area is within 50m of land that was anthropogenically deforested in the ten years prior to the project start date, as illustrated in the table and map below.



Rukinga Landscape Configuration Analysis
Imagery date: 02-06-2003
Imagery source: Landsat 7 (ETM+)

Total Ranch Perimeter (km)	84.05338
Perimeter coincident with reference region (km)	42.8745
coincident ratio	51.00%
Coincident forest (px)	1034
Coincident non-forest (px)	1147
% deforested (coincident w/ reference region)	52.59%
Total % deforested within 50m (Rukinga perimeter)	**26.83%**

This is not a Grouped Project.

1.3 Estimated amount of emission reductions over the crediting period including project size:

Rukinga Sanctuary (the project area) is 30,168.66 ha. The project is neither a mega nor a micro project, as the estimated gross emissions reductions over the 30 year crediting period are 7,542,945 m.t. GHG or on average, 251,432 m.t. GHG per year.

1.4 A brief description of the project:

Through a combination of Dryland Forest protection and extraordinary community sustainable development activities, this project is estimated to avoid the emission of over 7 Million metric tonnes of CO2e which would have been emitted due to slash and burn deforestation over the 30 year project life, or on average approximately 251,432 metric tonnes per year across the Carbon Pools of Above and Belowground Biomass (forest carbon), and Soil Carbon.

The Project Area is home to a fantastic diversity of mammals (over 50 species of large mammal, more than 20 species of bats), birds (over 300 species) and important populations of IUCN Red List species such as Grevy's zebra (*Equus grevyi*), Cheetah (*Acinonyx jubatus*), Lion (*Panthera leo*) as well as over 500 African elephants (*Loxidonta africana*) seasonally.

The project is clearly additional (under the project financial additionality tool) and the Baseline far from being hypothetical is an extension of actual deforestation that was occurring aggressively in the reference region immediately adjacent to the Project Area at the time Wildlife Works came on the scene, and that has been demonstrated clearly from historic satellite images.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

The Kasigau Corridor REDD Project is located in SE Kenya, in the Marungu Sublocation, Voi Division, Taita Taveta District, Coast Province, Kenya, approximately 150 kms NW of Mombasa.

This Phase I PD covers all the land known as Rukinga Sanctuary which is all that 74,516 acres (30,168.66 ha) of land originally known as LR 12263, historically reduced by subdivisions 12263/1 and 12263/2 at dates prior to the start date of this project.

Rukinga is part of that land that forms a corridor of land (the Kasigau Wildlife Corridor) between the Tsavo East National Park and the Tsavo West National Parks to the East of the Marungu range. The Project Area and Reference Region are clearly delineated in the image below, and the shape files representing the boundaries have been made available to the project validator. The land within the project boundary has been tropical dryland forest[1] for at least 20 years and has been a primary forest since recorded times[2].

1.6 Duration of the project activity/crediting period:

The Project Start Date and the Crediting Period Start Date are both January 1st, 2005.
VCS project crediting period: The VCS Project Crediting Period is January 1st 2005 thru December 31st 2034.

1.7 Conditions prior to project initiation:

It was not difficult to identify the baseline scenario for this project which is rapid deforestation due to unplanned slash and burn agricultural expansion by subsistence farmers, as all the conditions of the baseline were in place before the arrival of Wildlife Works and in fact even the Project Area itself was beginning to be cleared before we arrived. There is little need for speculation as to what would happen in the absence of our project if we ceased to protect the Project Area and ceased to provide alternative livelihoods for the community, the pattern of deforestation would pick up right where it left off, but now accelerated by a much larger population base than was present when we arrived.

The Project Area had previously been used for grazing of cattle and for ecotourism. Both activities failed due to lack of funds, because cattle ranching is difficult due to a fragile ecosystem and lack of water, which lead to the sale of the land to the current owners in 2000.

Aforestation of plantation species and agricultural activities cannot profitably be carried out in this sort of area due to a lack of water and a fragile ecosystem. Therefore we believe that we have demonstrated through our activities to attempt many different economic activities and the activities that preceded us that there are no credible alternative economic uses for this land that could compete with the Project financially, or provide financial sustainability that would protect it from slash and burn use by the community.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

Refer to Supporting Document - VCS Methodology PD Requirements Section 6.1.

1.9 Project technologies, products, services and the expected level of activity:

Refer to Supporting Document - VCS Methodology PD Requirements Section 6.1.

1.10 Compliance with relevant local laws and regulations related to the project:

It is our belief that Wildlife Works meets all local, National and International laws related to this project.
The laws that are relevant to this project are:

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[1] UN IPCC, Good Practice Guidance for LULUCF, Table 3A.1.8;
[2] Earliest record that has been located is dated 1895 which identifies the area as forested [Hobley 1895 – Upon a Visit to Tsavo and the Taita Highlands – The Geographical Journal 1895 Vol 5 No 6 pp 545-561]

<u>EMPLOYMENT LAWS.</u>

- Export Processing Zone's Act (Cap. 547)

As an Export Processing Zone Company we are exempted from the standard Labour Laws of Kenya, and instead must conform to those laws that that have been deemed applicable to (General Provisions of the Employment Act (Cap 226-229) or amended for EPZs as covered by the Export Processing Zone's Act (Cap. 547).

- National Health Insurance Fund.

N.H.I.F was established on 12th July 1966 by an act of parliament Cap 255 of the Laws of Kenya, and become a state corporation on 15th February 1999 through an act of Parliament no.9 of 1998. The objective of its establishment is to enable majority of Kenyans to access healthcare services at supplemented costs. Contribution to the fund are compulsory for all persons whose income is Ksh.1000/= and above. We physically go to the NHIF offices in Voi monthly to submit our monthly payroll and have the NHIF amount calculated by them, we pay and they give us a receipt. We are also subject to random checks with the NHIF inspector visiting our facility without notice and inspecting our books. We have never been found in violation of this act.

- The National Social Security Fund act ,Cap 258, is a government fund established by the National Social Security Fund Act,1965 ,For the benefit of the Members. It is a compulsory savings scheme into which the employer pays a statutory contribution for every employee who is a member. We physically go to the NSSF offices in Voi monthly to submit our monthly payroll on a NSSF form, and we pay the monthly dues. We are subject to strict audit checks by the NSSF inspector who visits our facility every two months and on passing the audit provides us with an official letter indicating we are in compliance. We have never been found in violation of this act.

- Pay As you Earn(P.A.Y.E)

Section 37 of the Income Tax act.
The "Pay As You EARN" method of deducting income tax from salaries and wages applies to weekly wages, Monthly salaries, annual salaries, bonuses, commissions, Directors fees (Whether the director is resident or non-resident). Monthly we are required to go to the bank (Kenya Commercial Bank = KCB) to pay the tax withheld from our employees wages and salaries, the bank takes one folio from our KRA receipt book, and stamps the other two folios, one of which we then take to the KRA office in Voi and give it to them.

- The Factories and Other Places of Work Act

The Factories Act (Cap. 514) deals with the health, safety and welfare of an employee who works in a factory or other place of work. We have never been audited by this department in the Government as it is very small and covers the whole country, however we have good reason to believe we are in full compliance with this act as a result of a third party audit of our factory and operations performed by the independent NGO Verite,from the USA.

- The Work Injury Benefits Act (Cap. 236) provides for ways through which an employee who is injured when on duty may be compensated by the employer. We are required to maintain private insurance to cover our responsibility under this act.

- Regulation of Wages and Conditions of Employment Act (Cap. 229)

This act sets the conditions of work and the minimum wage guidelines. The EPZ Act supersedes this act with regard to minimum wage and in fact the EPZ minimum wage guidelines are slightly higher than the National Employment Act guidelines.

- Labour Relations Act, 2007 (Acts No. 14)

This is the new version of the old Trade Unions Act and the Trade Disputes Act, revised to harmonize the old Trade Acts with Kenya's recent ratification of many of the elements of the ILO Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87). We are required to provide our workers with the freedom of association. We are required to honor a dispute process as laid out in the act. We currently have no collective bargaining agreement in place nor are we required to do so. To the best of our knowledge none of our employees belong to any Trade Unions, and it is our belief that our employees do not at this time feel that the benefits of membership outweigh the costs of dues which are born solely by them under the Act. We have never had a dispute with any employee that resulted in any collective action, lock out etc. and we have no disputes at all at this time, and we believe that we are in full compliance with this Act. To ensure that employees are aware of their rights under the Act, we have added the following language to all employment contracts issued by Wildlife Works;

"Wildlife Works, EPZ Ltd. acknowledges the importance of the recently enacted Labour Relations Act 2007, and therefore we wish to inform you that you are entitled to Freedom of Association, and specifically to join the Kenya Textile Workers Union(KTWU) should you so choose. Should you choose to join the KTWU, all membership dues and agency fees for the Union will be payable directly by you."

<u>CORPORATE LAWS.</u>

- Companies Act, (Law of Kenya Cap. 486);

We must remain a company in good standing, and are required to maintain our Corporate records with The Registrar of Companies in Nairobi annually.

- Bankruptcy Act (Cap. 53);

Lets hope this never applies to us.

<u>LAND and ENVIRONMENT LAWS.</u>

- Environmental Management and Coordination Act (Act 8, 1999)

We were required to undergo an environmental audit by the National Environmental Management Authority. We passed.

- Registration of Titles Act:

The terms of the Title Deed by which Rukinga Ranching Company Ltd is the owner of Rukinga Ranch are governed by this Act.

<u>LOCAL DISTRICT LAWS.</u>

County Council of Taita Taveta Rates are paid at the rate determined under the local By-Laws of our District.
It is confirmed that:

- the project is in compliance with all national laws and license requirements relating to conservation projects in Kenya; and

- there is no law mandating that the Land is a conservation area. It is noted that no category of land use relating to conservation exists under Kenyan law. The current land use category for the Rukinga Sanctuary project and other privately owned conservation projects is classified as agriculture.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

The major risks that could have an impact on the project are:

- Change in legislation – government expropriating the Land through compulsory purchase for development scheme; as the Government of Kenya is very supportive of our project and has no recent history of expropriation of private conservation lands this risk is very low. We will continue to seek international press for our project as keeping it in the spotlight ensures the Government remains aware of the values it is providing to the country;

- Income - Risk that carbon market revenues do not eventuate or are less than adequate to sustain the project financially; our financial sustainability was modeled at very conservative Carbon offset sale values, and we have a very well known project with high potential value in the marketplace so the likelihood of this occurring is small, especially in light of existing offtake contracts for the life of the project with BNP Paribas and Nedbank, two major international banks;

- Crop Failure - substantial and repeated crop failure in surrounding communities could lead to increased poaching and use of trees for financial benefit; this is very likely and all of our alternative economic development efforts are aimed at mitigating this risk, and we have demonstrated the ability to prevent this risk from damaging the forest for almost ten years;

- Invasion of cattle grazers due to famine in adjacent communities, or lack of grazing elsewhere. However any influx of cattle only affects quantity of grass on Project Area and leads to no significant change in carbon stock. Again this is possible especially as the Somalis have used land in this area to feed and water their cattle over the years, sometimes with permission sometimes without, however the increasing aridity in the area we believe will force the Somali's to look elsewhere for rangelands. We will be using funds from the Carbon project to increase Ranger patrolling to better protect the Project Area and Leakage Area from illegal incursions;

- Drought – drought is an increasing reality in this part of Kenya and we anticipate that with Climate Change it will only worsen in the years covering the project crediting period. Drought introduces two additional risks;

- Wildlife – drought obviously places a lot of stress on wildlife in the Project Area, and Leakage Area. However many of the species living in this ecosystem are extraordinarily drought adapted, and have no problem surviving in extended drought. For those that aren't we plan to continue to provide emergency water sources at Rukinga as we have for the past ten years;

- Cash crops – drought will make the survival of cash crops, such as jojoba, citrus trees etc. more difficult but these high value cash crops will be planted sparingly and need much less water than an entire field of maize, and are able to survive higher temperatures, provided they receive some water, which the farmers will be in a position to provide to preserve the financial value of the crop;

- Fire – grass fires are common in the region due to the intense heat and dry conditions, although naturally occurring fires are extremely rare, so our strategy is to continue to educate the local population especially the youth about the dangers of burning fallows to improve grazing for their animals. Fires tend to burn the grasses and shrubs but move quickly and do not kill the trees which have become tolerant of grass fires.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The Baseline emissions case has nothing to do with the Project Proponent, who entered the scene expressly to prevent the deforestation of the Kasigau Corridor.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

The project has not created another form of environmental credit, and as far as we know is not eligible for any other form of environment credit.

1.14 Project rejected under other GHG programs (if applicable):

Not Applicable

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

The Project Proponent for the Kasigau Corridor REDD Project – Phase I Rukinga Sanctuary is Wildlife Works Inc., a California Corporation in good standing. Wildlife Works Inc. acquired the carbon rights from the landowner, Rukinga Ranching Company Ltd. after a process of Free Prior and Informed Consent, through a Carbon Rights Agreement/Easement that was approved by a full vote at an AGM of the Shareholders at Rukinga on February 13th 2009, at which AGM the Shareholders present were given an explanation of the potential of the Carbon project, a copy of which has been provided to the Validator, and following which the Shareholders unanimously approved the pursuit of this opportunity by the Managing Director and majority shareholder of the land, Mike Korchinsky. This decision was ratified again unanimously by an extraordinary general meeting of shareholders of Rukinga Ranching Company Ltd on December 9th, 2009.

The carbon project is managed in the field in Kenya by Wildlife Works Carbon LLC, a joint venture of Wildlife Works, Inc. and Colin Wiel Investments II, in return for which Wildlife Works Carbon LLC is eligible for a share of the proceeds from the sale of the carbon credits generated by the project. Details of this arrangement are specified in the Membership Agreement of Wildlife Works Carbon LLC, which was provided to the Validator.

Contacts:
Wildlife Works Inc.:
Founder & CEO – Mike Korchinsky
Tel: +1-415-332-8081
Fax: +1-415-332-8057
Email: mike@wildlifeworks.com

Wildlife Works Carbon, LLC.:
President – Mike Korchinsky

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

Wildlife Works is working closely with the REDD Focal Point within the Government of Kenya to ensure that any future REDD legislation considers Projects such as this in the design of sub-national nesting rules. We do not believe there are any issues that could effect the eligibility of the project. All information related to the quantification of emission reductions has been detailed in the appropriate sections of the Supporting Document - VCS Methodology PD Requirements.

1.17 List of commercially sensitive information (if applicable):

The Carbon Rights Agreement between Wildlife Works, Inc. and Rukinga Ranching Company, Ltd contains commercially sensitive information and has been excluded from the public version of the PD. It was of course provided to the Validator during validation.

The Membership Agreement of Wildlife Works Carbon LLC between Wildlife Works, Inc. and Colin Wiel Investments II contains commercially sensitive information and has been excluded from the public version of the PD. It was of course provided to the Validator during validation.

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

This project used the VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests, approved by the VCS for sectoral scope 14 on January 11th, 2011.

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests was developed by the Project Proponent based on their experience on this Project, and was developed to be especially suited to the slash and burn agricultural conditions found in this project, and the mitigation activities conducted by the Project Proponent in this project. This project meets all of the applicability conditions of the methodology.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

Refer to Supporting Document - VCS Methodology PD Requirements Sections 5.3 and 5.4.

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

Refer to Supporting Document - VCS Methodology PD Requirements Section 6.1.

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

Refer to Supporting Document - VCS Methodology PD Requirements Sections 6.1 and 7.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

This project used the VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests, approved by the VCS for sectoral scope 14 on January Nth, 2011.

VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests was developed by the Project Proponent based on their experience on this Project, and was developed to be especially suited to the slash and burn agricultural conditions found in this project, and the mitigation activities conducted by the Project Proponent in this project. This project meets all of the applicability conditions of the methodology.

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

Refer to Supporting Document - VCS Methodology PD Requirements Sections 13.14.

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Refer to Supporting Document - VCS Methodology PD Requirements Sections 13.14.

3.4 Description of the monitoring plan

Refer to Supporting Document - VCS Methodology PD Requirements Sections 13.14.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

This project used the VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests, approved by the VCS for sectoral scope 14 on January 13th, 2011.

VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests was developed by the Project Proponent based on their experience on this Project, and was developed to be especially suited to the slash and burn agricultural conditions found in this project, and the mitigation activities conducted by the Project Proponent in this project. This project meets all of the applicability conditions of the methodology.

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

Refer to Supporting Document - VCS Methodology PD Requirements Section 8.

4.3 Quantifying GHG emissions and/or removals for the project:

Refer to Supporting Document - VCS Methodology PD Requirements Section 11.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

Refer to Supporting Document - VCS Methodology PD Requirements Section 11.

5 Environmental Impact:

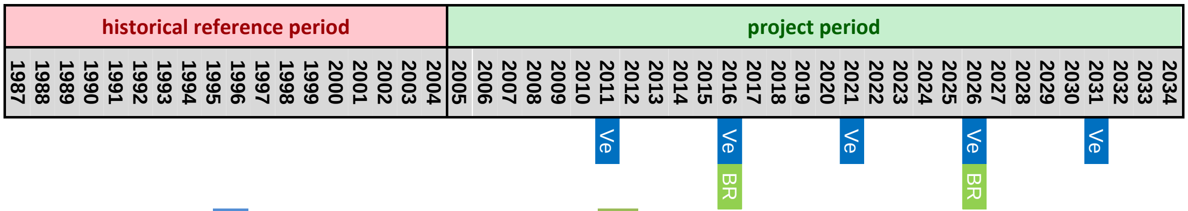
We were required to undergo an environmental audit by the National Environmental Management Authority. We passed. Results provided for review by the Validator.

6 Stakeholders comments:

Stakeholder comments were solicited via public comment periods on the internet, and by postings on local area notice boards. Copies of the public comments received were provided to the Validator.

7 Schedule:

A complete timeline of Project Activities was provided to the Validator. The overall Schedule for the project is shown below. Project Start Date and Crediting Period Start Date are both January 1st 2005, and Project end Date is December 31st 2034. Project Activities began on January 1st 2005, with an escalation of activities in 2009 after receipt of initial carbon project finance, costs prior to 2009 being born solely by the Project Proponent.



project timeline (Ve = external verification year, BR = baseline re-evaluation year)

8 Ownership:

8.1 Proof of Title:

Rukinga Ranching Company Ltd has legal title to all of the land of the Project Area, known as Rukinga Sanctuary. A copy of the title deed was provided for the Validator. Wildlife Works Inc. acquired the carbon rights from the landowner, Rukinga Ranching Company Ltd. after a process of Free Prior and Informed Consent, through a Carbon Rights Agreement/Easement that was approved by a full vote at an AGM of the Shareholders at Rukinga on February 13th 2009, at which AGM the Shareholders present were given an explanation of the potential of the Carbon project, a copy of which has been provided to the Validator, and following which the Shareholders unanimously approved the pursuit of this opportunity by the Managing Director and majority shareholder of the land, Mike Korchinsky. This decision was ratified again unanimously by an extraordinary general meeting of shareholders of Rukinga Ranching Company Ltd on December 9th, 2009.

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Not Applicable

WILDLIFE WORKS

The Kasigau Corridor REDD Project
Phase I – Rukinga Sanctuary

Project Document (PD) For Validation

Using the Voluntary Carbon Standard (VCS) 2007.1 / Sectoral Scope 14

VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests

Version 9

January 31st, 2011

In partnership with the Landowner

Rukinga Ranching Co Ltd.

Technical Assistance Provided by

eco PARTNERS

Acknowledgements

This Project Description was developed for the Kasigau Corridor REDD Project - Phase I, Rukinga Sanctuary by Mike Korchinsky, Founder and CEO, Jeremy Freund, VP Carbon Development, and Jessie Parteno at Wildlife Works. The authors would like to acknowledge the following individuals and organizations, without whom this effort would not have been possible:

- Kyle Holland and Ryan Anderson, at EcoPartners for technical assistance
- Rob Dodson, VP African Field Ops, and the Wildlife Works Kenyan team, Jamie Hendriksen, Lara Cowan, Laurian Lenjo, Hassan Sachedina, Patrick Kabatha, Eric Sagwe and the ranger team, Joel Mwandiga and Mwololo Muasa and the plot sampling team

for field support and for making this project such a success. Wildlife Works would like to extend sincere thanks to all mentioned above, as well as the many other contributors to the project.

Asante Sana!

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Section 4 Applicability Conditions

For the Kasigau Corridor REDD Project the following conditions apply;

- The primary driver of deforestation is conversion of forest to cropland for annual crops, typically maize, as evidenced by the substantial conversion to maize in the Reference Area during the Reference Period. The primary agents of deforestation are a growing population of local Taita and Kamba people living in the Reference Area. Agriculture in the reference and leakage areas is permanent and cultivation activities do not shift.
- The land within the project area has been tropical dryland forest[1] for at least 20 years and has been a primary forest in its current state since recorded times[2]. The Project Area forest has an average canopy of 39% and mature tree height of 5-10m, and therefore has qualified as forest as defined by FAO 2010, or that of the definition of forest set by the residing designated national authority (DNA) (10% canopy, 4m height) for the project country for a minimum of 10 years prior to the project start date (VCS, 2008)
- 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 may be accounted for as zero.
- The project is located in a semi-arid tropical region.
- The primary agents of deforestation are local Taita and Kamba peoples, with a small minority of other tribes who moved in during the El Niño rains of the mid 1990s, when the land was still sparsely populated, or to work as herders for the former cattle operations. Tribal mobility for farm land in Kenya is very low, as Kenya's population is relatively high everywhere that leakage could potentially shift, and the population in the Reference Area outside of the Project Area, and the proposed Phase II Project Area (see map in Section 6.3) is high. There exists no opportunity for the agents of deforestation to shift their activities outside the leakage area.
- The project is not mandated by any enforced law, statute, or other regulatory framework.
- The project area does not contain organic or peat soils. (see soils Map in section 6.5 below).
- A reference area has been delineated meeting the requirements described in sections 6.3.1 and 6.3.2 of the methodology VM0009, 'Methodology for Avoided Mosaic Deforestation of Tropical Forests' (MED), including the minimum size requirement.
- As of the project start date, historic imagery in the reference region exists with sufficient coverage to meet the requirements of section 6.4.2 of the MED.
- A wide range of project activities have been implemented to mitigate deforestation by addressing the agents and drivers of deforestation as described in section 10.1 of the MED.
- The project start date and end date and crediting period are clearly defined (see Section 6.3).

[1] UN IPCC, Good Practice Guidance for LULUCF, Table 3A.1.8;
[2] Earliest record that has been located is dated 1895 which identifies the area as forested [Hobley 1895 – Upon a Visit to Tsavo and the Taita Highlands – The Geographical Journal 1895 Vol 5 No 6 pp 545-561]

- Wildlife Works (the Project Proponent) has access to the leakage area to sample forest degradation, as evidenced by implementation of the leakage plots used to create the leakage model.
- The lag period for the cumulative leakage model was estimated after the project start date but before the end of the first monitoring period, and initial leakage plot measurements showed that no activity-shifting leakage had occurred prior to the estimation of the lag period.
- The project area does not include lands designated for legally sanctioned logging activities.

Section 5 Project Boundaries

Section 5.1 Spatial Boundaries

Kasigau Corridor Phase I - Rukinga Ranch

This Phase I Project Document covers 100% of the land known as Rukinga Sanctuary (see map below) which is all that 74,516 acres (30,168.66 ha) of land originally known as Rukinga Ranch, LR 12263, historically reduced by subdivisions 12263/1 and 12263/2 at dates prior to the start date of this project. Project lands conform to the latest VCS definition of forest, with an average canopy cover of 39%, and mature tree height at 5-10m, and have been primary forest since historic times. A GIS database with canopy measurements for Rukinga Ranch is available upon request.

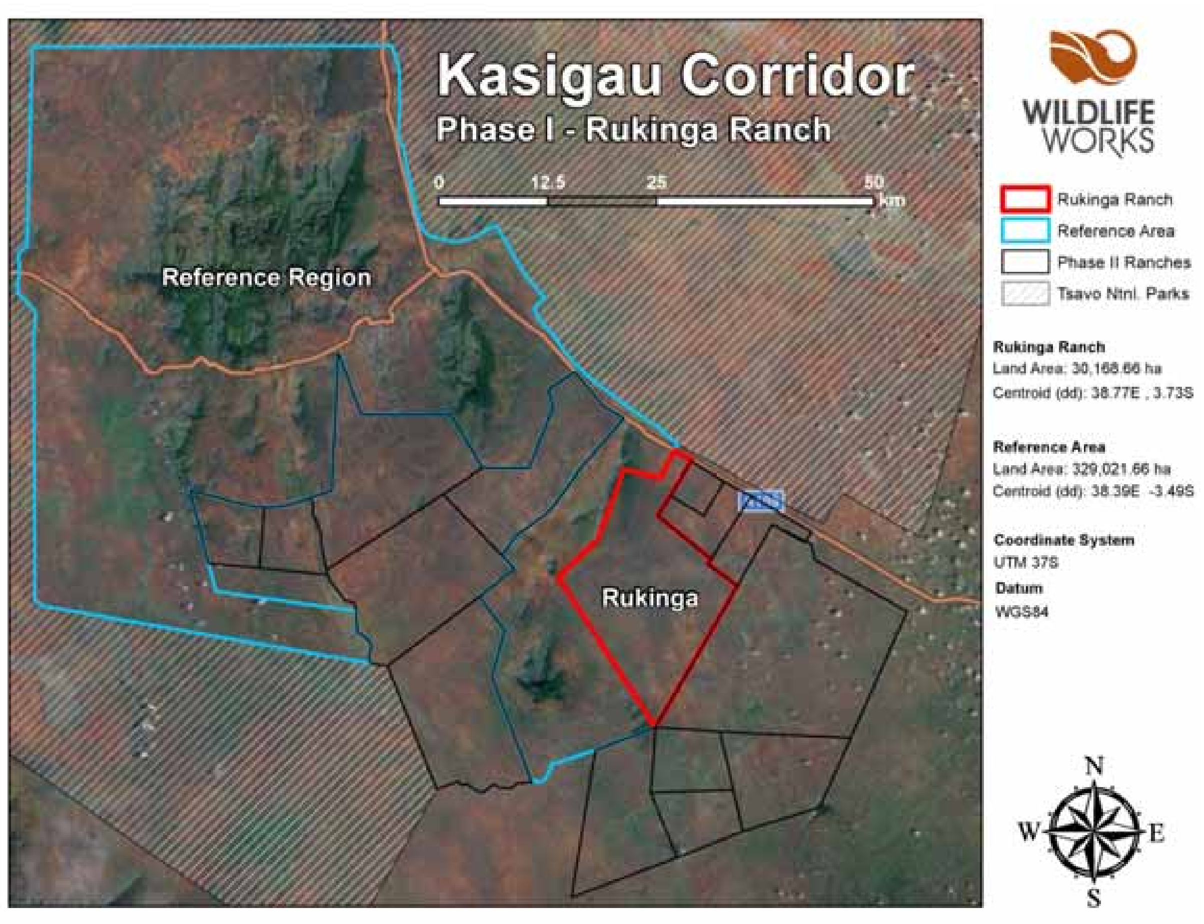


Figure 1. Rukinga Ranch REDD Project and Reference Region Spatial Boundaries

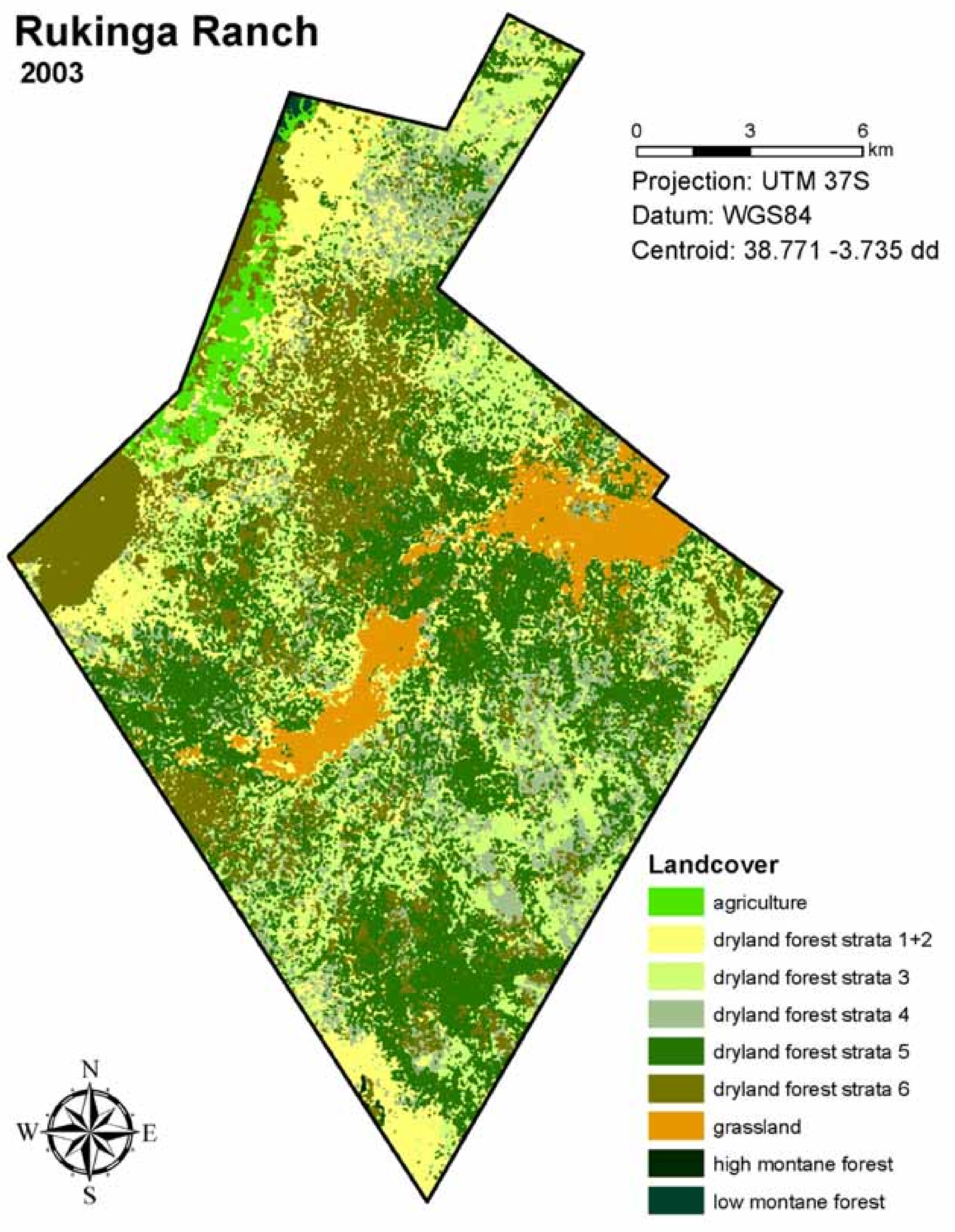


Figure 2. Rukinga Landcover Map, Classified from Landsat 7 ETM+ Acquired February , 2003

The following table shows the landcover strata for Rukinga Ranch and their respective areas. Strata sum to the total area for the Ranch, 30,168.66 ha.

Stratum	Area (ha)
ag active	713.7
dryland forest strata 1+2	6,883.6
dryland forest strata 3	5,651.1
dryland forest strata 4	2,773.4
dryland forest strata 5	8,133.4
dryland forest strata 6	4,345.5
Grassland	1,610.9
montane forest	570.6
Total area:	**30,168.7**

Table 1. Landcover Strata area for Rukinga Ranch, Febrary 2003

Using these values, forested area for the Sanctuary at project start date is calculated as:

27,844 / 30,168.7 = **93% forested 10 years prior to project start date**

Land Ownership

Rukinga Sanctuary is privately owned by Rukinga Ranching Company Ltd., the majority shareholder being Mike Korchinsky, Founder & CEO of Wildlife Works. The leasehold on the title will be due for renewal in 2038, and can then be renewed for either 33, 66 or 99 years under Kenyan law, at the leaseholder's option. Wildlife Works has had a wildlife conservation and land management operating agreement with Rukinga Ranching Company Ltd. since 2005, and more recently acquired the carbon rights from the landowner, Rukinga Ranching Company Ltd. after a process of Free Prior and Informed Consent (FPIC), through a Carbon Rights Agreement/Conservation Easement that was approved by a full vote at an AGM of the Shareholders of Rukinga Ranching Company Ltd. on February 13th 2009. At that AGM the shareholders were given a presentation - explaining in lay terms - the potential of the REDD project, a copy of which has been provided to the validator. Following the presentation, the shareholders unanimously approved the pursuit of this opportunity by the Managing Director and majority shareholder of the land. This decision was ratified again unanimously by an extraordinary general shareholder meeting of Rukinga Ranching Company Ltd. on December 9th, 2009, at the request of the CCB Validators, Scientific Certification Systems, Inc (SCS).

Section 5.2 Temporal Boundaries

The project was commenced on January 1, 2005. Since this time, Wildlife Works has been successfully protecting Rukinga Ranch from agricultural encroachment (deforestation), wildlife poaching and forest degradation. The Phase I Project is 30 years in length. The project will therefore end on December 31, 2035.

Wildlife Works took financial responsibility for all conservation activities within the Project Area as of January 1st 2005, as a result of the agreement between Wildlife Works and Rukinga Ranching Company, Ltd., the landowner, a copy of which was provided to the Validators.

Wildlife Works began conservation activities centered around our ecofactory prior to 2005, but all activities were located outside the Project Area. The figure below illustrates the relationship between the companies involved with Rukinga Sanctuary.

The VCS rule for AFOLU projects starting after Jan 1 2002 states that there is no specific time requirement for validation and verification. Language exists in the MED to clarify the type of project activities that qualify a project for a historical project start date, and Wildlife Works fully conforms to these MED requirements.

Wildlife Works will monitor the project every year, producing accurate and credible documentation for all VCS required project accounting. Wildlife Works will validate the project once every 5 years throughout the life of the project until the project end date.

Per VCS minimum requirements, a baseline revision will be performed once every 10 years, on January 1, 2016 and January 1, 2026. If the VCS standard regarding baseline revision periodicity changes in the future, Wildlife Works will commit to performing baseline revisions whenever specified by the VCSA.

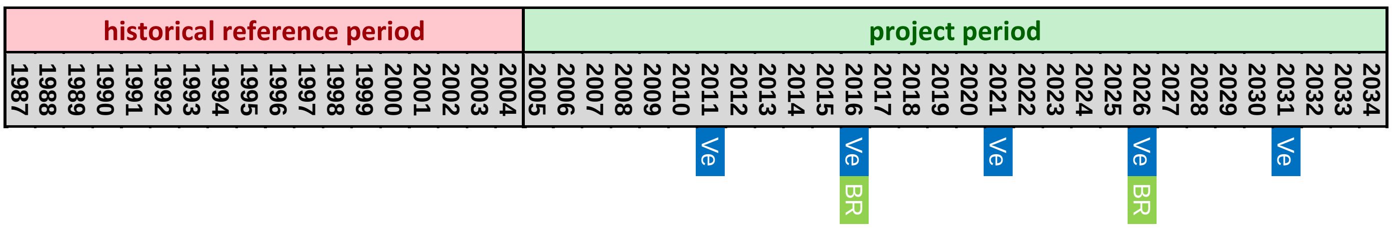
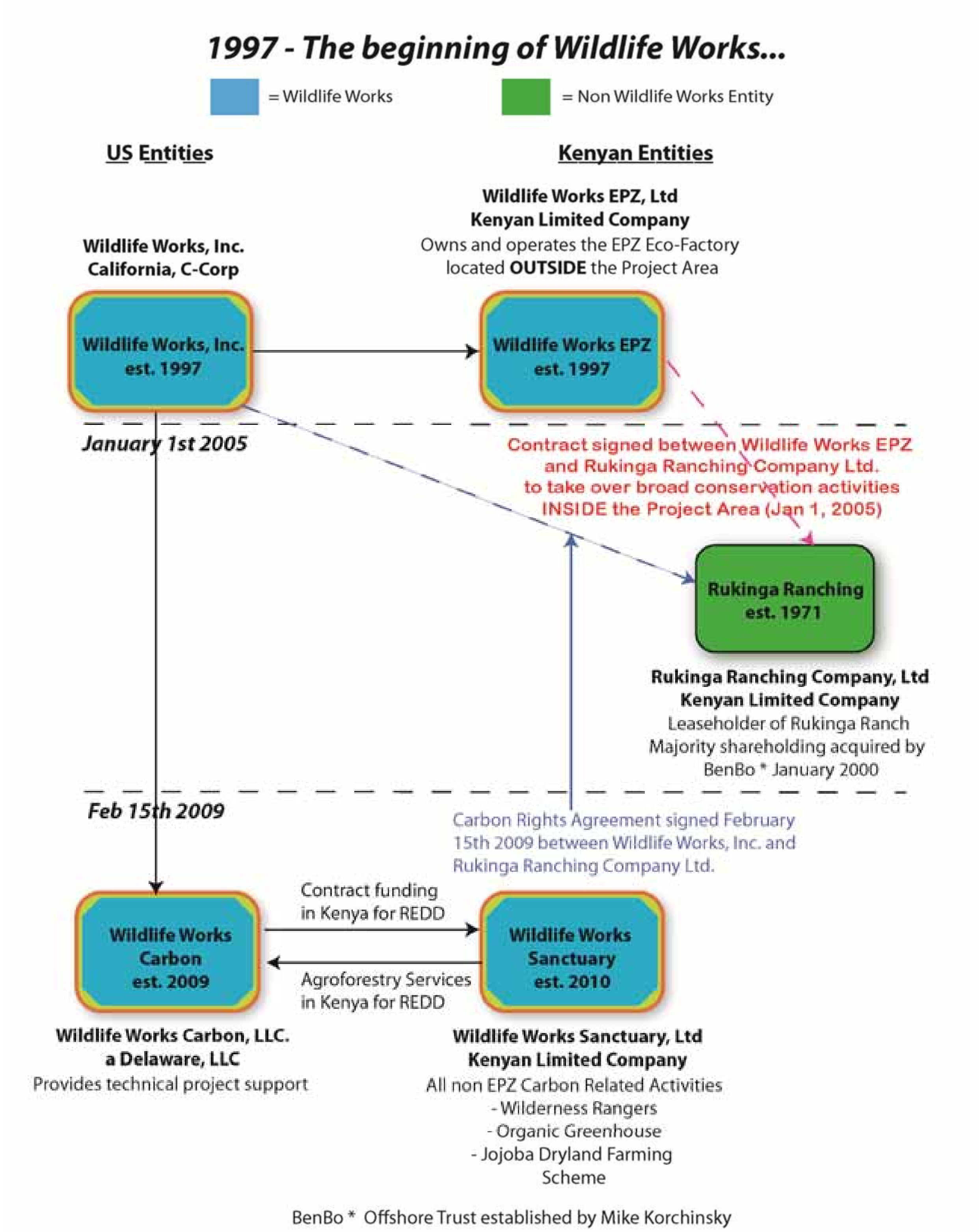


Figure 3. Project Timeline (Ve = verification year, BR = baseline re-evaluation year)

Rukinga Sanctuary is comprised of primary Acacia-Commiphora dryland forest, and therefore conforms to the minimum requirement for project land to have qualified as "forest" (10 years per VCS 2007.1). The landcover classification shown above in figure 2 was performed on ETM+ imagery acquired from the Landsat 7 satellite on February 6, 2003. As both dominant tree species in this ecosystem (Acacia and Commiphora) grow very slowly (some trees on Rukinga Ranch are estimated to be over 300 years old), we make the assumption that Rukinga ranch was in virtually the same forest state in 1996 as it was in 2003.


1997 - The beginning of Wildlife Works...
= Wildlife Works
= Non Wildlife Works Entity
US Entities
Kenyan Entities
Wildlife Works EPZ, Ltd
Kenyan Limited Company
Owns and operates the EPZ Eco-Factory
located OUTSIDE the Project Area
Wildlife Works, Inc.
California, C-Corp
Wildlife Works, Inc.
est. 1997
Wildlife Works EPZ
est. 1997
January 1st 2005
Contract signed between Wildlife Works EPZ
and Rukinga Ranching Company Ltd.
to take over broad conservation activities
INSIDE the Project Area (Jan 1, 2005)
Rukinga Ranching
est. 1971
Rukinga Ranching Company, Ltd
Kenyan Limited Company
Leaseholder of Rukinga Ranch
Majority shareholding acquired by
BenBo * January 2000
Feb 15th 2009
Carbon Rights Agreement signed February
15th 2009 between Wildlife Works, Inc. and
Rukinga Ranching Company Ltd.
Contract funding
in Kenya for REDD
Wildlife Works
Carbon
est. 2009
Agroforestry Services
in Kenya for REDD
Wildlife Works
Sanctuary
est. 2010
Wildlife Works Carbon, LLC.
a Delaware, LLC
Provides technical project support
Wildlife Works Sanctuary, Ltd
Kenyan Limited Company
All non EPZ Carbon Related Activities
- Wilderness Rangers
- Organic Greenhouse
- Jojoba Dryland Farming
Scheme
BenBo * Offshore Trust established by Mike Korchinsky

Section 5.3 Greenhouse Gases

The dominant method of deforestation in the Kasigau corridor is conversion to subsistence agriculture by slash and burn techniques. As such, only Carbon Dioxide (CO_2) was selected as a source for greenhouse gas emissions in the project. Although Methane (CH_4) and Nitrous Oxide (N_2O) are also greenhouse gases, they are conservatively excluded from this project, as neither of which are present to a significant degree in the Kasigau corridor region.

Section 5.4 Carbon Pools

The following table indicates carbon pools required for consideration under the MED, including those pools that are mandatory, optional and respective justification for selection under this project:

Pool	Required	Included in Project?	Justification
Above-ground large tree biomass	Yes	Yes	Major pool considered
Above-ground small tree biomass	Yes	Yes	Major pool considered
Above-ground non-tree biomass	Optional	Yes	Major pool considered
Below-ground large tree biomass	Optional	Yes	Major pool considered
Below-ground small tree biomass	Optional	Yes	Major pool considered
Below-ground non-tree biomass	Optional	Yes	Major pool considered
Litter	No	No	Conservatively excluded
Standing dead wood	Optional	Yes	Major pool considered
Lying dead wood	Optional	No	Conservatively excluded
Soil	Optional	Yes	Major pool considered
Long-lived wood products	Yes	Yes	May be a significant reservoir under the baseline scenario

Table 2: Carbon pools selected for inclusion in the project and respective justification

Size Class Diameter Selection and Justification

Expert knowledge of the agents of deforestation and cultural practices in the Kasigau corridor ecosystem indicate that farmers invariably burn all stumps in the process of clearing land for agriculture, We therefore do not differentiate large trees from small trees for this project, and assume that all stumps (below-ground large tree biomass) are burned during agricultural conversion. Credible evidence can be produced through farmer polling and or interviews with Wildlife Works resident community liaison, Laurian Lenjo, who has intimate knowledge of farming practices throughout the corridor, knows many farmers personally, and advises Wildlife Works regarding issues such as this.

Section 5.5 Project Grouping

The Kasigau Corridor Phase I project is not a grouped project. Therefore, no supporting evidence is supplied.

Section 6 Baseline Scenario

Section 6.1 Obvious Agents and Drivers of Deforestation

Wildlife Works staff and employees possesses an incredible depth of local knowledge regarding both the Reference and Project Areas, as a result of direct involvement and integration with this community since 1997. As such, it was considered unnecessary for us to conduct a participatory rural appraisal (PRA) to demonstrate a clear understanding of the principle driver of deforestation in the reference region. This is observed as conversion of dryland forest to annual subsistence cropland by two main groups of local agents during the historic Reference Period.

List of Obvious Agents and drivers of deforestation

- Local farmers from the Taita Tribe (approximately 95% of local population according to the 1999 Kenyan census) deforesting for cropland.
- Farmers from the Duruma Tribe (approximately 5% of local farmers – from 1999 Kenyan census) deforesting for cropland.

Both of the aforementioned populations began aggressively converting land in the 1990s prior to Wildlife Works' arrival in the area in 1997. After rendering it impossible to illegally farm private group ranch land, immigration to the area virtually ceased, and in fact many Duruma families returned to their primary farms at the Coast, while most Taita farmers remained, establishing themselves as the dominant project community.

- Illegal charcoal trade – typically first element of degradation as it generates cash to fund the clearing of the land for subsistence farming.

Large scale Tribal mobility in Kenya today for access to cropland is very restricted, as Kenya is fairly highly populated, certainly in areas of adequate rainfall for farming, and the traditional tribes in any given area typically prevent the incursion of immigrants from outside.

Narrative describing why the agents of deforestation are evident

Wildlife Works contends that the reasons for the presence of the agents of deforestation is obvious. Agricultural conversion has occurred adjacent to - and even into - the Project Area during the historical reference period just prior to Wildlife Works' arrival in the area in 1997, and continues in a heavy and visible manner in the reference region today. Standing on the boundary of the Project Area, one can see the stark contrast to the converted land outside the Project Area without effort. This makes the deforestation process extremely evident. Forest degradation is in turn conspicuous judging by the amount of charcoal sale depots alongside the main Highway (A109) that leads from the Reference Region to the closest major coastal city, Mombasa.

Looking back towards Rukinga Sanctuary from deforested area in the Reference Area.

Descriptions of agents and drivers including any useful statistics and their sources

Local Taita Farmers have traditionally farmed the fertile cloud forested hills of the Eastern Arc Mountains, Kasigau, and Taita and Sagalla Hills. As their population exceeded the carrying capacity of the montane land they relocated to the dryland Acacia-Commiphora forest that dominates the lower elevations of the district. However, their traditional farming practices did not sustain, due to extremely low average rainfall. After colonizing all available land with permanent water sources, they began to clear any available unprotected land, hoping that the unpredictable rainfall would bless them with a crop. The larger blocks of remaining land in the area outside of communally owned land protected by local administrations were privately held group ranches - designated as cattle carrying areas - for the communities of the hills in the 1970s. However, due to the remoteness of these areas and a lack of permanent water sources, these areas were never been developed as cattle ranches, and remained as natural forest over the years until the mid 1990s, when rainfall patterns initiated a population boom in the area. This boom was also facilitated by the improvement of the main Mombasa highway (A109) and a local arterial road that runs along the edge of the Rukinga project area.

Duruma farmers, originally from the Kenyan Coast, came to the area in the mid 1990s due to anomalous El Niño rains, when there was still a very small Taita population living in the Dryland forested areas that now comprise the reference region. In many cases these Duruma families were lead by second wives of a man whose primary family was at the Coast, and who farmed this area on squatter land, sending the produce home to the primary family at the Coast. Because both of these agents of deforestation did not possess legal land tenure, they never invested in the land, and chose to simply farm with no inputs until the soil was depleted. They subsequently cleared more forest and began engaging in an annual depletion cycle. Wildlife Works addressed this issue by creating a land cooperative, providing farmland for those landless farmers who were deforesting the area[3].

List of Project Activities designed to mitigate deforestation

The Project Activities designed to mitigate deforestation include (in order of importance);

Wildlife Works Sustainable Development Initiatives

Wildlife Works has implemented a wide range of sustainable development initiatives at Rukinga over the past ten years, and is committing to continue with a new range of innovative co-benefits for the communities that are in the Project Zone once the funding for the REDD project begins. These initiatives collectively form the basis of Wildlife Works' deforestation mitigation strategy. An implementation schedule for these Project Activities, complete with timelines and budgets, was shared with the Project Validator.

Organic clothing factory

[3] Local history obtained through multiple conversations with community members over a period of 12 years.

Wildlife Works' core project has been the construction of an Ecofactory. We employed over 150 people from the local community during construction, and now trained and employ young women from the community to sew organic cotton clothing, which we export to the US and Europe for sale on the internet and in fashion boutiques. First and foremost, we plan to continue the level of investment we have been making for the past ten years in this Ecofactory.

In addition, going forward we have several new Project Activities in this area;

- Adding capacity – we plan to immediately rehire ten women previously trained by Wildlife Works but let go due to lack of funding
- Factory Expansion – we plan to complete a second production cell, capable of dyeing and screen printing fabric so that we can manufacture finished goods completely within our complex without having to send out for dye and print. We believe this will make our production capability much more attractive to a wider range of customers, and reduce our production costs. The walls for this production cell were built back when the first sewing cell was built, but it needs roofing, flooring, electrification and importation of the dye and screen print equipment acquired by Wildlife Works in the US. A full budget for this factory expansion was provided to the Validator.
- Increase Fabric Inventory and Produce 2010 Collection – we have been unable to produce a new fashion collection from Rukinga for the past two years due to lack of funding, so we plan to initiate a new Collection immediately in 2010, once carbon funding is received. This new collection will be sold online and will relaunch our brand into the international marketplace, now with 100% of production being done in Rukinga. This is critical to our long term strategy to wean local people away from agricultural employment that conflicts with wildlife, and to introduce elements of sustainability to our model for post carbon finance in 20 years.

Organic Greenhouse

Widlife Works established an organic greenhouse to grow citrus trees, which we sell at a discount to local farmers so that they may plant a tree for shade that has the added benefit of earning them income. We use the funds from the citrus sales to fund the growth and distribution of free agroforestry species such as Neem and Moringa Oliefera to local farmers, to meet their medicinal, nutrition and fuelwood needs. With the financing from the Carbon project, we plan to initiate a number of new Project Activities in this area;

Wildlife Works Organic Greenhouse

- Expansion of our core greenhouse at Rukinga HQ to add a second shade house, doubling our capacity by adding two additional greenhouse workers from the local community. A full budget for this activity has been provided to the Validator.

- Establishment of 5 nurseries in the villages surrounding the Eastern and Southern boundary of the Project Area and Kasigau Wildlife Corridor: Maungu, Itinyi, Sasenyi, Buguta, Makwasinyi. Each nursery will utilize the same template and budget as for our own shade house (see above), and each nursery will employ an additional 2 members of the local community, totaling 10 new employees. Each nursery will be responsible for working with their immediate community to plan and implement a cash crop and implement fuelwood and construction pole strategy for that community. They will plant the same combination of tree species currently being grown in our own greenhouse. Once again, for the foreseeable future, the nurseries will provide agroforestry species and native hardwood seedlings for free, while the sale of cash crop trees will contribute to the budget. We will provide training in organic agroforestry and our organic Project Team Leader, Joseph Mwanganda, will manage these new nurseries.

- We will continue a project activity through which we provide relatively small amounts of elephant dung from the Rukinga Sanctuary to a local women's group called the Imani Women's Group. Periodically and at their request, they can use the dung as a growing medium for their commercial mushroom farm, which is housed in a small shed within the women's group compound and provides a good income to the group, with little to no negative impact on biodiversity or land use.

- We will restart a 3 year reforestation project on the slopes of Mt. Kasigau, working closely with the Kasigau Conservation Trust (KCT) to plant 20,000 indigenous hardwood trees over the next three years in one of the Project Zone's High Conservation Value (HCV) areas. This project aims to replace trees taken out for charcoal or construction over the past years. We will be using the nursery built at Makwasinyi and Sasenyi (see above) as the base for propagating the seedlings of the indigenous trees in the first year, until Phase II of this project, at which time we plan to add an additional 4 nurseries on the South and East sides of Mt. Kasigau. We will be providing financial rewards to community members who plant those trees and protect them through two full years. We are confident that this project will go a long way in restoring the habitat and conserving the endemic species in this region. Its model might hopefully be emulated in other parts of the country so as to stop the loss of forests in Kenya. We have involved the community in all facets of the project, from the formulation of this proposal, the monitoring and as indicated in its implementation. This has ensured that the community has taken it up as its own initiative and will see it through even in the absence of Wildlife Works, thus ensuring sustainability.

Dryland Farming scheme

Our most recent project involves working with the Kenyan Agricultural Research Institute (KARI) to cultivate a climate appropriate plant called Jojoba (Simmondsia chinensis) that provides a cash crop through its seeds and is also extremely drought tolerant, non invasive and has the added critically important benefit that it is not eaten by any wildlife, birds or even insects. It is therefore viewed as the ultimate non-conflict crop. Wildlife Works is currently studying the impact of various levels of plant maintenance and irrigation on plant seed and oil productivity, with the idea that we can provide local farmers root stock to establish their own plants. They can then determine how much they can likely make if they are willing to put a certain level of effort into the plant maintenance. There are three specific Project Activities associated with this scheme;

- Complete our involvement in Phase I of the joint Research Project, taking place on the Jojoba fields at our HQ which will end in 2010
- Develop a full business plan on how to create a self sustaining venture to outplant jojoba in the surrounding community farmland, providing the local farmers with a drought tolerant and non-conflict crop.
- Source private funding to implement the Jojoba outplanting business plan, either from donors, private investors, Government of Kenya, or some combination thereof.

Wildlife Works REDD Forest and Biodiversity monitoring

There are a number of specific Project Activities in the Kasigau area that Wildlife Works will complete throughout the project lifetime;

- Continue daily ranger patrols to monitor of the health and vitality of the Project area – we have been performing daily patrols for almost fourteen years, and our rangers are very skilled at identifying potential threats to the forest and biodiversity of the Rukinga Sanctuary.
- Using Carbon finance, we have added a new permanent Ranger Station at the SoutEast end of the Project area, furthest from our headquarters. This supports the addition of a full new section of 8 Wildlife Works Rangers, recruited and trained from the local community, along with a new Team Leader promoted from within our existing force. This is primarily to prevent incursions of illegal cattle from that direction, to make patrolling the far boundary easier, and to develop closer working relationships with the Makwasinyi community.
- We have made a significant investment in modernizing our patrol fleet, by purchasing three new Toyota Land Cruisers, to reduce the carbon emissions from our patrol vehicles, and to reduce the cost of operating and maintaining them. Perhaps most importantly, we wish to ensure that we have a reliable fleet to support constant patrol activities. We have thus retired our oldest patrol vehicle, a 1980 Toyota Land Cruiser – HJ45 Diesel.
- We will improve our ability to monitor the HCV species in Rukinga by adding a dedicated Ranger Patrol, the HCV Ranger Team, which will be responsible for constant tracking and monitoring of the HCV species. Unlike the general ranger teams that are patrolling geographic sectors of the Project area, this dedicated team will be recruited from the existing ranger Patrols based on tracking ability and biodiversity knowledge, and the 4 members of the patrol will be backfilled in the geographic Ranger teams by hiring new rangers from within the community.

Wildlife Works ranger force team members

- Additionally, to improve our monitoring of HCV species, we plan to establish a GIS center of excellence at Rukinga HQ, for which we have hired one full time Kenyan GIS expert, and set up a state of the art GIS computer station. This individual is responsible for liaising closely with the HCV Ranger Team, with the Ecotourism partner in the Project Zone, and with all Wildlife Works ranger patrols to maintain daily sighting logs of the HCV species. They will also be responsible for monitoring those other species of ecotourism value, such as Elephant, Buffalo, Giraffe and Common Zebra. A biodiversity database is being collected with recordings made from standard daily ranger patrol sheets.

- We will begin annual monitoring of our carbon inventory by revisiting 20% of our permanent fixed plots each year to resample the trees, shrubs and grasses, looking for degradation or improvement in existing stocks. In addition we plan to acquire remote sensed imagery to prove the absence of large scale deforestation or boundary incursion. Wildlife Works subsidized the purchase of a gyrocopter by our VP African Operations, Rob Dodson, which he will use to perform periodic aerial monitoring of the project area and reference region.

- We will investing in third auditors to verify project carbon inventories and project progress every five years.

Ecotourism

Wildlife Works has located an ecotourism provider who now operates a safari camp in the center of the Rukinga Sanctuary. This provides employment for safari guides and other service jobs, as well a market for local produce. In the absence of REDD funding, and our continued protection of the biodiversity in the project area, this business would likely lose its support.

Ecotourism Center at Rukinga - "Camp Tsavo"

The primary ecotourism tenant, called Camp Kenya, brings groups of young people to the camp from the UK who stay at the camp, but spend their days in the communities of the project area implementing community projects, providing a significant benefit to the communities. Wildlife Works has negotiated for a second partner, called EcoTraining, to come to Rukinga. They are a South African safari guide training company, and have agreed to support the placement of local youth into their program, on a space available basis, to be trained as Safari Guides at a very high quality level. As a project activity, we plan to provide funding for two local youth per year to go through their program and be trained as safari guides.

Finally we plan to explore a second high end ecotourism retreat on Rukinga, to bring more jobs and income to the Project. This effort will be self funded by outside investment partners, and represents a significant capital expenditure.

School Construction and Bursary Scheme

When Wildlife Works arrived in the area, there were almost no schoolrooms, no books and no desks. None of the necessary infrastructure for children to have a hope of a decent education exisited. We began with a school building program, and over the years we have partnered with the community and various identified donors to build 18 classrooms throughout the district. We also build desks, and our original Kenyan manager Alice Ndiga launched a school bursary program, which she administers, called the Kelimu Trust, that has sent over 65 local children through private high school, and several on to college.

Old Kale School – no floor, no desks, one mud room New School block built by Wildlife Works

Once the Project Carbon funds start to come in we plan on two specific Project Activities in this scheme, as outlined in the Project Implementation Schedule provided to the Validator;

- Provide Wildlife Works direct funding to send 5 new students through four year secondary schools program and on to three or four year College/University should they qualify – this is an annual commitment of $2000 in the first four years of Secondary School fees and between $5000 and $10000 a year in college/university fees.

- Establish a Wildlife Works School Construction and Maintenance fund, by hiring a dedicated staff person to manage the fund with project management skills and ability to write grant proposals, and provide $10,000 per year in Wildlife Works funding above and beyond the compensation of the fund manager to seed school construction and maintenance projects in the Project Zone. The Fund Manager will work closely with the local District Education Officer, and the existing school boards in the area to determine which projects should receive funding each year.

Please note that this document outlines minimum levels of financial commitment to project activities, and funding levels will be revisited as project financing becomes more clear based on carbon credit sales each year.

A List of External Drivers of Deforestation (Covariates) Used in the Deforestation Model

We explored the most obvious covariate - population - and found that it did not significantly affect the deforestation baseline rate. We ultimately decided to not use any covariates, basing deforestation on historical information alone.

Section 6.2 Participatory Rural Appraisal

As a result of Wildlife Works extensive knowledge of the Reference Region and Project Area, we are intimately familiar with the agents and drivers of deforestation and therefore we found it unnecessary to perform a Participatory Rural Appraisal.

Analysis of Agents of Deforestation

This section is Not Applicable.

Analysis of Drivers of Deforestation

This section is Not Applicable.

Section 6.3 The Reference Region

Delineation of the Reference Area

The Reference Region for the Kasigau Corridor Phase I project was chosen to specifically address the behavior of the local agents of deforestation as well as the drivers of deforestation for the ecoysystem. Specifically, the area is comprised almost entirely of local inhabitants engaging in subsistence farming practices. In the area that are not zoned for group ranch ownership, local agents practice slash and burn agriculture. This type of deforestation is prevalent and exclusive, as the dominant species (Acacia / Commiphora) are not commercially viable. For this reason, the main agents of deforestation, as described in section 6.2.1 consist of local community members, and the primary driver, as will be tested in section 6.4, the Cumulative Deforestation Model, is population.

Narrative describing the rationale for selection of the reference region boundaries

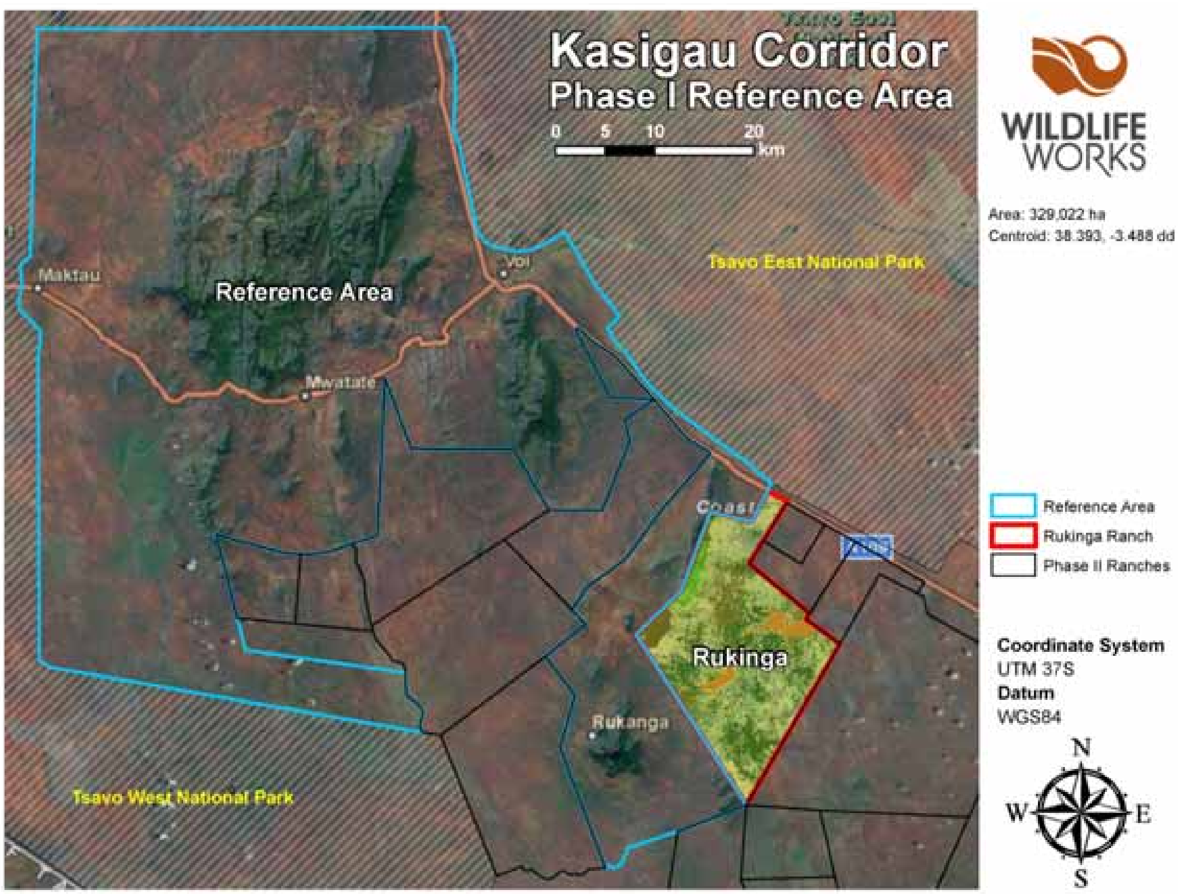
The Reference region boundaries were chosen to address the behavior of the agents of drivers of deforestation in the Kasigau Corridor. The reference area is bounded by Tsavo West national park to the west, Tsavo East national park to the Northeast, and group-owned ranches on all other boundaries. The area is therefore bound on all sides by either protected areas or tracts owned by groups under agreement with Wildlife Works for Kasigau Corridor Phase II Project. As such, unplanned deforestation will necessarily occur within the delineated reference area.

The region was specifically chosen to embody a region that has seen deforestation of a nature typical for this ecosystem. In fact, the area forms a corridor between the two aforementioned national parks, with virtually no extraneous space. As such, Wildlife Works is confident that by studying the area delineated as the reference region for this project, the culture and behavior of the agents and drivers of deforestation will be completely captured.

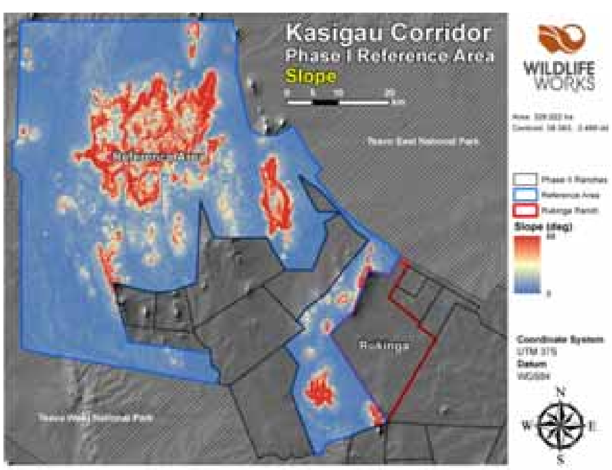
Additionally the geographic qualities of the reference region are similar to those of Rukinga Ranch. Forest type, soils, river density, and infrastructure are similar. The reference region does encompass the Taita Hills area; Wildlife Works feels that it is not only appropriate, but necessary to include these hills in the reference area, as they have been subject to subsistence conversion to agriculture as much, if not to a greater extent, than the surrounding lowlands. It would be inappropriate to omit the hills simply due to their elevation. The reference region was also chosen such that the agents of deforestation would, and are perfectly able, to act within its boundaries as an alternative to deforesting within Rukinga Ranch itself.

The following maps demonstrate the geographic features of the reference area that render it appropriate for evaluating the baseline scenario for this project.

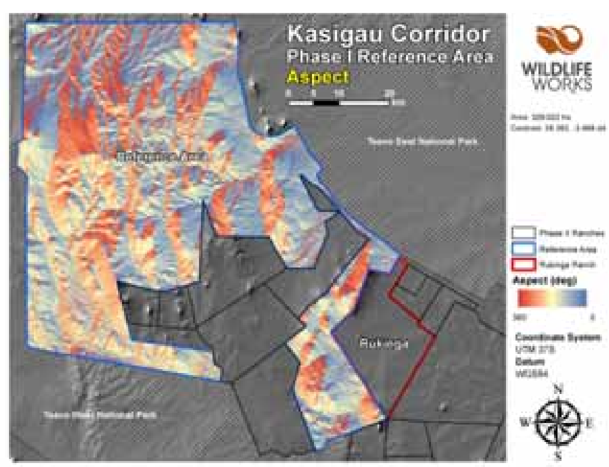
Delineated boundaries



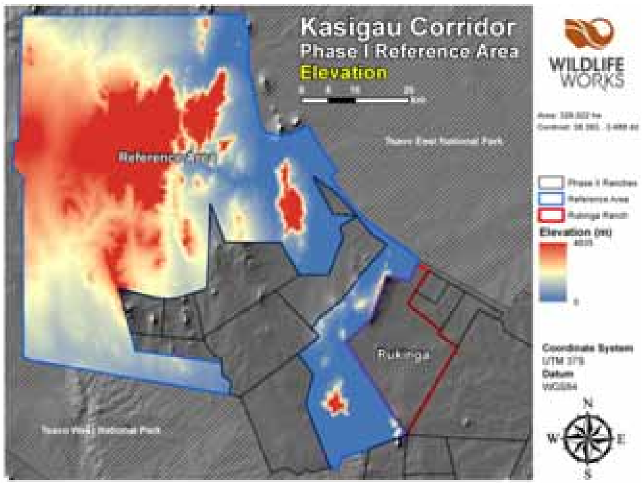
Reference Area and Land Tenure Boundaries, Roads and Major Markets



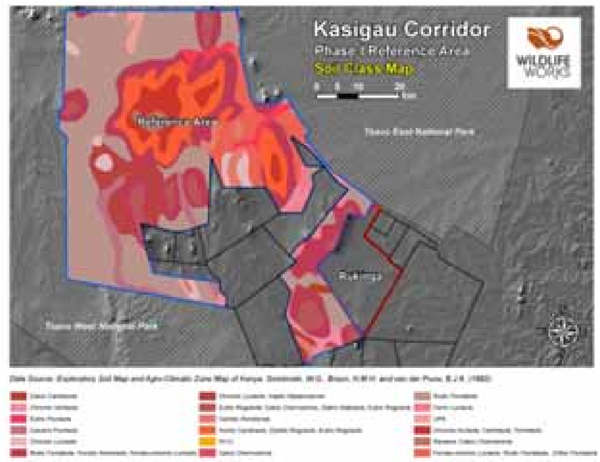
Reference Area Slope



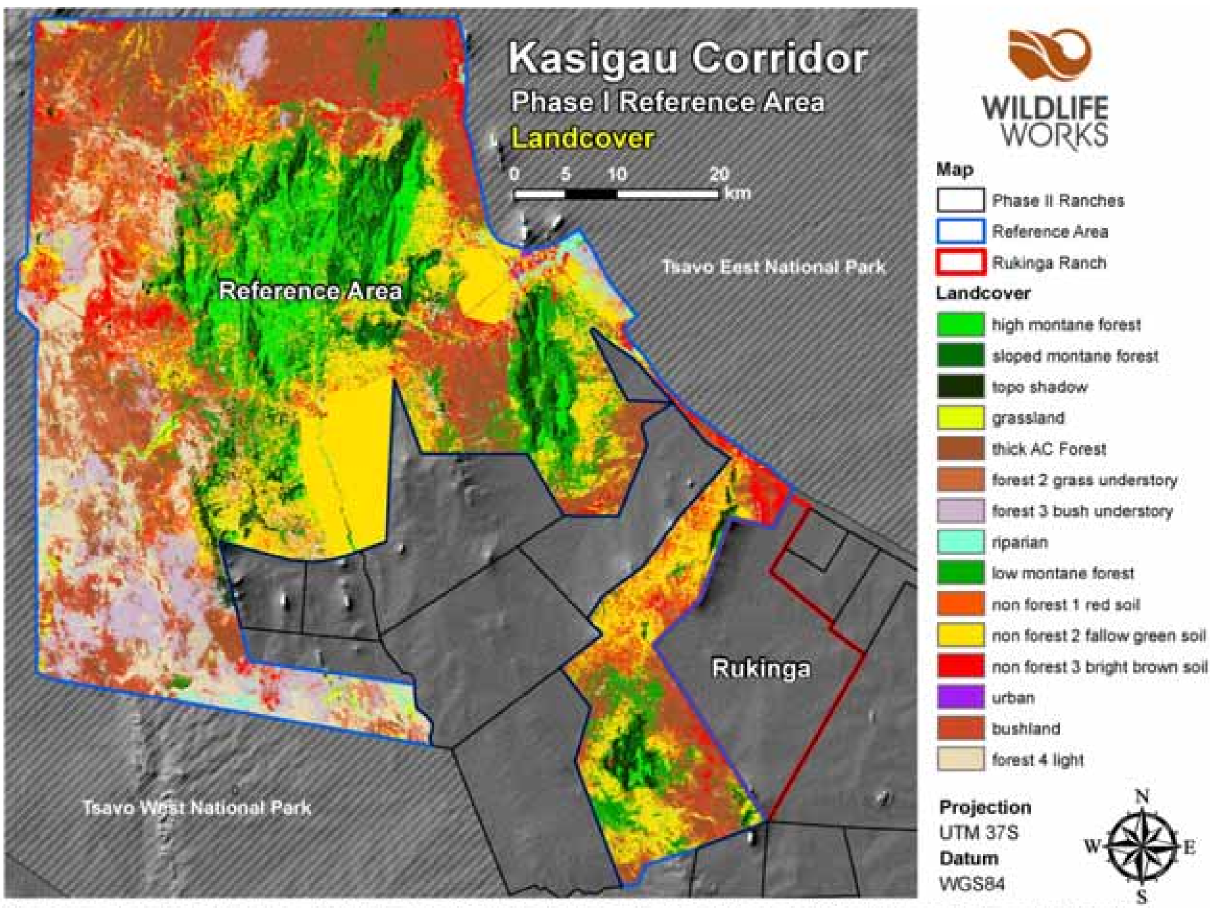
Reference Area Aspect



Reference Area Elevation



Reference Area Soil Classes



Data Source: Landsat 7 ETM+ | Acquired: Febrary 6, 2003 | Spatial Resolution: 30m | Supervised Classification: Maximum Likelihood

Reference Area Thematic Landcover

Infrastructure (roads, major markets, land tenure)

These characteristics are shown on the main maps of the reference region.

Defining the Reference Period

The reference period is defined by the following historic events;

- Population in the Taita Hills began to exceed the carrying capacity of the fertile hill top lands in the late 1980s, and families began to move down into the dryland forested areas.

- Local lore has it that the Coastal Duruma first came to the Reference Area adjacent to the Project Area in the early 1990s when they were promised land by a local Taita politician who had taken a Duruma wife in return for their votes in local elections. The only problem was he promised them land he did not own that falls within the Reference Area for this project. The Duruma are polygamists, and therefore the common practice was for a husband to bring his second or third wives to the Project area to establish agricultural plots. The husband would leave them in the bush with their small children and return to the Coast where they would spend most of the time with the family of the first wife. The husband would then return at harvest and claim a large portion of the crop should there actually have been a crop, and would take it back to the Coast family. These single parent families were rarely successful at agriculture, but continued to clear land aggressively hoping they would find the perfect location where the tragically localized rainfall patterns would find their land. In the interim, the teenage males would snare animals for food, the Duruma being much more comfortable in the bush than Taita farmers.

- El Niño Rains in the mid 1990s caused more landless families from both Taita and Coastal Duruma communities to move to the area, as they could get successful maize harvests, and the land was still relatively under populated.

- The main Nairobi - Mombasa highway that passes through the Reference Area (A109) fell into horrible disrepair in the late 1990s, so the high volume of trucks that travel up and down the highway from the main port of Mombasa to the interior of Kenya and beyond (as far as Zambia) was forced to make frequent maintenance stops. As a result, small towns such as Maungu, which is the town directly adjacent to Rukinga, sprang up along the highway.

- There are no significant economic factors involved in selection of the Reference Period, as the local population consists primarily of subsistence farmers, producing for their own consumption.

- These factors lead to a reference period beginning in February, 1987, before which there was very little population and very low deforestation, and extending to the Project sart date, January 1st, 2005. Wildlife Works then located historical imagery covering as much of the reference area as possible, both on a spatial and temporal basis. The following were found and used in building the cumulative deforestation model (CDM).

Kasigau Corridor Phase I Imagery

	Image Number	Image Year	plot line height	Imagery date	Satellite/sensor	Tile / record	Notes
Historical Reference Period	1	1987	10	2/18/1987	Landsat 5 - TM	167/62 167/63	
	2	1994	-12	11/20/1994	Landsat 5 - TM	167/62 167/63	
	3	1995	10	1/7/1995	Landsat 5 - TM	167/62 167/63	
	4	1995	20	2/8/1995	Landsat 5 - TM	167/62 167/63	
	5	1995	30	3/28/1995	Landsat 5 - TM	167/62 167/63	
	6	1999	10	10/25/1999	Landsat 7 - ETM+	167/62 167/63	
	7	2001	-12	3/4/2001	Landsat 7 - ETM+	167/62 167/63	
	8	2003	15	2/6/2003	Landsat 7 - ETM+	167/62 167/63	
	9	2003	30	10/1/2003	Quickbird-2 (Multi-spectral)		
	10	2004	10	9/4/2004	Landsat 7 - ETM+	167/62 167/63	SLC-OFF
	11	2005	-20	2/11/2005	Landsat 7 - ETM+	167/62 167/63	SLC-OFF
	12	2006	-12	1/29/2006	Landsat 7 - ETM+	167/62 167/63	SLC-OFF
	13	2008	30	1/3/2008	Landsat 7 - ETM+	167/62 167/63	SLC-OFF
	14	2008	20	9/7/2008	Landsat 5 - TM	167/62 167/63	
	15	2008	10	10/1/2008	Landsat 7 - ETM+	167/62 167/63	SLC-OFF
	16	2009	-12	2/22/2009	Landsat 7 - ETM+	167/62 167/63	SLC-OFF
	17	2009	-20	10/4/2009	Landsat 7 - ETM+	167/62 167/63	SLC-OFF

Figure 4. Historical imagery used for the Cumulative Deforestation Model (CDM).

It should be noted that the MED makes use of the post 2003 Landsat SLC-OFF imagery, that was in turn accessible and useful in the deforestation analysis.

Section 6.4 The Cumulative Deforestation Model

Historic Imagery Used to Build the Cumulative Deforestation Model

The imagery located for the reference period provided 100% “double coverage” over the reference area. Upon request, the valdiator will be shown a double coverage map to demonstrate this point. All images were registered to within 10% RMSE. The line plot of the historic images confirms stationarity.

Historical Reference Period Image Line Plot

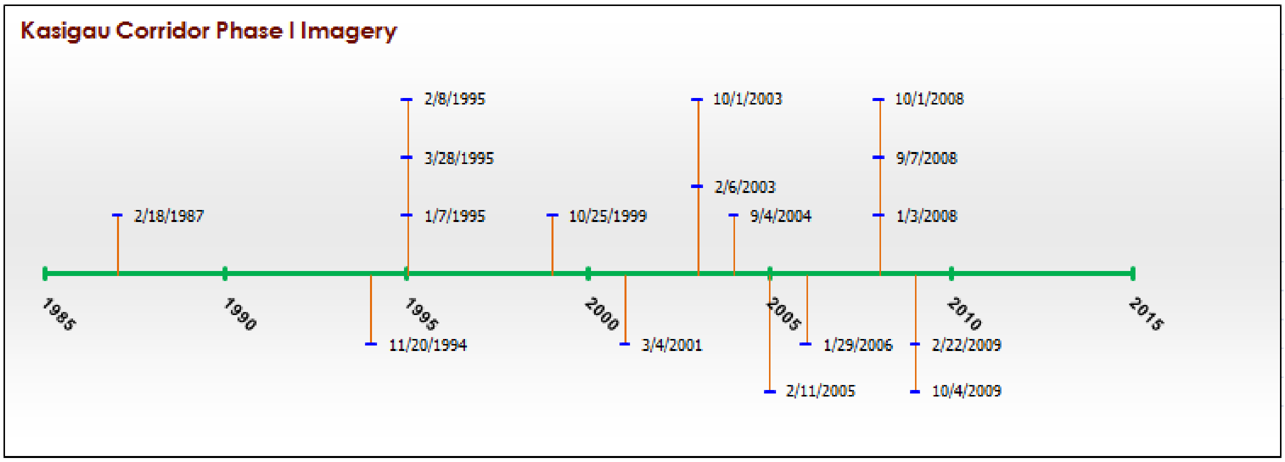


Figure 5. Line plot of historic images demonstrating stationarity.

Sampling Deforestation to Build the Cumulative Deforestation Model

Variance from the pilot sample (100 points) was collected and input to equation 6 to determine total sample size for the CDM:

$$\hat{\sigma}_{DF} = 0.3126$$

$$\hat{m}_{DF} \geq \frac{1}{2}\left(\frac{\hat{\sigma}_{DF}1.96}{0.01}\right)^2$$

$$\hat{m}_{DF} \geq \frac{1}{2}\left(\frac{(0.3126)1.96}{0.01}\right)^2$$

$$\hat{m}_{DF} \geq \mathbf{1877}$$

We chose to use an even 2000 samples, as it is conservatively greater than 1877. To support the collection of data for the CDM, Wildlife Works developed an image classification protocol, and a grid classification tool, which generates the dot grid overlaid on the historic imagery, and supports the analyst in performing the deforestation analysis of each of the grid values over time. An excerpt of the image classification protocol is provided below, and the full document was provided to the Validator.

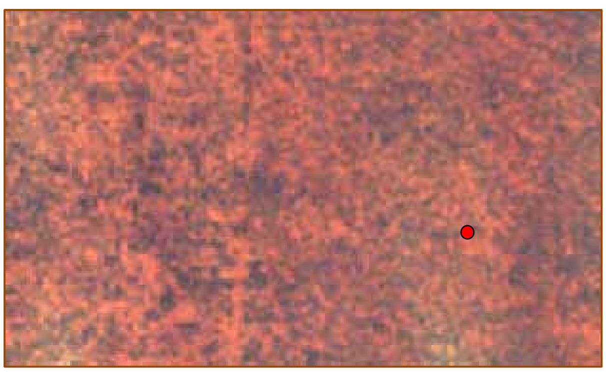
Evaluating points

When classifying the points in the grids it is very important to evaluate the area around each point to get a clear understanding of the land cover features and classification type, not just the area directly under the point. Points will often land in transition areas so a thorough review must be done to evaluate the relative proximity to the various land covers. The follow examples examine a range of land covers and features in the images and how to classify them correctly.

Example 1: Forests

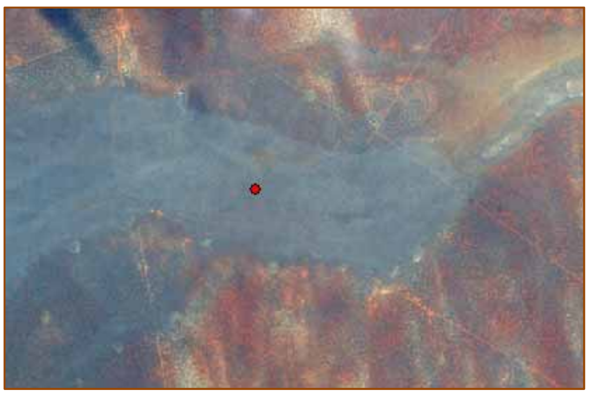
A. **High density** – This point is in the center of a forest. This forest is consistently deep green and very little to no soil is visible.

B. **Low density** – This point is on a low density forest where a lot of soil can be seen. The dark spots in the image are trees and the red area is soil visible between the trees.



C. **Low density –** This is another example of a low density forest.

D. **Shrub/grass land/naturally low vegetation** – This point is on a non-forest area; however this area has not been deforested. This is a very important distinction to be aware of; even though this area may not be forested it should still be classified as forest because the lack of forest was not caused by anthropogenic activities.



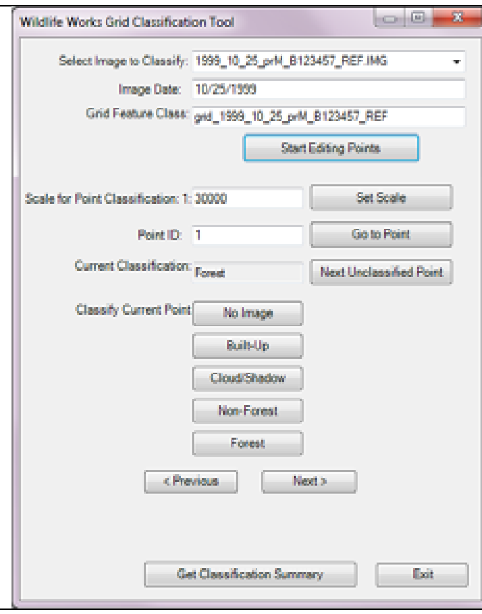
Example 2: Anthropogenic deforestation

The key to identifying anthropogenic deforestation versus land that is naturally non-forested or low density forest is the identification of unnatural patterns in the landscape. These patterns look very unnatural and include agricultural fields, mosaic deforestation and clear-cut area.

A. **Agricultural fields** – This point is in an agricultural field. The distinct lines and structure of the fields are common landscape characteristics of land that is used for agricultural activities.

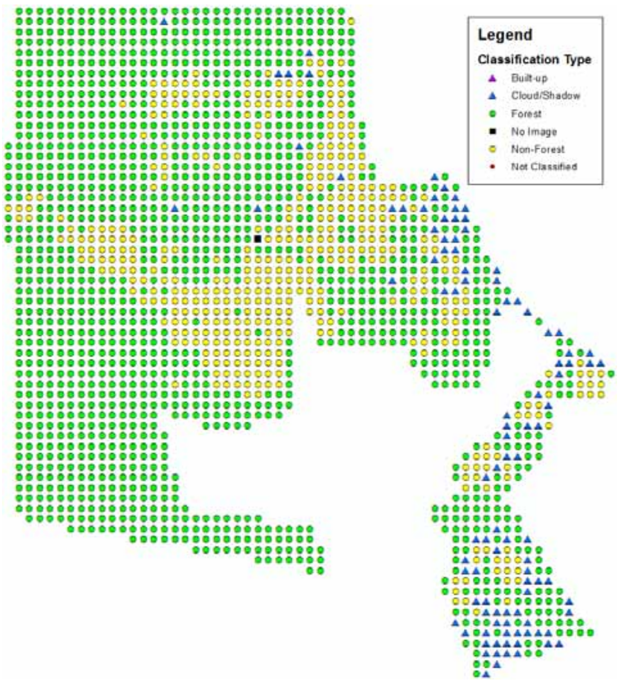
B. **Mosaic Deforestation** – This point is on a mosaic patch of deforestation. A common characteristic of mosaic deforestation is random patches of cleared areas that usually start in a dense area and become less dense and scattered as it spreads out.

The points in the grid can be classified to the appropriate land cover type using the Grid Classification tool. For more information about the Grid Classification tool see: **Grid Classification Tool User Manual**.

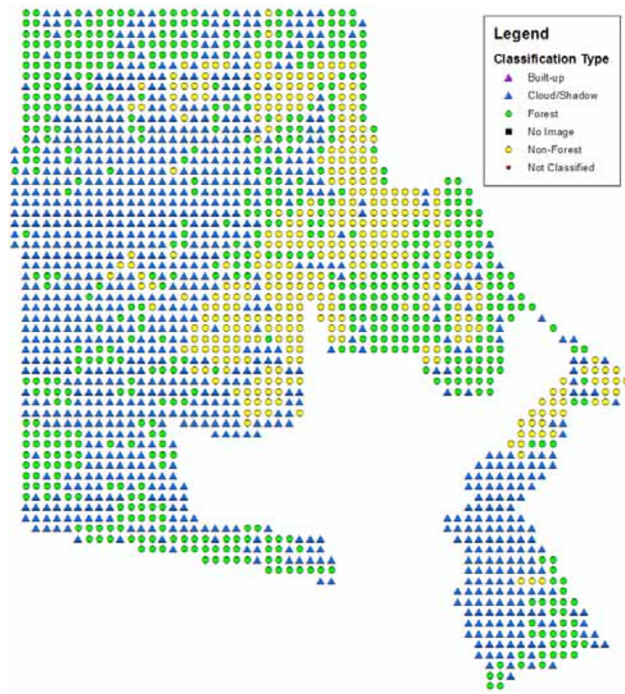


Excerpt from image classification protocol

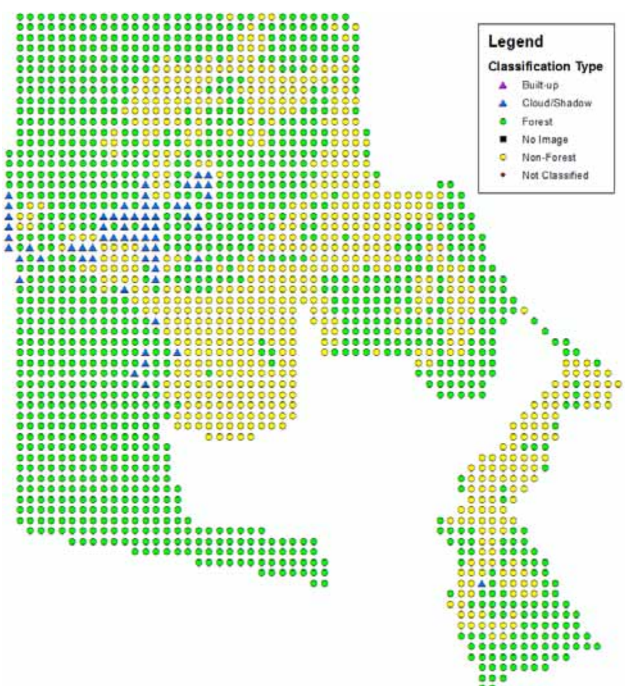
The grid data was collected according to the procedure described in the MED and using the Grid Classification Tool (shown above). The result of this data collection analysis for the Reference Area for all time periods follows;



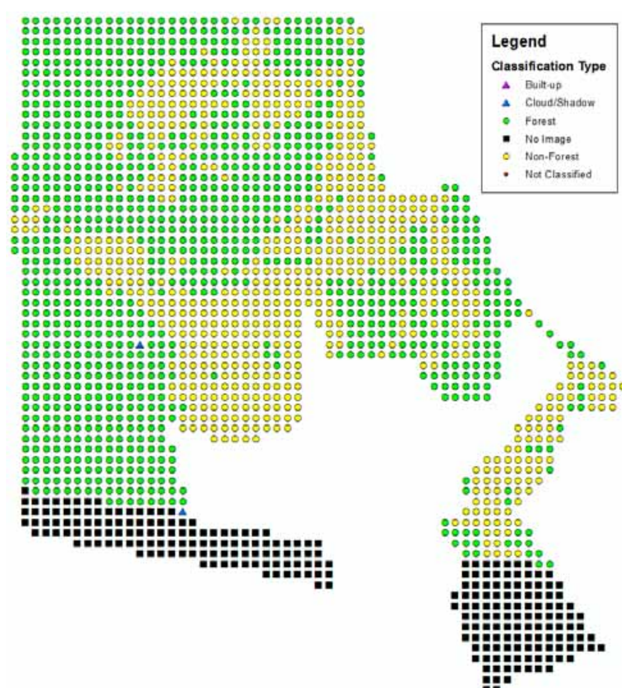
1987



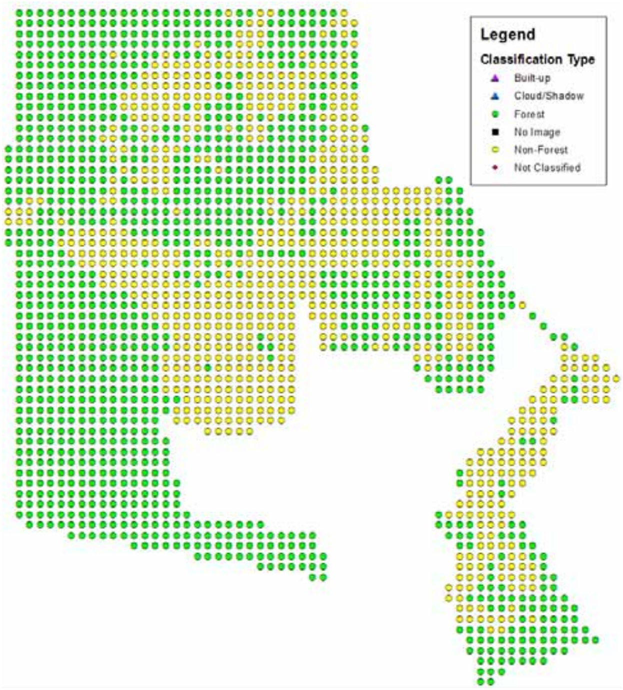
1994



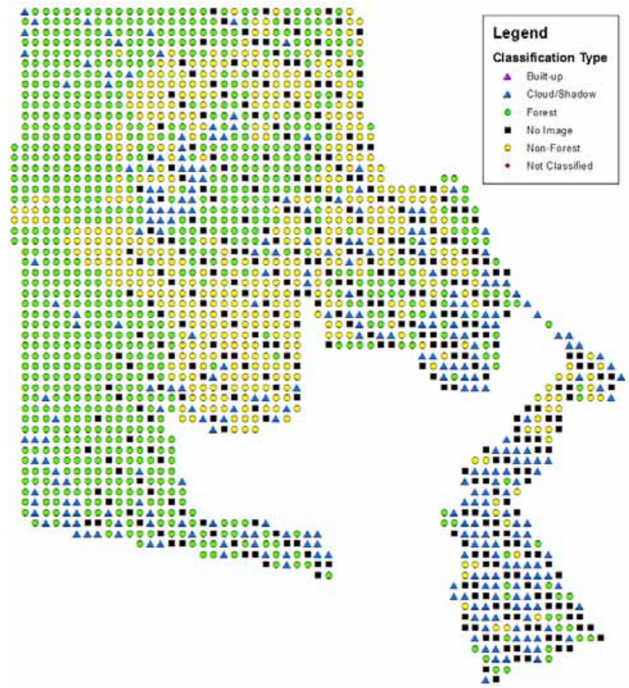
1999



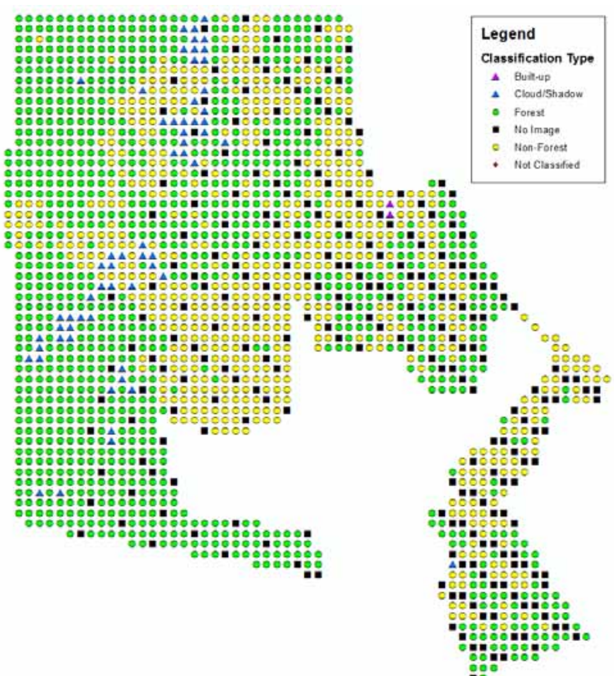
2001



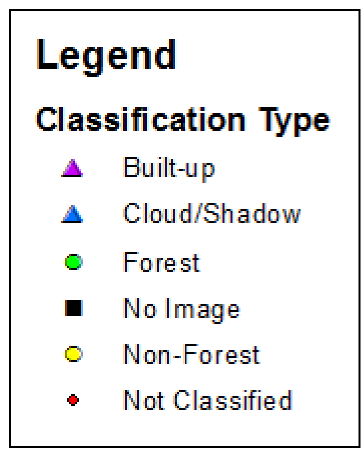
2003



2004



2005



Classification Legend

Figure 6. Data collected over the historical reference period used to fit the CDM

Minimizing Uncertainty in the Cumulative Deforestation Model

To minimize interpretation errors while evaluating forest state in the images used to develop the CDM, an image interpretation protocol was developed and followed by all interpreters. This protocol includes the following information;

- Instructions in how to interpret images using a grid of points overlaid on each image.
- A description of the set of thematic landcover classes used to interpret the points.
- Common (typically encountered) types of land cover patterns and features, and instructions as to how to recognize thematic classes using context.
- How to interpret the forest state of an image, including potential pitfalls to be cognizant of.

After forest state interpretation was completed for all the images within in the historical reference period, the data was independently checked for inconsistencies and systematic misinterpretation. This was accomplished by using an algorithm that flagged any points that had an unlikely forest state transition over the reference period (an example being a transition from non-forest to forest in less than 5 years). These points were then re-evaluated by examining all images at each point (the temporal span) in order to accurately identify and rectify any misinterpretations.

A total of 164 points out of 2000 were flagged for inconsistencies. A spreadsheet was used to evaluate and track the forest state change over the reference period. The images were then re-interpreted for each point and the errors were documented. After the points were reclassified, the check algorithm was run again to ensure that all flagged forest state transitions had been corrected.

The following documents were made available to the validator:

Image Classification Protocol: Image Evaluation Protocol, 01/12/2011

List of flagged and rectified forest state transition: Grid Data RefArea flaggedPointsv2, 01/12/2011

Fitting the Cumulative Deforestation Model

Observations of forest state from the reference region and applicable covariate data sets were used to fit the cumulative deforestation model using the free statistical program R. Population census data were considered as covariates to deforestation throughout time, and these data were obtained for two census districts near the project area – Sagalla and Kasigau – from the Kenya Census for 1989, 1999 and 2009. A linear interpolation was used to estimate population between 10-year census dates. However, these covariates did not inform the model when compared to the model evaluated using only historical observations of deforestation. Four models were evaluated using AIC and their linear predictors, and are presented in the table below.

Model	AIC
Forest State = Alpha + Time	4
Forest State = Alpha + Time + Sagalla	6
Forest State = Alpha + Time + Kasigau	6
Forest State = Aplha + Time + (Sagalla + Kasigau)	12

Table 3. Linear predictors considered and AICs.

The selected linear predictor, per equation 7 is

$$\hat{\eta} = -1.0804558 + 0.0003792x$$

where x is the number of days since the project start date. This predictor was selected because it gave the model with the lowest AIC. A graph of the selected model based on this linear predictor is given below.

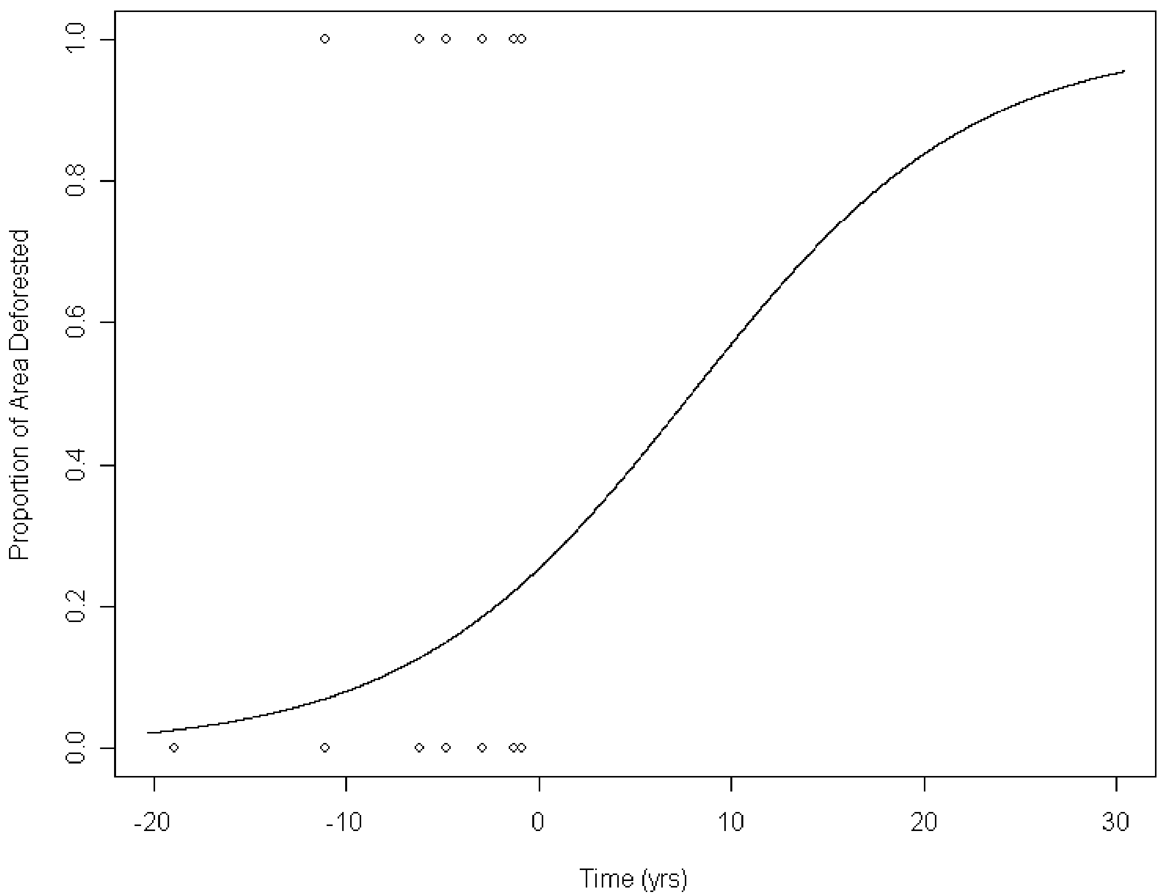


Figure 7. A plot of the selected logistical cumulative deforestation model.

Linear Prediction of Deforestation

A linear rate was selected to predict the cumulative deforestation for project accounting purposes. According to the notation of equation 7, the selected rate is

$$y = 0.031649x$$

where x is the number of days since the project start date, and y is proportion of area deforested. This linear rate is conservative because it predicts less baseline deforestation than the cumulative deforestation model, does not cross the CDM, and is at least 20 years in length. For the end date of this monitoring period, the projected proportion of cumulative deforestation by the cumulative deforestation model is 0.404, while the linear model is 0.1898, less than that predicted by the logistical cumulative deforestation model.

The following lists the proportion of cumulative deforestation for all monitoring periods to-date based on this selected linear rate.

Monitoring Period	Year Ending	Cumulative Deforestation
1	2010	0.1898

Table 4. List of cumulative deforestation by monitoring period.

A graph of the selected linear rate compared to the cumulative deforestation model from the project start date to end date is presented below to illustrate that the linear rate is conservative.

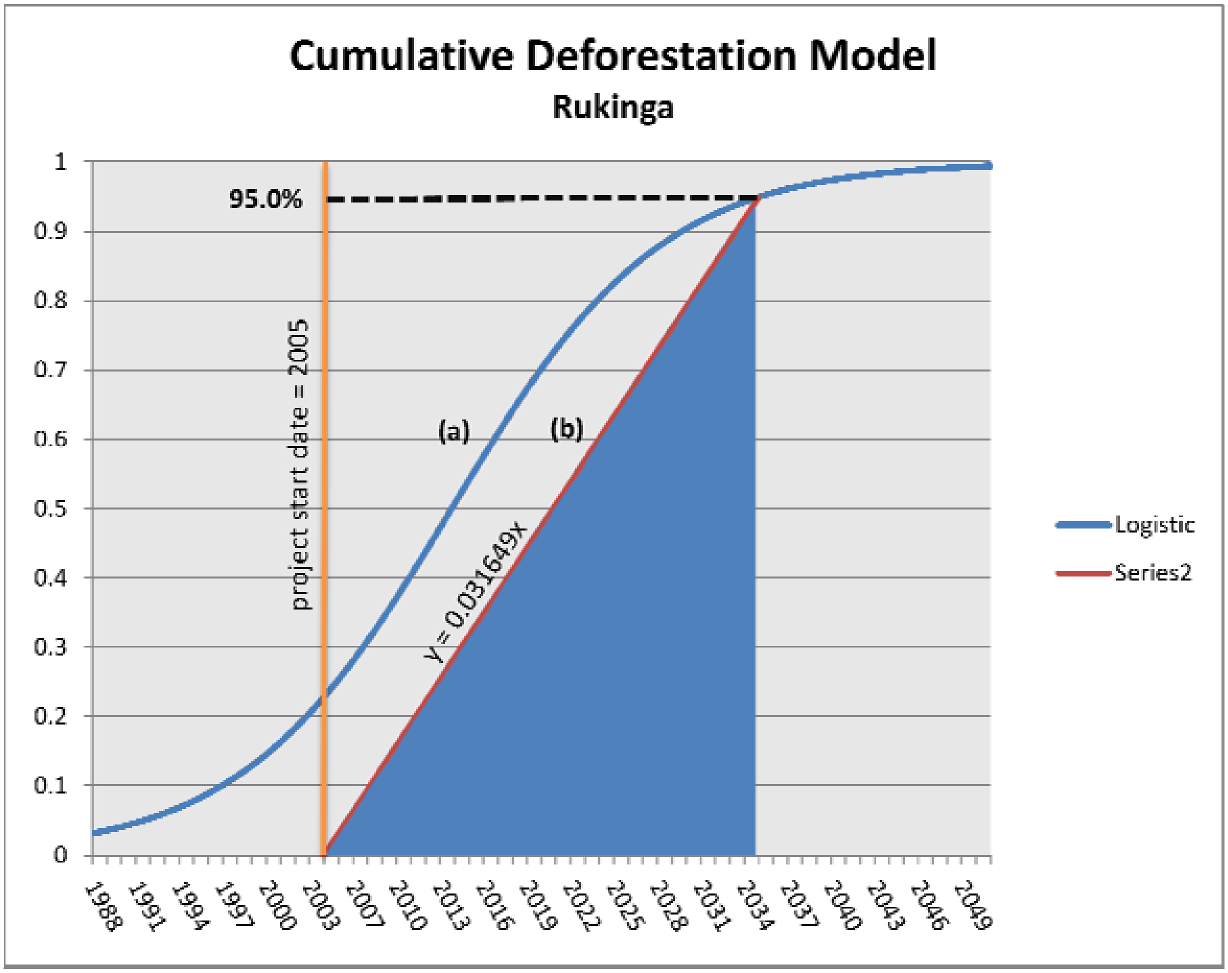


Figure 8. A plot of the logistical cumulative deforestation model (a) and the selected linear rate (b).

Estimating Uncertainty in the Cumulative Deforestation Model

Uncertainty in the cumulative deforestation model was quantified using equation 15 and 17. Equation 17 is calculated as

$$\hat{\sigma}_{DF} = \sqrt{\left[\sum_{i \in \mathcal{J}} w_i o_i\right]\left[1 - \sum_{i \in \mathcal{J}} w_i o_i\right]}$$

$$0.3126732 = \sqrt{0.1098263(1 - 0.1098263)}$$

where 0.1098263 is equal to $\sum_{i \in J} w_i o_i$.

Equation 15, the uncertainty in the deforestation model, is then calculated as

$$U_{DF} = \frac{1.96\hat{\sigma}_{DF}}{\sqrt{n_{DF}} \times \sum_{i \in \mathcal{J}} w_i o_i}$$

$$U_{DF} = \frac{1.96 \times 0.3126732}{\sqrt{8821} \times 0.1098263}$$

where 8821 is the number of state observations made to fit the cumulative deforestation model. The uncertainty in the deforestation model is

$$\boldsymbol{U_{DF} = 0.05941298}$$

Section 6.5 Soil Carbon Loss Model

Sampling Soil Carbon Loss

Soil carbon was determined to be an important pool for this project and was measured using purposive samples of farms in the reference area, most closely correlated to the original dryland forest conditions on Rukinga Ranch. This was possible because Wildlife Works primary shareholders, and of course all employees were in the region prior to the Project start date, so we were able to determine which farms were converted from dryland forest conditions most similarly matching those inside the Project area, as well as when they were converted.

We selected 25 soil sample locations outside of Rukinga's boundary in farms(shambas), all at least 10 years since conversion to farm land with conversion as recently as 10 years and as distant as 40 years ago. We also randomly selected 25 locations inside Rukinga in intact dryland forest.

This following is a table of the shambas that were sampled:

Name	Location	Plot Description	Sample Depth (cm)
Mzungu	Sasenyi	Farm cleared 28 yrs ago. Crops grown are maize and green peas	100
Nemu	Marungu	Farm cleared 10 yrs ago. Crops grown are maize & green peas	100
Nzangi	Kulikila	Farm cleared 17 yrs ago. Crops grown are maize & green peas	100

Ndaro	Sasenyi	Farm cleared 35 yrs ago. Crops grown are maize & green peas	100
Ngome	Sasenyi	Farm cleared 37 yrs ago. Crops grown are maize & green peas	100
Maziko	Sasenyi	Farm cleared 26 yrs ago. Crops grown are maize & green peas	100
Jira M	Sasenyi	Farm cleared 40 yrs ago. Crops grown are maize & green peas	100
Kazungu	Sasenyi	Farm cleared 30 yrs ago. Crops grown are maize & green peas	100
Kamau	Itinyi	Farm cleared 12 yrs ago. Crops grown are maize & green peas	100
Walter	Marungu	Farm cleared 10 yrs ago. Crops grown are maize & green peas	100
Kivuva	Itinyi	Farm cleared 20 yrs ago. Crops grown are maize & green peas	100
Mwanjila	Itinyi	Farm cleared 10 yrs ago. Crops grown are maize & green peas	100
Marungu primary	Marungu	Farm cleared 40 yrs ago. Crops grown are maize & green peas	100
J. Mkala	Sasenyi	Farm cleared 40 yrs ago. Crops grown are maize & green peas	100
Alima	Marungu	Farm cleared 10 yrs ago. Crops grown are maize & green peas	100
Mwikali	Lokichigio	Farm cleared 20 yrs ago. Crops grown are maize & green peas	100
Nicholus	Lokichigio	Farm cleared 10 yrs ago. Crops grown are maize & green peas	100
M. Ngele	Itinyi	Farm cleared 13 yrs ago. Crops grown are maize & green peas	100
Kibarangoma	Marungu	Farm cleared 13 yrs ago. Crops grown are maize & green peas	100
F. Kamau	Itinyi	Farm cleared 16 yrs ago. Crops grown are maize & green peas	100
Mwanyuma	Marungu	Farm cleared 14 yrs ago. Crops grown are maize & green peas	100
Chimanga	Mwagwede	Farm cleared 17 yrs ago. Crops grown are maize & green peas	100
Mwadule	Mwagwede	Farm cleared 17 yrs ago. Crops grown are maize & green peas	100
Lomitir	Lokichogio	Farm cleared 18 yrs ago. Crops grown are maize & green peas	100
M. Mtima	Marungu	Farm cleared 17 yrs ago. Crops grown are maize & green peas	100

Table 4. List of soil samples in the reference region.

The location of all the soil samples taken is shown below in a map of Rukinga Sanctuary and the immediately surrounding reference area.

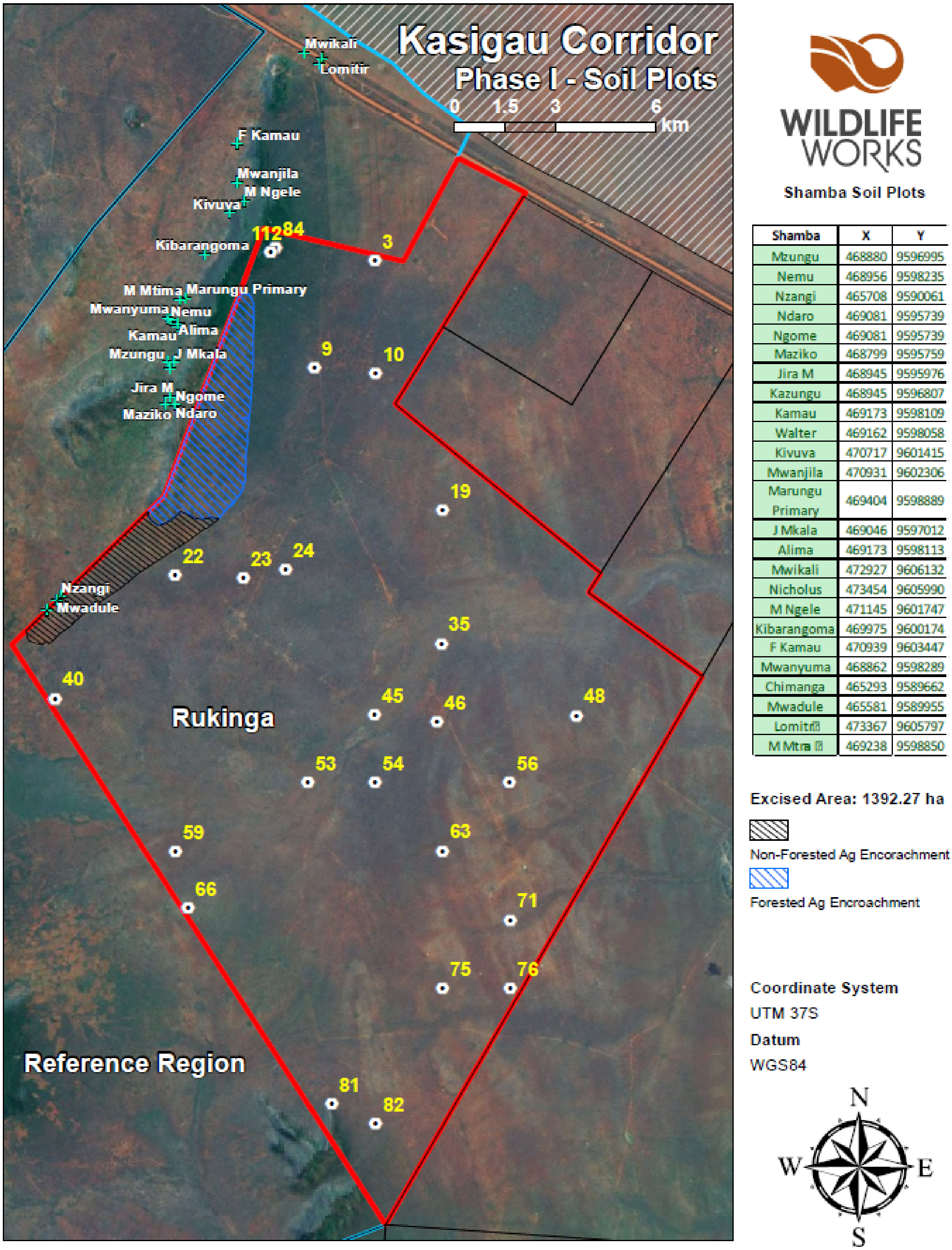


Figure 9. Soil samples in Rukinga and shambas in the reference region

For each plot location, soil was sampled to a consistent depth of 1m. We selected this depth due to the results of a pilot study using a few test pits. Analysis showed that soil carbon loss was still significant down to 1m. Farmers typically disturb the top 30cms with their ploughs, or with any farming practices they might use to improve or deteriorate soil condition, but we had surmised that the deep root systems of the dryland forest would lead to high soil carbon at lower depths over time, and we thus chose to sample to a 1m depth.

Each sample was performed in two "lifts", the first representing the top 30cm (Top Soil), the second from 31-100cm (Sub Soil), by digging a 1m square pit and thoroughly mixing the soil removed from the pit in each "lift" before extracting a sample in a bag for sending of to the independent Soil Laboratory in Nairobi. Wildlife Works has been using the same soil sampling laboratory - in fact using the same analyst - for several years. The laboratory analyst / manager has agreed to speak with the Validator should they require any/all of the following:

- calibration records
- certification documents
- a description as to how soil carbon is analyzed

All laboratory reports, depicting bulk density and soil carbon, have been provided to the Validator. The process for soil sampling is illustrated in a soil sampling protocol standard operating procedure , which serves as a training guide for the field sampling teams, and has also been provided to the Validator.

The following tables list soil data collected inside the project area and in the immediately surrounding reference area:

Reference area samples

Sample	Farm	Soil Depth	Comments	Bulk Density (g/cm^3)	Carbon (%)
CW019SA0290	Mzungu	Top Soil	Sasenyi - X0468880,Y9596995	1.57	0.64
CW019SA0291	Mzungu	Sub Soil	Sasenyi - X0468880,Y9596995	1.42	0.52
CW019SA0292	Nemu	Top Soil	Marungu-X0468956,Y9598235	1.43	0.80
CW019SA0293	Nemu	Sub Soil	Marungu-X0468956,Y9598235	1.36	0.55
CW019SA0294	Nzangi	Top Soil	Kulikila-X0465708,Y9590061	1.31	1.34
CW019SA0295	Nzangi	Sub Soil	Kulikila-X0465708,Y9590061	1.29	0.64
CW019SA0296	Ndaro	Top Soil	Sasenyi-X0469081,Y9595739	1.53	0.51
CW019SA0297	Ndaro	Sub Soil	Sasenyi-X0469081,Y9595739	1.38	0.17
CW019SA0298	Ngome	Top Soil	Sasenyi-X0469081,Y9595739	1.57	0.32
CW019SA0299	Ngome	Sub Soil	Sasenyi-X0469081,Y9595739	1.36	0.27

CW019SA0300	Maziko	Top Soil	Sasenyi-X0468799,Y9595759	1.45	0.36
CW019SA0301	Maziko	Sub Soil	Sasenyi-X0468799,Y9595759	1.41	0.22
CW019SA0302	Jira M	Top Soil	Sasenyi-X0468945,Y9595976	1.43	0.62
CW019SA0303	Jira M	Sub Soil	Sasenyi-X0468945,Y9595976	1.38	0.19
CW019SA0304	Kazungu	Top Soil	Sasenyi-X0468945,Y9596807	1.43	0.81
CW019SA0305	Kazungu	Sub Soil	Sasenyi-X0468945,Y9596807	1.31	0.62
CW019SA0306	Kamau	Top Soil	Itinyi-X0469173,Y9598109	1.69	0.20
CW019SA0307	Kamau	Sub Soil	Itinyi-X0469173,Y9598109	1.52	0.34
CW019SA0308	Walter	Top Soil	Marungu-X0469162,Y9598058	1.5	0.41
CW019SA0309	Walter	Sub Soil	Marungu-X0469162,Y9598058	1.47	0.37
CW019SA0310	Kivuva	Top Soil	Itinyi-X04770177,Y9601415	1.51	0.40
CW019SA0311	Kivuva	Sub Soil	Itinyi-X04770177,Y9601415	1.37	0.25
CW019SA0312	Mwanjila	Top Soil	Itinyi-X0470931,Y9602306	1.5	0.78
CW019SA0313	Mwanjila	Sub Soil	Itinyi-X0470931,Y9602306	1.43	0.30
CW019SA0314	Marungu Primary	Top Soil	Marungu-X0469404,Y95988891	1.52	0.26
CW019SA0315	Marungu Primary	Sub Soil	Marungu-X0469404,Y95988891	1.42	0.19
CW019SA0316	J Mkala	Top Soil	Sasenyi-X0469046,Y9597012	1.58	0.24
CW019SA0317	J Mkala	Sub Soil	Sasenyi-X0469046,Y9597012	1.46	0.35
CW019SA0318	Alima	Top Soil	Marungu-X0469173,Y9598113	1.48	0.64
CW019SA0319	Alima	Sub Soil	Marungu-X0469173,Y9598113	1.42	0.51
CW019SA0320	Mwikali	Top Soil	Lokichiqio-X0472927,Y9606132	1.53	0.69
CW019SA0321	Mwikali	Sub Soil	Lokichiqio-X0472927,Y9606132	1.39	0.34
CW019SA0322	Nicholus	Top Soil	Lokichiqio-X0473454,Y9605990	1.56	0.50
CW019SA0323	Nicholus	Sub Soil	Lokichiqio-	1.41	0.38

			X0473454,Y9605990		
CW019SA0324	M Ngele	Top Soil	Itinyi-X0471145,Y9601747	1.33	0.47
CW019SA0325	M Ngele	Sub Soil	Itinyi-X0471145,Y9601747	1.57	0.15
CW019SA0326	Kibarangoma	Top Soil	Marungu-X0469975,Y9600174	1.57	0.56
CW019SA0327	Kibarangoma	Sub Soil	Marungu-X0469975,Y9600174	1.5	0.28
CW019SA0328	F Kamau	Top Soil	Itinyi-X0470939,Y9603447	1.59	0.51
CW019SA0329	F Kamau	Sub Soil	Itinyi-X0470939,Y9603447	1.5	0.26
CW019SA0330	Mwanyuma	Top Soil	Marungu-X0468862,Y9598289	1.54	0.42
CW019SA0331	Mwanyuma	Sub Soil	Marungu-X0468862,Y9598289	1.29	0.51
CW019SA0332	Chimanga	Top Soil	Mwaqwede-X0465293,Y9589662	1.56	0.52
CW019SA0333	Chimanga	Sub Soil	Mwaqwede-X0465293,Y9589662	1.38	0.55
CW019SA0334	Mwadule	Top Soil	Mwaqwede-X0465633,Y9589944	1.34	0.91
CW019SA0335	Mwadule	Sub Soil	Mwaqwede-X0465633,Y9589944	1.28	0.76
CW019SA0336	Lomitir	Top Soil	Lokichogio-X0473367,Y9605797	1.51	0.44
CW019SA0337	Lomitir	Sub Soil	Lokichogio-X0473367,Y9605797	1.45	0.35
CW019SA0338	M Mtima	Top Soil	Marungu-X0469238,Y9598850	1.55	0.43
CW019SA0339	M Mtima	Sub Soil	Marungu-X0469238,Y9598850	1.44	0.35

Sample Number	Farm	Field	Comments	Bulk Density	Carbon
CW019SA0239	Rukinga Ranch	Rukinga 75	0-30cm-X0477067, Y9578494	1.38	0.59
CW019SA0240	Rukinga Ranch	Rukinga 75	31-100cm- X0477067, Y9578494	1.21	1.70
CW019SA0241	Rukinga Ranch	Rukinga 53	0-30cm- X473061, Y9584563	1.23	1.47
CW019SA0242	Rukinga Ranch	Rukinga 53	31-100cm- X0473061, Y9584563	1.33	0.74
CW019SA0243	Rukinga Ranch	Rukinga 40	0-30cm- X0465557, Y9587046	1.34	1.09
CW019SA0244	Rukinga Ranch	Rukinga 40	31-100cm- Xx0465557, Y9587046	1.13	1.90
CW019SA0245	Rukinga Ranch	Rukinga 45	0-30cm- X0475045, Y9586570	1.22	1.49
CW019SA0246	Rukinga Ranch	Rukinga 45	31-100cm- X0475045, Y9586570	1.35	0.69
CW019SA0247	Rukinga Ranch	Rukinga 54	0-30cm- X0475063, Y9584564	1.3	0.59
CW019SA0248	Rukinga Ranch	Rukinga 54	31-100cm- X0475063, Y9584564	1.33	0.83
CW019SA0249	Rukinga Ranch	Rukinga 81	0-30cm- X0473772, Y9575089	1.39	0.61
CW019SA0250	Rukinga Ranch	Rukinga 81	31-100cm- X0473772, Y9575089	1.38	1.10
CW019SA0251	Rukinga Ranch	Rukinga 63	0-30cm- X0477066, Y9582559	1.39	0.38
CW019SA0252	Rukinga Ranch	Rukinga 63	31-100cm- X0477066, Y9582559	1.25	0.72
CW019SA0253	Rukinga Ranch	Rukinga 71	0-31cm- X0479067, Y9580518	1.2	0.52
CW019SA0254	Rukinga Ranch	Rukinga 71	31-100cm- X0479067, Y9580518	1.36	0.60
CW019SA0255	Rukinga Ranch	Rukinga 19	0-30cm- X0477062, Y9592623	1.38	0.44
CW019SA0256	Rukinga Ranch	Rukinga 19	31-100cm- X0477062, Y9592623	1.4	0.80
CW019SA0257	Rukinga Ranch	Rukinga 3	0-30cm-X0475059, Y9599984	1.33	0.40
CW019SA0258	Rukinga Ranch	Rukinga 3	31-100cm- X0475059, Y9599984	1.42	0.85
CW019SA0259	Rukinga Ranch	Rukinga 56	0-30cm- X0479048, Y9584582	1.37	0.65
CW019SA0260	Rukinga Ranch	Rukinga 56	31-100cm- X0479048, Y9584582	1.21	1.28
CW019SA0261	Rukinga Ranch	Rukinga 23	0-30cm- X0471146, Y9590615	1.3	0.65
CW019SA0262	Rukinga Ranch	Rukinga 23	31-100cm- X0471146, Y9590615	1.25	1.05
CW019SA0263	Rukinga Ranch	Rukinga 24	0-30cm- X0472402, Y9590858	1.25	0.69
CW019SA0264	Rukinga Ranch	Rukinga 24	31-100cm- X0472402, Y9590858	1.35	0.98
CW019SA0265	Rukinga Ranch	Rukinga 10	0-30cm- X0475077, Y9596669	1.34	0.52
CW019SA0266	Rukinga Ranch	Rukinga 10	31-100cm- X0475077, Y9596669	1.4	0.72
CW019SA0267	Rukinga Ranch	Rukinga 48	0-30cm- X481050, Y9586554	1.31	0.87

CW019SA0268	Rukinga Ranch	Rukinga 48	31-100cm- X481050, Y9586554	1.34	0.65
CW019SA0269	Rukinga Ranch	Rukinga 22	0-30cm- X0469113, Y9590709	1.38	1.13
CW019SA0270	Rukinga Ranch	Rukinga 22	31-100cm- X0469113, Y9590709	1.52	0.55
CW019SA0271	Rukinga Ranch	Rukinga 112	0-30cm- X0471958, Y9600245	1.44	0.35
CW019SA0272	Rukinga Ranch	Rukinga 112	31-100cm- X0471958, Y9600245	1.33	0.78
CW019SA0273	Rukinga Ranch	Rukinga 76	0-30cm- X0479067, Y9578494	1.22	0.54
CW019SA0274	Rukinga Ranch	Rukinga 76	31-100cm- X0479067, Y958494	1.26	1.39
CW019SA0275	Rukinga Ranch	Rukinga 35	0-30cm-X0477031, Y9588676	1.21	1.19
CW019SA0276	Rukinga Ranch	Rukinga 35	31-100cm- X0477031, Y9588576	1.29	1.12
CW019SA0277	Rukinga Ranch	Rukinga 82	0-30cm- X0475085, y9574499	1.34	0.54
CW019SA0278	Rukinga Ranch	Rukinga 82	31-100cm- X0475085, Y9574499	1.45	0.73
CW019SA0279	Rukinga Ranch	Rukinga 66	0-30cm- X0469494, Y9580862	1.3	0.67
CW019SA0280	Rukinga Ranch	Rukinga 66	31-100cm- X0469494, Y9580862	1.59	0.59
CW019SA0281	Rukinga Ranch	Rukinga 59	0-30cm- X046129, Y9582521	1.5	0.48
CW019SA0282	Rukinga Ranch	Rukinga 59	31-100cm- X0469129, Y9582521	1.36	1.07
CW019SA0283	Rukinga Ranch	Rukinga 9	0-30cm- X0473253, Y9596819	1.39	0.62
CW019SA0284	Rukinga Ranch	Rukinga 9	31-100cm- X0473253, Y9596819	1.45	0.47
CW019SA0285	Rukinga Ranch	Rukinga 84	0-30cm- X0472093. Y9600367	1.36	0.44
CW019SA0286	Rukinga Ranch	Rukinga 84	31-100cm- X0472093, Y9600367	1.28	0.81
CW019SA0287	Rukinga Ranch	Rukinga 63	0-30cm- X0476903, Y9586364	1.24	0.51
CW019SA0288	Rukinga Ranch	Rukinga 46	31-100cm- X0476903, Y9586364	1.26	0.98

Description of Soil Types

The dominant soil type within the Project Area is Red Laterite typical of this region of Kenya. There are small bands of black cotton soil that occur randomly within the project area but account for a tiny - and we believe insignificant - element from the standpoint of the Project soil carbon pool. There are also areas within the Project Boundary where Gneiss Islands, or rocky outcrops penetrate the soils to form small rocky hills. These outcrops also represent a tiny and we believe insignificant portion of the land and therefore were ignored from the standpoint of the Project soil carbon pool. A soil classification map was obtained for the whole of Kenya[4] from which the soil classification map for the Reference Area, and the supporting data below, was produced:

[4] Sombroek, W.G., Braun, H.M.H. and van der Pouw, B.J.A. (1982). Exploratory Soil Map and Agro-Climatic Zone Map of Kenya, 1980. Scale: 1:1,000,000. Exploratory Soil Survey Report No. E1. Kenya Soil Survey Ministry of Agriculture - National Agricultural Laboratories, Nairobi, Kenya.

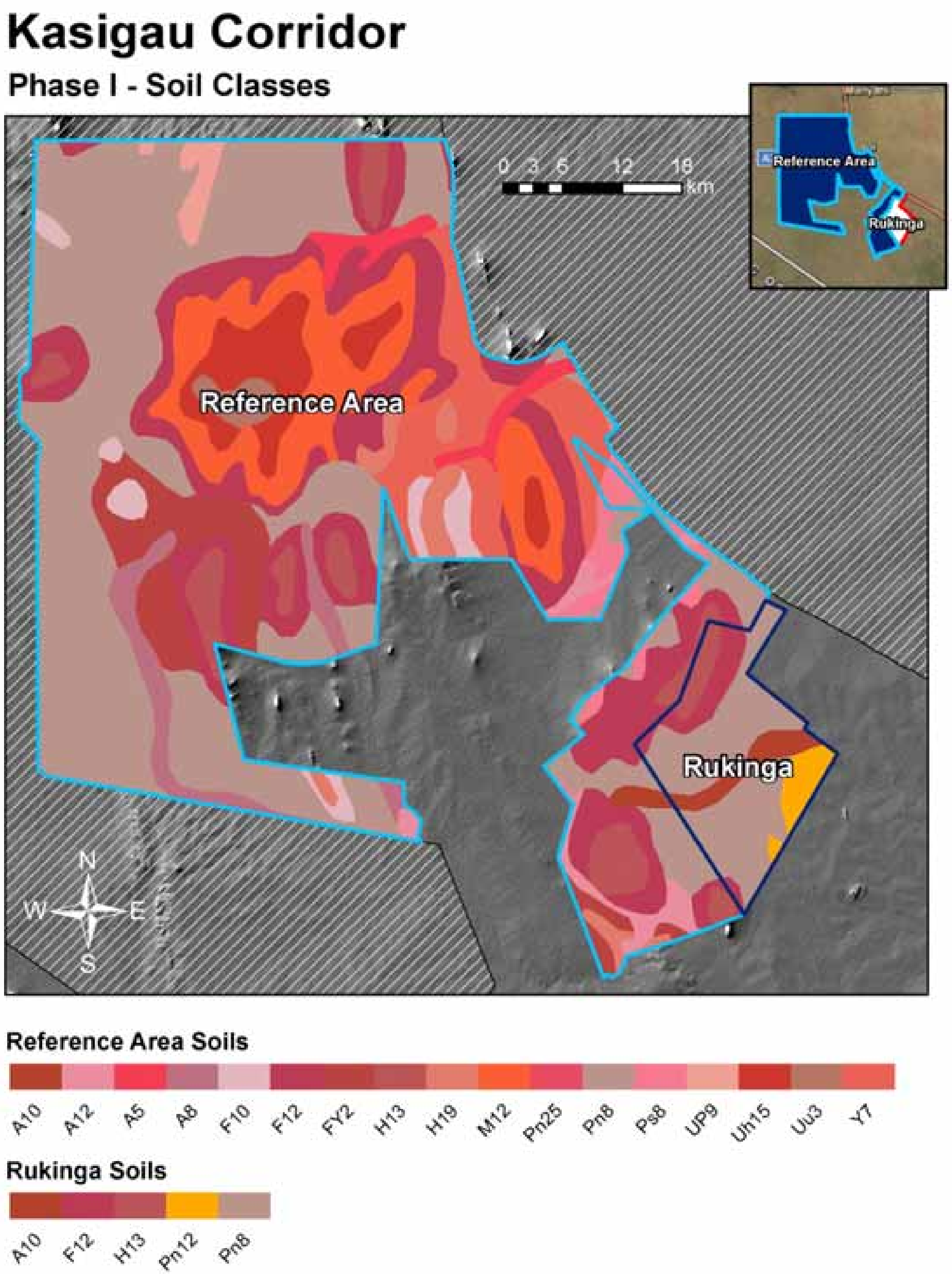


Figure 10. Soil classes in the reference and project areas.

2 Soil Classes:

Reference	Area (ha)	Contrib area (ha)	Soil Unit(s)	Soil Sub Type	Soil Type	contrib (%)	Lithology	Area (ha)	Contrib area (ha)	Rukinga
A10	1,174	1,174	BK	Calcic Cambi	Cambisols	100	I	3,198	3,198	A10
A12	5,722	5,722	VC	Chromic Vert	Vertisols	100	UE			
A5	5,534	5,934	JE	Eutric Fluvisc	Fluvisols	100	UF			
A8	10,101	10,101	JC	Calcaric Fluvi	Fluvisols	100	SC2			
F10	6,848	6,848	LC	Chromic Luvi	Luvisols	100	SO1			
F12	61,367	30,684	FR	Rodic Ferrals	Ferralsols	50	MA2	3,571	1,786	F12
		18,410	QF	Ferralic Aren	Arenosols	30			1,071	
		12,273	LIC	Ferralo-chror	Luvisols	20			714	
FY2	18,239	10,944	LC	Chromic Luvi	Luvisols	60	MA2			
		7,296	KH	Haplic Kastar	Kastanozems	40				
H13	14,083	8,450	RE	Eutric Regosc	Regosols	60	IA1	1,919	1,151	H13
		1,408	DK	Calcic Chernc	Chernozems	10			192	
		1,408	OK	Distric Histos	Histosols	10			192	
		2,817	ROCK	Eutric Regosc	Regosols	20			384	
H19	8,272	6,272	EC	Cambic Rend	Rendzinas	100	SC3			
M12	30,348	21,244	BH	Humic Cambi	Cambisols	70	MA			
		6,070	RD	Dystric Regos	Regosols	20				
		3,035	ROCK	Eutric Regosc	Regosols	10				
Pn25	37	37	DC	Calcic Chernc	Chernozems	100	SO1			
Pn8	122,681	122,681	FR	Rodic Ferrals	Ferralsols	100	MA2	18,522	18,522	Pn8
Ps8	6,036	6,036	LF	Ferric Luvisol	Luvisols	100	MB3			
UP9	2,914	2,914			Other	100				
Uh15	14,188	8,513	AC	Chromic Acri	Acrisols	60	MA2			
		2,838	B	Cambisols	Cambisols	20				
		2,838	F	Ferralsols	Ferralsols	20				
Uu3	2,893	1,447	U	Rankers	Rankers	50	MA			
		1,447	DH	Calcic Chernc	Chernozems	50				
Y7	20,184	20,184	LIC	Ferralo-chror	Luvisols	100				
			FR	Rodic Ferrals	Ferralsols	50	MA2	2,958	1,479	Pn12
			FO	Orthic Ferrali	Ferralsols	50			1,479	
total:		329,021							30,168	

	Reference	Rukinga
Cambisols	7.68%	10.60%
Vertisols	1.74%	0.00%
Fluvisols	4.87%	0.00%
Regosols	6.19%	5.09%
Ferralsols	47.47%	77.12%
Chernozem	0.88%	0.64%
Histosols	0.43%	0.64%
Luvisols	17.11%	2.37%
Kastanozem	2.22%	0.00%
Acrisols	2.59%	0.00%
Rankers	0.44%	0.00%
Rendzinas	1.91%	0.00%
Arenosols	5.60%	3.55%
Other	0.89%	0.00%
total:	100.00%	100.00%

Figure 11. Soil type comparison between Rukinga and the reference area

Minimizing Uncertainty

Wildlife Works has developed a field protocol for sampling soil carbon and that document "Standard Operating Procedure – Soils" was provided to the Validator.

The same team has been collecting soil samples for over one year in the project area and has collected well over 100 soil samples during that time. Our VP African Field Operations, Rob Dodson, trained the teams in the proper procedures and conducts periodic audits. Wildlife Works has the utmost confidence in our soil sampling team, and they have produce consistently accurate results. Ultimately, provided accuracy in field measurements, soil carbon uncertainty lies in the variance between plots and the quality of the soil laboratory used to determine soil organic carbon levels. Wildlife Works has, and will continue to use, Crop Nutritional Services in Nairobi. "Cropnuts" is run by Jeremy Cordingley, who has extensive training and experience in soil science and laboratory procedures. Jeremy conducts periodic calibration exercises with his equipment, and has offered to speak to the Validators should the so desire.

Fitting the Soil Carbon Loss Model

The soil carbon loss model was fit by first estimating the asymptotic proportion of soil carbon loss. Per equation 12 of the MED, the estimated asymptotic proportion is

$$\hat{\ell}_{max} = 1 - \left[\frac{C_{SOIL}^{[0]}}{a_{project}}\right]^{-1} \times \frac{1}{\#(\mathcal{A})} \sum_{i \in \mathcal{A}} y_i$$

$$\hat{\ell}_{max} = 1 - \frac{224.01}{411.53}$$

$$\hat{\ell}_{max} = \mathbf{0.456}$$

where 224.01 is the estimated mean carbon stock (tonnes CO2e/ha) of shambas in the reference area and 411.53 is the same for the project area. The default of 20% was selected for the mean rate of soil carbon loss (based on a conservative value derived from Davidson and Ackerman, 1993). A mean rate of 20% decay is achieved by $\lambda = 0.55$, and the final model is

$$S(t_1, t_2, \lambda, \ell_{max}) = \ell_{max}[G(t_2, \lambda) - G(t_1, \lambda)]$$

$$= \ell_{max}[1 - \exp(-\lambda t_2) - 1 - \exp(-\lambda t_1)]$$

$$\boldsymbol{S(t_1, t_2, \lambda, \ell_{max}) = 0.456\{[1 - \exp(-0.55 t_2)] - [1 - \exp(-0.55 t_1)]\}}$$

Predicting Soil Carbon Loss

The final soil model is displayed by equations 11 and 13 below. These equations show that upon deforestation in the project area, soil carbon gradually decays from the stocks in the deforested areas. Most soil carbon is lost in the 5 years after deforestation and the proportion of soil carbon lost asymptotes at 0.456.

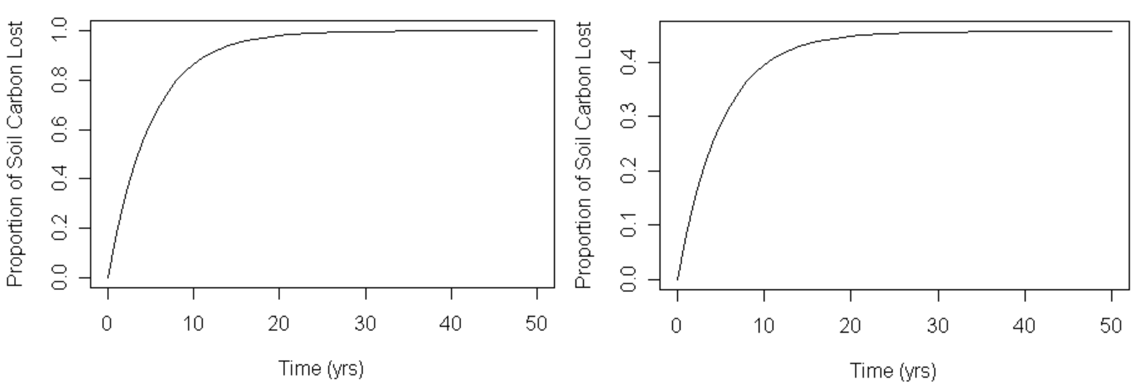


Figure 12. Equation 11 (general soil loss form) and Equation 13 (general carbon loss form applied at Rukinga)

Estimating Uncertainty in the Soil Carbon Loss Model

Per equation 19, the total estimated uncertainty in the soil carbon loss model is

$$U_{SCL} = 1.96 \times \hat{\sigma}_{SCL} \times \left[\sqrt{n_{SCL}} \times \frac{1}{n_{SCL}} \sum_{i \in \mathcal{A}} y_i \right]^{-1}$$

$$U_{SCL} = 1.96 \times 79.48 \times \left[\sqrt{25} \times 224.01 \right]^{-1}$$

$$\boldsymbol{U_{SCL} = 0.1391}$$

where 79.48 is the estimated standard deviation of soil carbon stocks (tonnes CO2e/ha) from the sampled shambas, 25 is the sample size and 224.01 is the estimated sample mean (tonnes CO2e/ha).

Section 6.6 Baseline Scenario for Selected Carbon Pools

Selecting the Proportion of Below Ground Biomass Removed from Large Trees

The Kasigau Corridor is semi-arid, and due to very low average annual rain fall, the Dryland Forest on Rukinga Ranch and in the surrounding reference region is characterized by small to medium sized trees, mostly Acacia ssp and Commiphora ssp. When farmers clear the forest for agriculture, stumps are always removed if the cleared land is to be used for growing crops such as maize. This is because the land is usually tilled by ox-plough and stumps can present an impediment. Commiphora stumps rot away quite quickly after the tree has been cut down but the acacia are often too hard to be cut with an axe or panga, so the farmers fell them by making a fire around the base of the tree. This eventually topples the tree and the fire smolders into the stump and burns it down to below the surface of the soil. Stumps are correspondingly not visible from the cleared farm.

Our site management team and the majority shareholder of Rukinga Ranching Company Ltd, Mike Korchinsky, have been in the area for almost 15 years and have not seen a single stump in a maize farm. As a result we contend that it is common practice in this region to burn the stumps out, and therefore we select 100% as the Proportion of below ground biomass removed from large trees.

Selecting the Proportion of Wood Products

There is no harvest of commercial timber from the project area in the Baseline, nor for wood carving, furniture etc. The only potential harvest of wood products under the baseline would be for building materials for local village huts, e.g. the farmer might cut one or two trees for poles to build his home prior to slash and burn of the remaining biomass for cropland preparation. There are approximately 200-300 trees per hectare in the dryland forest, and a typical small farm or “shamba” is 5 acres or 2.5 hectares, representing 500-750 trees, so the one or two poles taken for hut construction per farm represent a deminimus amount of the above ground biomass of less than .5%. As not all farmers use locally harvested poles for hut construction, and even for those that do, the poles represent a tiny amount of biomass as the huts are very small and grass thatched, we feel it is reasonable to ignore the sequestration of carbon in long lived wood products in the baseline scenario, and therefore suggest the proportion of baseline emissions that are stored in long-lived wood products can be zero.

Figure 13. Local farmers house - Rukinga boundary

Section 6.7 Baseline Reevaluation

This PD was written at the time of initial validation and first monitoring period at the beginning of the project. This section is not yet applicable. Wildlife Works understands that under certain circumstances in the future as specified in VCS 2008a there may be reason to perform a Baseline Reevaluation before the mandatory time frame of 10 years.

Section 7 Additionality

Within the Project Area, none of the proposed Project activities violate any law.

1. Identification of alternative land use scenarios

    a. Continuation of the pre-project land use as private wildlife sanctuary:

    Prior to the implementation of the REDD project on Rukinga, the Project proponents had spent a significant and unsustainable amount of money over the last ten years financing activities to attempt to protect the forest from destruction. Those activities provided no significant sources of income from the land to offset the land protection costs, and therefore this project would eventually have failed financially if carbon funding were not made available.

    b. Uses a in the ten years prior to Project start date:

    Cattle Ranching - When the current majority landowners acquired their interest in Rukinga Sanctuary in 2000, the previous owners were operating a financially unsuccessful cattle ranching operation on the land. The area is too dry with no permanent water for successful cattle ranching, and there was predation by lions on the cattle at a rate that lead to the financial failure of the operation, and eventual sale of the land to the majority shareholder of Wildlife Works.

    Ecotourism - The prior owners also had an ecotourism facility on the Project area, but as evidence that these activities were not financially viable on the land, the slash and burn clearing had reached within 200 meters of the ecotourism facility, causing it to fail and move away.

    c. Slash and Burn Agriculture by subsistence farmers:

    Prior to the Project Proponent taking over management of the land in 2005, local people had begun to clear part of the Project area, and have systematically cleared the dryland forest from a majority of the Reference area in order to provide land for annual crops. This is evidently the most likely Baseline scenario, as it had been carried out routinely throughout the Reference region, in clear violation of land laws.

2. Consistency of credible land uses with enforced mandatory laws and regulations:

    All of the alternative land use scenarios above represent legal land uses, with the exception of slash and burn agriculture, which essentially consists of squatting on privately owned land; illegal under Kenyan law. However, there is overwhelming evidence that this law had been systematically unenforced, as greater than 30% of the area of the administrative unit that encompasses the project area had been deforested in the ten years prior to the Project start date. Thus, all the land uses above are credible.

3. Investment Analysis – Simple Cost Analysis:

    Physical protection of the Project area, and provision of deforestation mitigation activities, such as school building, scholarships, ranger patrols, reforestation of deforested indigenous forests etc. for the community cost the Project Proponent approximately $300-400,000 per year in the years prior to implementation of the VCS AFOLU project. There exists no significant income to offset these costs. In the absence of active protection, both physical and that created by partnering with the communities to create economic alternatives, it is clear the land in the Project area would be cleared aggressively for subsistence agriculture, as that was in fact what was already happening prior to our arrival. Slash and burn agriculture faces no economic barriers, and is therefore once again the most likely Baseline scenario.

4. Common Practice Analysis

   It is common practice to protect wilderness in Africa, and to provide sustainable development support for rural African communities, but that common practice is typically funded by governments or donor agencies, and not by financial return from the project activities. It is NOT common practice for private companies that are not donor funded, such as the Project proponent to protect forested wilderness in Africa for financial return, in the absence of AFOLU revenues. The Project proponent's Rukinga Sanctuary project is the first AFOLU Project Activity of its type in Kenya, and one of the very first in Africa.

Summary of Additionality Test

In summary;

- the Kasigau Corridor REDD project is not the only credible alternative land use consistent with enforced mandatory applicable laws,
- one of those alternative land uses, that of Slash and Burn Agriculture is by far the most likely baseline land use,
- the Kasigau Corridor project passes the Investment Analysis Test as it is not a financially viable land use without the AFOLU VCS project revenues
- and the project activities are NOT common practice.

therefore it is additional under the rules of VT0001 Tool for the Demonstration of Additionality in VCS AFOLU Project Activities.

Section 8 Baseline Emissions

Baseline emissions are calculated as the carbon pools measured in the project area, which are applied to the cumulative deforestation model (determined by sampling historical imagery). The estimated emissions (tonnes CO2e) for each selected carbon pool in the project area for each year since the project start date are shown in the following table. The total estimated baseline emissions for the first monitoring period are 1,450,329 tonnes CO2e. These emissions are based on the selected linear predictor of cumulative deforestation. It should be noted that it is not mandatory to measure ex-ante carbon stocks in the project area according to VCS standards. However, Wildlife Works chose to verify the project at the same time as project validation, and therefore performed a full ex-ante carbon inventory. The spreadsheet 'NER Analysis v4, 01/25/2011' provides complete GHG emission analysis for the entire project crediting period, and was provided to the Validator.

	2005	2006	2007	2008	2009	2010
Linear Model (%)	3.16%	6.33%	9.49%	12.66%	15.82%	18.99%
AGLT	50,776	50,776	50,776	50,776	50,776	50,776
BGLT	20,310	20,310	20,310	20,310	20,310	20,310
AGST	0	0	0	0	0	0
BGST	0	0	0	0	0	0
AGNT	8,556	8,556	8,556	8,556	8,556	8,556
BGNT	3,422	3,422	3,422	3,422	3,422	3,422
SDW	0	0	0	0	0	0
LDW	0	0	0	0	0	0
WP	0	0	0	0	0	0
SOIL	119,709	155,515	166,225	169,429	170,387	170,674
Total Emissions	**202,774**	**238,580**	**249,290**	**252,494**	**253,452**	**253,739**

Table 5. Baseline emissions by carbon pool and year.

8.1 Estimating Emissions from Above Ground Large Tree Biomass

See above summary table.

8.2 Estimating Emissions from Above Ground Small Tree Biomass

See above summary table – no distinction is made in this project between large and small trees; small tree biomass is therefore included in the large tree pool.

8.3 Estimating Emissions from Above Ground Non-Tree Biomass

See above summary table – non-tree includes shrubs and grasses.

8.4 Estimating Emissions from Below Ground Large Tree Biomass

See above summary table.

8.5 Estimating Emissions from Below Ground Small Tree Biomass

See above summary table – no distinction is made in this project between large and small trees; small tree biomass is therefore included in the large tree pool.

8.6 Estimating Emissions from Below Ground Non-Tree Biomass

See above summary table – non-tree includes shrubs and grasses.

8.7 Estimating Emissions from Standing Dead Wood

See above summary table – standing dead wood was included in the large tree numbers. Lying dead wood was conservatively ignored (see below)

8.8 Estimating Emissions from Lying Dead Wood

While there are many lying dead trees in the ecosystem, termites are very active in this ecosystem. To provide a conservative estimate of total aboveground biomass from trees, we have excluded this pool, although in some plots the weight of lying dead wood is significant as a result of elephant damage.

8.9 Estimating Emissions from Soil

See above summary table

8.10 Estimating Emissions from Wood Products

The proportion of long lived wood products defined in section 6.6.10 was zero. Therefore, there are no measured negative emissions (sequestration) from this pool.

Section 9 Project Emissions

9.0 Forest Fires

There have been no significant forest fires in the Project area during the first monitoring period. The Project proponent understands that should significant forest fires occur in the future during the Project crediting period, that we would be required to produce a map of the boundaries of the fire prior to the subsequent monitoring period.

9.1 Emissions from Burning

There have been no events of woody biomass burning within the Project area. Wildlife Works' sustainable charcoal project activity uses fingerling wood, sustainably harvested from indigenous trees outside the Project Area.

Section 10 Leakage

Section 10.1 Leakage Mitigation Strategies

- Providing economic alternatives to the slash and burn agricultural practices that have devastated so much of sub-saharan Africa:

  a) we built a factory on the edge of our project area where we train the local women how to sew. We have employed many local people over the years, producing organic cotton fashion which we sell locally and internationally. A pact with the community exists: if they value the jobs, they agree to stop clearing the forest and damaging biodiversity, or we will not be able to sell products, and they will lose their jobs. Our factory uses a small amount of electricity generated from the National Grid, which in Kenya is 40% hydroelectric. We believe the emissions created by this power use are more than offset by the reduction in emissions gained from our greenhouse and tree nurseries and replanting schemes discussed below.

  b) we established an organic greenhouse and nursery program to grow a variety of trees, providing fuelwood, cash crops and medicinal/agroforestry species to the community. Increasing agricultural productivity on existing farmland is viewed as the best way to stop additional conversion. We plan to expand this activity to sponsor nurseries in each of the main villages surrounding our project upon receipt of carbon revenue from this project. We havfe already initiated a reforestation activity with native hardwoods grown in our nursery, and outplanted into previously deforested areas on community lands. We are claiming no additional carbon emissions credits for this activity; it is simply an element of our leakage mitigation strategy.

  c) we have been working with the Kenyan Agricultural Research Institute (KARI) to explore the potential of growing jojoba as a dryland cash crop that can withstand drought and poor agricultural practices and still generate a cash crop on a high value per hectare basis, again to improve food security by increasing agricultural productivity on existing ag lands to reduce conversion pressure. We have completed a two year study and are ready to roll out a farmer outreach model.

- Providing planned Farm land

  The local population's need for additional farm land was addressed by the establishment of a land cooperative on 5000 acres of what was still at that time Rukinga Ranch. This Sasenyi Valley land cooperative on land that had been cleared of forest prior to our arrival gave the community area to expand into without needing to clear more forest. They were able to receive legal title for their farms, a first in this area of Kenya. This program has been fully implemented.

- Expansion of our ranger patrols and implementation of community ranger groups to patrol the leakage area

  Unlike most REDD projects, Wildlife Works directly employs its own rangers to protect the forest from illegal incursion, deforestation and even damage to biodiversity. We have a 10 year track record of physically protecting the land from all potential deforestation agents. Our success, where many other projects have failed in this regard, is due to our providing economic alternatives to the community, preventing the requirement to clear more forest for agriculture. This has created a partnering relationship with the community, and increased the effectiveness of our rangers, even though they are not armed. They can draw heavily on support from the influential members of the local community. We believe that our presence in daily protection of the forest has significantly reduced, if not completely eliminated, the threat of immigrant populations from non forested areas of the Coast province in Kenya coming to the area in search of unprotected land for slash and burn agriculture. Therefore, in addition to stopping the specific deforestation of the project area, the project activities have reduced the population pressure that would have been seen under the baseline / without project scenario. We have more than doubled our ranger force since the beginning of the REDD project.

- Phase II:

  We plan to implement a second phase of the Kasigau Corridor project, in which we will extend our monitoring and protection to ALL of the remaining dryland forest in this region of Kenya, nearly 500,000 acres, to prevent slash and burn agriculture from moving into any of the adjacent forested lands privately owned by members of the community. We have entered into Carbon Rights Agreements / Easements with the neighboring community land owners to execute this component of the strategy, and have already begun protection of their forests with additional rangers and ranger posts. This program has been fully implemented.

- Fuelwood and sustainable charcoal:

  a) We are establishing 5 organic greenhouse extensions within the Project area to produce fuelwood and other agriforestry species for the local community. We aim to assist them in becoming self-sufficient in fuelwood, without having to extract from any of the Project area or other private dryland forest in the region. This activity is currently being established.

  b) A study carried out by Matthew Owen of the University of North Carolina, “Adaptation to Rural Domestic Fuelwood Scarcity in Embu District, Kenya" showed that when fuelwood is an abundant and free resource, it is used at a level far above necessity, and that when it becomes a constrained resource, consumption can drop by as much as 50% without loss of function to the community. This indicates that the amount of wood being harvested for fuelwood from Rukinga can probably be replaced with far less fuelwood grown in woodlots and community farms.

  c) We have been developing a sustainable charcoal alternative to destructive bush charcoal. We currently employ 12 people in the production of charcoal briquettes from fingerling charcoal harvested from indigenous trees and shrubs, and using a cassava flour binder. We believe we can substitute this carbon neutral charcoal into the local economy with minimal subsidy to provide for the community’s fuel needs, with zero leakage. Production testing has been completed for this activity. Sales tests are ongoing.

  d) Our baseline analysis shows that the without project scenario would have seen the Project area eventually cleared completely for farm land. As such, wood resources the community may have extracted from the Project area would have been transient at best.

Section 10.2 Delineation of the Leakage Area

The leakage area, depicted in the map in section 10.3.2 below, was selected from forested areas as close as possible to the Project area which are subject to the same agents and drivers of deforestation as the project area, and that exhibit similar geographic characteristics (such as elevation, proximity to villages or towns, forest type etc.) The MED requires that the leakage area be forested at the project start date. Tsavo National Parks were excluded, as they fall under a different legal protection status. The most obvious area with a high potential for leakage are the group-owned ranches with identical land ownership system to the Project area. They are immediately adjacent to the project area, but were not selected for inclusion in the leakage area, as they are now being protected by Wildlife Works under Phase II of the Kasigau Corridor REDD. The second criteria was accessibility by the agents of deforestation, as some of the remaining forested land in the reference region is very remote and unlikely to suffer leakage. Soil fertility or rainfall were not considered, as they are fairly constant across the Reference area.

Section 10.3 The Leakage Model

Sampling Deforestation and Degradation to Build the Leakage Model

Per the requirements of the MED, the leakage area was sampled prior to the first monitoring period, to estimate the lag period for the leakage model.

Equation [10], dependent on the standard deviation of the forested state observations, was used to calculate the number of sample point locations required, and yielded a result of 38 locations within the leakage area

$$\hat{m}_{LE} \geq \left(\frac{\hat{\sigma}_{DF}1.96}{0.1}\right)^2$$

$$\hat{m}_{LE} \geq \left(\frac{(.3126)(1.96)}{0.1}\right)^2$$

$$\hat{m}_{LE} \geq \mathbf{38}$$

38 equal sized 2 hectare square plots were then randomly located within the Leakage area, and coordinates of the NE corner of each Leakage plot was given to the leakage plot sampling team. A number of extra plots were generated to allow for inaccessibility in the field of certain plots. The rationale behind the extra plots is that in this ecosystem, inaccessibility is limited to thick bush, where vehicles cannot approach to a safe distance for the sampling teams to reach the location on foot to perform the sampling exercise. At Wildlife Works, safety for our employees is of primary concern, and if sampling teams walk too far in thick bush, they run the risk of encountering elephant or buffalo. As inaccessibility always corresponds with thick primary vegetation, it can be assumed that the exclusion of the inaccessible points is a conservative measure of leakage, as they would undoubtedly have a factor of 0. Note that the field leakage sampling done by Wildlife Works personnel was done prior to the MED being finally validated, and at the time the Leakage Plot samples were taken, a 0% leakage factor was not encountered; the lowest factor was 0-20%. Again, we believe this leads to a conservative measure of average leakage factor, and a conservative leakage lag period. Maps of the leakage area, showing the permanent Leakage plots are shown below.

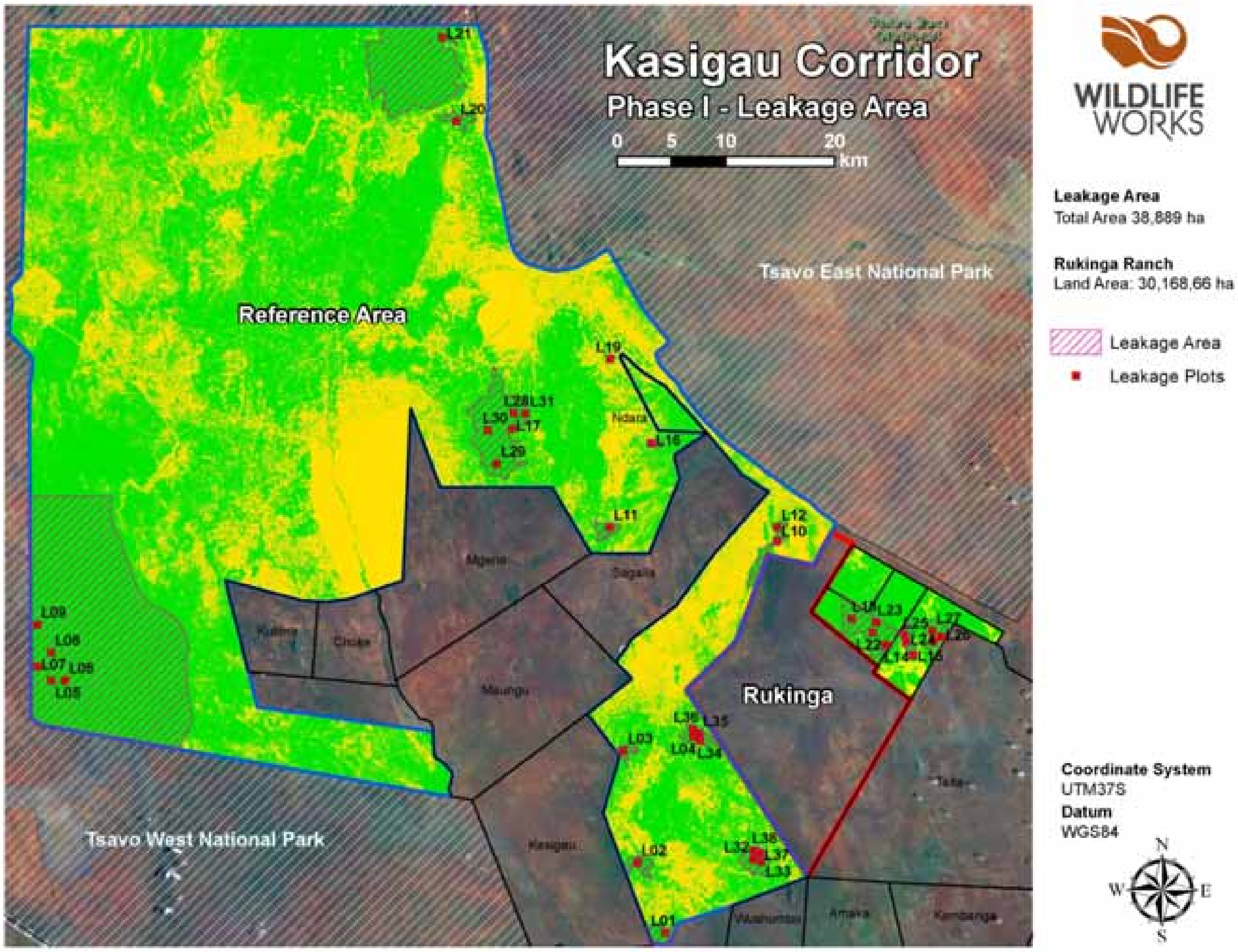
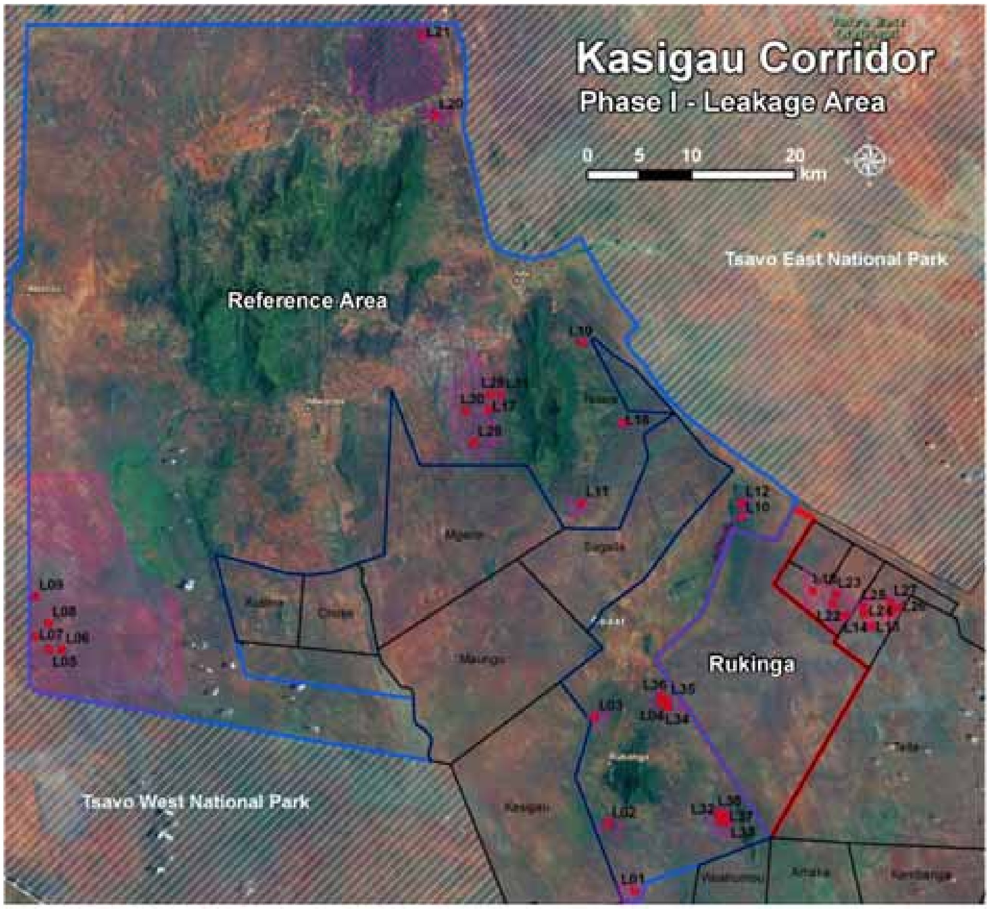


Figure 14. Leakage plots overlaid on a forest/non-forest map



Leakage Plot Coordinates

Plots	Point X	Point Y
L01	462290.6	9566407.4
L02	459730.6	9572807.4
L03	458450.6	9583047.4
L04	464850.6	9584327.4
L05	405970.6	9589447.4
L06	407250.6	9589447.4
L07	404690.6	9590727.4
L08	405970.6	9592007.4
L09	404690.6	9594567.4
L10	472530.6	9602247.4
L11	457170.6	9603527.4
L12	472530.6	9603527.4
L13	486859.7	9593065.8
L14	482453.6	9592769.8
L15	485034.1	9591786.5
L16	461010.6	9611207.4
L17	448210.6	9612487.4
L18	479344.8	9595139.2
L19	457170.6	9618887.4
L20	443090.6	9640647.4
L21	441810.6	9648327.4
L22	481307.2	9593867.3
L23	481598.5	9594812.8
L24	484344.9	9592969.2
L25	484231.9	9593633.8
L26	487579.8	9593521.9
L27	486771.0	9594064.8
L28	448401.6	9613947.0
L29	446810.4	9609307.4
L30	446012.1	9612379.7
L31	449457.4	9613888.1
L32	470359.3	9573125.2
L33	471130.8	9572882.0
L34	465491.1	9583961.7
L35	465407.2	9584618.5
L36	464821.6	9585006.8
L37	470989.6	9573694.4
L38	470380.8	9573910.4

Figure 15. Leakage plots and corresponding coordinates

The Leakage Sampling team performed estimates of deforestation and degradation according to 'Standard Operating Procedure Leakage', a copy of which was provided for the Validator. They made no permanent marking of plots, and will simply return to the same NE corner coordinate each monitoring period, and repeat the procedure in each subsequent period. Sampling results are summarized in the table below. Leakage sampling was lead by Operations Manager Jamie Hendriksen, and supervised by Rob Dodson, VP African Field Operations, our two most experienced staff members, as this was our first ever leakage area plot sampling effort. They will now be responsible for training other members of our field plot sampling team to perform this activity each required monitoring period, and for performing QA on a selected sample of the Leakage Plots each monitoring period to ensure consistency in their evaluation of degradation for this first monitoring period.

Leakage Plot Coordinates				
Plots	**Point X**	**Point Y**	**Degradation % Dec, 2010**	**value**
L01	462290.6	9566407.4	0-20	1
L02	459730.6	9572807.4	41-60	3
L03	458450.6	9583047.4	21-40	2
L04	464850.6	9584327.4	0	0
L05	405970.6	9589447.4	0-20	1
L06	407250.6	9589447.4	0-20	1
L07	404690.6	9590727.4	0-20	1
L08	405970.6	9592007.4	21-40	2
L09	404690.6	9594567.4	21-40	2
L10	472530.6	9602247.4	0-20	1
L11	457170.6	9603527.4	61-80	4
L12	472530.6	9603527.4	0-20	1
L13	486859.7	9593065.8	0-20	1
L14	482453.6	9592769.8	21-40	2
L15	485034.1	9591786.5	41-60	3
L16	461010.6	9611207.4	41-60	3
L17	448210.6	9612487.4	21-40	2
L18	479344.8	9595139.2	20-40	2
L19	457170.6	9618887.4	0-20	1
L20	443090.6	9640647.4	0	0
L21	441810.6	9648327.4	0	0
L22	481307.2	9593867.3	0-20	1
L23	481598.5	9594812.8	21-40	2
L24	484344.9	9592969.2	0-20	1
L25	484231.9	9593633.8	21-40	2
L26	487579.8	9593521.9	0-20	1
L27	486771.0	9594064.8	0-20	1
L28	448401.6	9613947.0	61-80	4
L29	446810.4	9609307.4	61-80	4
L30	446012.1	9612379.7	41-60	3
L31	449457.4	9613888.1	21-40	2
L32	470359.3	9573125.2	61-80	4
L33	471130.8	9572882.0	41-60	3
L34	465491.1	9583961.7	21-40	2
L35	465407.2	9584618.5	21-40	2
L36	464821.6	9585006.8	0-20	1
L37	470989.6	9573694.4	41-60	3
L38	470380.8	9573910.4	21-40	2

Leakage Area Polygons	
perimeter (m)	**area (m^2)**
10394.51227	2622654.416
2046.461795	221164.6479
4547.836483	522040.3724
7837.745452	2487550.251
17675.17905	3713644.272
8279.920827	1626170.571
10307.97126	3942253.055
9726.982167	2795240.98
18021.21369	13467407.77
7857.944337	2567239.308
8822.613995	4934017.422
68042.63615	255753249.1
32587.05298	29928113.67
38283.42394	56169524.54
8619.378165	3420972.65
9174.509654	4721327.05
Total Leakage area (ha)	**38,889**
Rukinga forested area (ha)	**27,844**

deg	value
0	0
0-20	1
21-40	2
41-60	3
61-80	4
81-100	5

Table 6. Leakage plot evaluation results

Fitting the Leakage Model

The leakage model was fit by first computing the proportion of cumulative deforestation and degradation in the leakage area as the average of observed factors. This proportion $\hat{d}_0$ is 0.3789, applied to equation 9 to compute the lag period as

$$\hat{\delta}_{LE} = \log(\hat{d}_t) + \log(1 - \hat{d}_t) + \hat{\alpha} + \hat{\boldsymbol{\theta}}\boldsymbol{x}^T$$

$$\hat{\delta}_{LE} = \log(0.3737) + \log(1 - 0.3737) + 1.08804558$$

$$\hat{\delta}_{LE} = \mathbf{0.4498}$$

And the final leakage model per equation 8 is then

$$F_{LE}(t, \hat{\eta}, \hat{\delta}_{LE}) = \frac{1}{1 + \exp(-(-1.08804558 + 0.0003792x) - 0.4498)}$$

The following is a plot of the leakage model for the leakage area compared to the cumulative deforestation model.

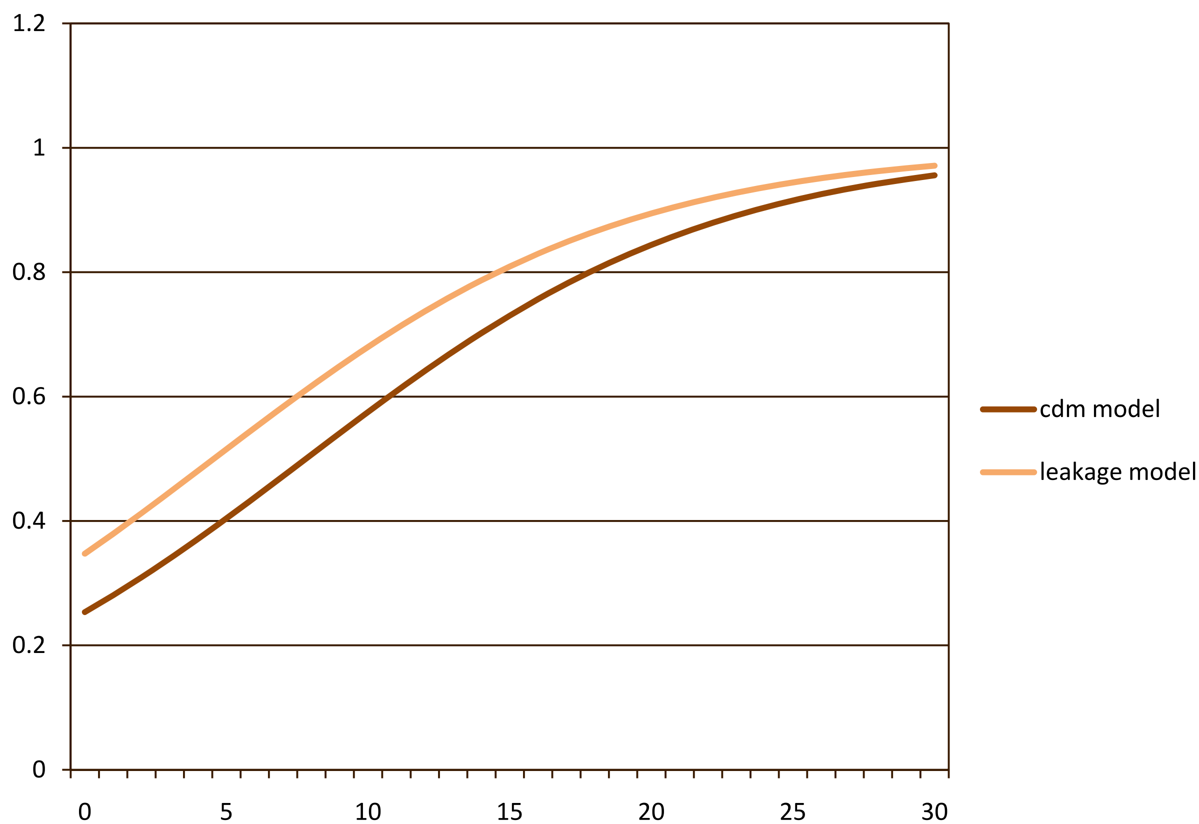


Figure 16. Plot of the leakage model compared to the cumulative deforestation model over time (years).

Section 10.4 Estimating the Leakage Factor and Emissions from Leakage

The estimated cumulative degradation and deforestation predicted by the leakage model is 0.343 which necessarily matches that observed in the leakage area for the first monitoring period. Since this is the first monitoring period and the leakage model was parameterized after the project start date, the leakage factor is zero. Likewise, for this monitoring period, the estimated emissions from leakage are zero.

During subsequent monitoring periods, the Leakage Plot Sampling teams will revisit the 38 two-square hectare plots and perform the same SOP to determine the Leakage Factor evident at that time, and that will be used to determine whether or not Leakage has occurred during that monitoring period, per the requirements of the MED.Leakage measured for each monitoring period will be applied to net emission reduction figures for that same period (i.e. adjustment for leakage is applied at the point of each verification event following the first, which is used to only determine the leakage lag factor).

Section 11 Quantification of NERs

Net Emissions Reductions (NERs) to date are quantified from the following components (tonnes CO2e) with 290,066 and 1,160,263 tonnes CO2e to buffer pool and issuance, respectively.

Component	Value
Estimated Baseline Emissions	1,450,329
Uncertainty Deduction	0
Project Emissions	0
Emissions from Leakage	0
Gross Total NERs	1,450,329
NERs to Buffer Pool (20%)	290,066
Net Total NERs	**1,160,263**

Table 7. Components of NER calculations, allocation to buffer pool and total NERs to date.

Section 11.1 Determining Deductions for Uncertainty

Given the calculated, weighted quadratic average using equation 36, no confidence deduction is applied, as total uncertainty falls below 0.15. The weighted quadratic average of quantified uncertainty, per equation 36, is

$$U^{[m]} = \sqrt{\left[C_{TOTAL}^{[1]} U_{DF}^2 + C_{TOTAL}^{[1]} \left(U_{TOTAL}^{[1]}\right)^2 + C_{SOIL}^{[1]} U_{SCL}^2\right] \left(2C_{TOTAL}^{[1]} + C_{SOIL}^{[1]}\right)^{-1}}$$

$$U^{[m]} = \sqrt{\frac{[2624568.9 \cdot 0.05941298^2 + 2624568.9 \cdot 0.0851^2 + 11842347.78 \cdot 0.1391^2]}{(2 \cdot 2624568.9) + 11842347.78}}$$

$$\boldsymbol{U^{[m]} = 0.124}$$

where the inputs are presented below.

Variable	Description	Value
$\boldsymbol{C_{TOTAL}^{[1]}}$	Total forest carbon stock at monitoring period [1]	2,624,568.9
$\boldsymbol{C_{SOIL}^{[1]}}$	Soil carbon stock within the project area at monitoring period [1]	1,1842,347.8
$\boldsymbol{U_{DF}}$	Estimated uncertainty in the CDM at monitoring period [1]	0.05941298
$\boldsymbol{U_{TOTAL}^{[1]}}$	Estimated uncertainty of total carbon stocks at monitoring period [1]	0.0851
$\boldsymbol{U_{SCL}}$	Estimated uncertainty in the soil carbon model at monitoring period [1]	0.1391

Table 8. Variables and values used to calculate the weighted quadratic average of uncertainty.

Section 11.3 Ex-Ante Estimation of NERs

Baseline emissions were projected over the life of the project to estimate net carbon benefit. An ex-ante estimate of the total *gross* NERs generated by the project is 7,542,945 tonnes CO2e.

The project activities described in detail in Section 10 Leakage and Section 6.1 Baseline Scenario Overview, were specifically designed to mitigate deforestation and human-wildlife conflict, and therefore by default serve to mitigate leakage and uphold project permanence. Wildlife Works is of the opinion that the project will suffer little to no leakage, due to our exceptional attention to leakage mitigation. However, in the absence of precedent for estimating ex-ante leakage emissions, Wildlife Works chose to use a conservative value of 20%. Applying this factor to gross NERs yields an estimate of total net NERs over the project lifetime of:

$$\mathrm{Ex-Ante\ NERs} = 7{,}542{,}945 - (7{,}542{,}945 * 0.20)$$

$$\mathrm{Ex-Ante\ NERs} = \mathbf{6,034,356}$$

This analysis is available as a spreadsheet and accounts for an estimate of 20% leakage from 2011 onwards, according to the MED. It includes project emissions and a total confidence deduction. A chart of the projected NERs over the life of the project is presented below. Actual leakage values will be measured empirically at each monitoring period, and will vary from these conservative ex-ante estimates.

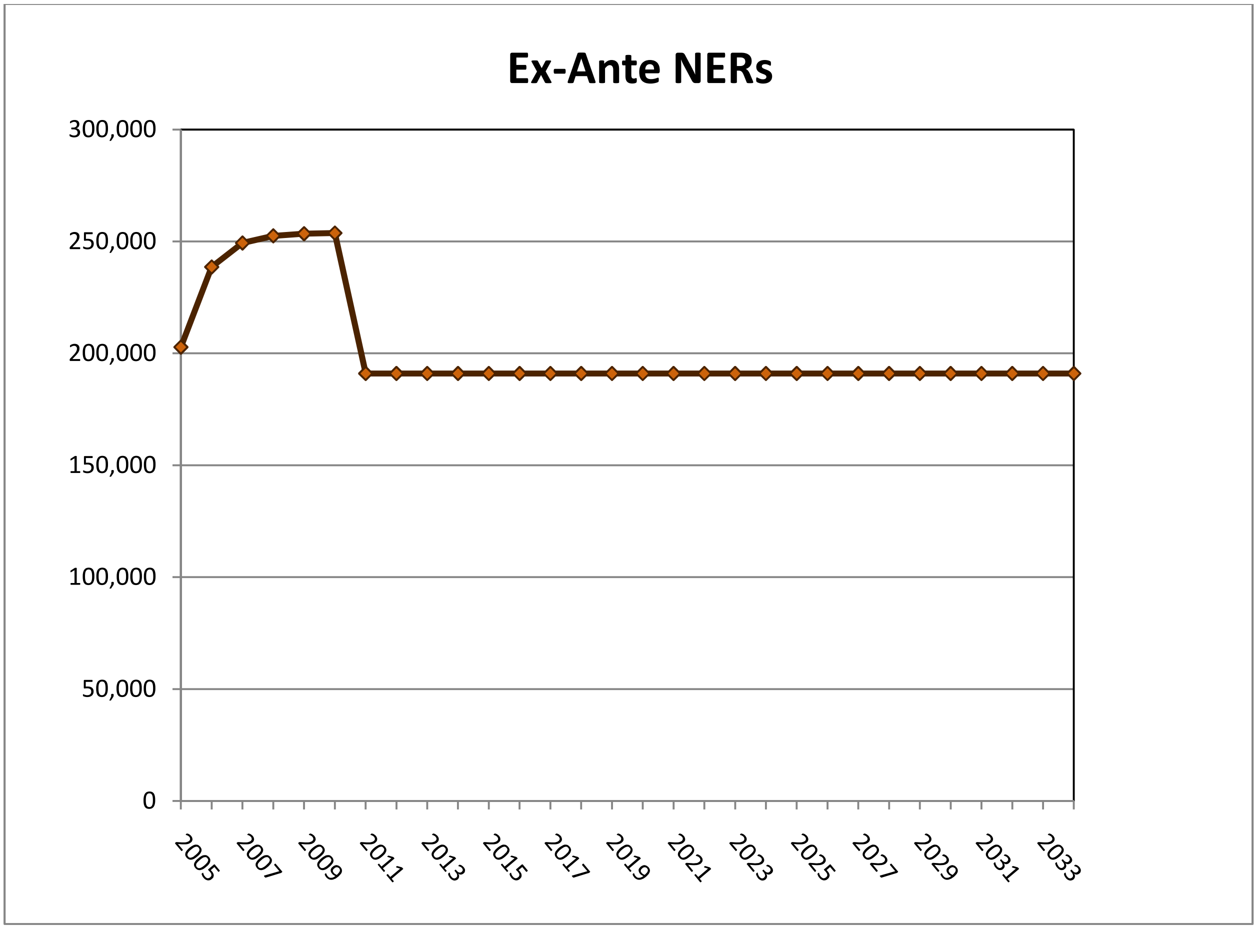


Figure 17. Ex-Ante Calculation of NERs for the Project lifetime.

Section 13 Monitoring

Please also refer to the document entitled 'Section 13 Monitoring' (01/14/2011)

Section 13.14 Monitoring of Carbon Stocks in the Project Area

Summary of sampling procedures

(See Standard Operating Procedure Biomass, 1/10/2011 and Standard Operating Procedure Soils, 1/1/2011 provided to the Validator for detailed procedures)

Rukinga Sanctuary is 30,169 hectares of varying density Acacia-Commiphora woodland/forest located in the SE of Kenya. Altitudes on the sanctuary range from approximately 450m to 1,000m and the ecosystem encompasses montane forest on the slopes of the higher elevations, through Acacia-Commiphora dryland forest at mid elevations and down to grassland dominated savannah at the lowest elevations. In order to most accurately estimate the biomass of the sanctuary, with reasonable time and expense, we divided the sanctuary into three major strata based on ecosystem type, as there is a high perceived variation in average biomass across the three strata pools, with larger trees in high density in the montane forest strata, medium to large trees and lots of shrubs in the dryland forest strata and scattered trees, very few shrubs and heavy grass cover in the savannah grassland strata. Overall, we used 9 strata, summing to the total land area, to depict landcover in Rukinga.

In order to most accurately estimate biomass in the sanctuary, with reasonable time and expense, we divided the sanctuary into three major ecosystem types, as there is a high perceived variation in average biomass across these pools, with larger trees in high density in the montane forest strata, medium to large trees and lots of shrubs in the dryland forest strata and scattered trees, very few shrubs and heavy grass cover in the savannah grassland areas. We ultimately used 9 strata, summing to the total land area, to depict homogeneous patches of landcover in Rukinga.

It should be noted that our ex-ante monitoring was conducted in February and March 2009, the dry season in this area. We believe this will yield an extremely conservative biomass estimates, as the dominant tree species enter into estervation to preserve moisture. During this season, the trees lose all leaf mass, and the perennial grasses senesce. Wildlife Works executive management supervised the data collection teams at the initial plots, to ensure proper adherence to procedure.

It was determined that a systematic random plot sampling technique would best capture variability in landcover, due to the high degree of perceived variation of type and density of trees and shrubs. A systematic sampling method was used to overlay a 2km x 2km grid over the sanctuary and select sample plot centers at the center point of each square (see figure 18 below). The upper left corner of the grid was randomly positioned within its UTM 1km x 1km grid.

To sample soil, coordinates were provided to the soil plot sampling teams by our GIS team, at random forest plot locations, and they sampled using the method illustrated in the 'Standard Operating Procedure Soils' document provided to the validator. The following is an excerpt from the soil sampling procedure:

Step1 For a plot inside Rukinga, coordinates are provided to the soil plot sampling teams by our GIS team, at random plot locations. The plot teams use their GPS to find the plot center.

Step 2. A one meter square is marked out on the ground, and digging commences.

Step 3. The soil from the top 30cms is piled together and the larger lumps are smashed with the back of a hoe.

Step 4. Whilst the soil is being dug from the sample pit, the tailings are thoroughly mixed so that the various layers are interspersed.

Step 5. The lower layer taken from 31cm-100cm is then piled on the other side of the pit and it too is mixed thoroughly.

Step 6. A sample is then taken from each of the mixed piles, bagged, and sent to the independent testing lab – CROP NUTRITION SERVICES, Nairobi Kenya.

If outside Rukinga, the location and name of the farm and any comments are recorded on the bag and in the sampling notes, and Top Soil(0-30) and Sub Soil(31-100) are recorded for the respective samples. Care should be taken not to include any large rocks or roots or other obvious organic matter in the samples; mineral soil only.

Crop Nutrition Services performs standard bulk density and organic matter analysis of the soil samples and returns the results in excel spreadsheets. The Bulk Density method used by the outside laboratory (Crop Nutrition Services) that performed the soil testing for the PD is an official FAO methodology for measuring Bulk Density of disturbed soil samples. A copy of the FAO approved protocol was provided to the Validators.

Field training

Field training was conducted in February, 2009 for the first tree plot sampling team. This team consisted of;

- a local tree expert who was able to identify all the different acacia and commiphora species encountered in the sampling - Joel Mwandiga
- Mike Korchinsky – CEO Wildlife Works
- Rob Dodson – VP African Field Operations
- Mwololo Muasa a Wildlife Works employee who would be the permanent team lead and data recorder
- Three casuals to assist with carrying equipment into the field and marking the plots
- A driver
- A ranger for security

The Standard Operating Procedures for Biomass and Soils were produced following refinement of the field techniques by this initial team and two other teams have been trained using the procedure and by accompanying our permanent team on their work, to ensure consistency in method.

Documentation of data quality assessment such as the results from a check cruise

Quality Control (QC) for Biomass plots was conducting using the following protocol;

1. An independent QC team not involved in the original plot sampling of each plot is given coordinates for the plot centers for 5% of the original plots. The Independent QC team is also given blank plot data recording sheets, plot radius for each carbon pool, a copy of the plot sampling "Standard Operating Procedure – Biomass", dbh tape, compass and long tape, and sent out to measure the plots as though they were doing it for the first time.

2. The QC team returns to headquarters with data sheets which are given to a third party analyst, who are neither on the original nor the QC plot team, for comparison against the original plot data sheets.

3. Any discrepancies are noted, and when all sheets have been compared, the two plot teams are brought together with the VP African Field Operations or his deputy the Operations Manager to discuss and explain any significant variances (±15%)

4. The monitoring team lead is informed if more than 1 QC plot contains significant discrepancies from the original data sheets, and further QC plots may be required to establish the extent of the quality errors.

5. The Monitoring Team Lead and/or senior carbon staff makes a determination as to whether a plot needs to be revisited:

   For a given plot, the number of trees that fall outside the ±15% threshold for change since original measurement is counted. If greater than 10% of trees in that plot fall outside the threshold, and QC has been performed on the plot within 1 year from original measurement, the plot must be re-measured. If QC has been performed on a plot greater than 1 year after original measurement, the threshold described above shall be relaxed to 15%.

Map Showing Strata Boundaries and Plot Locations

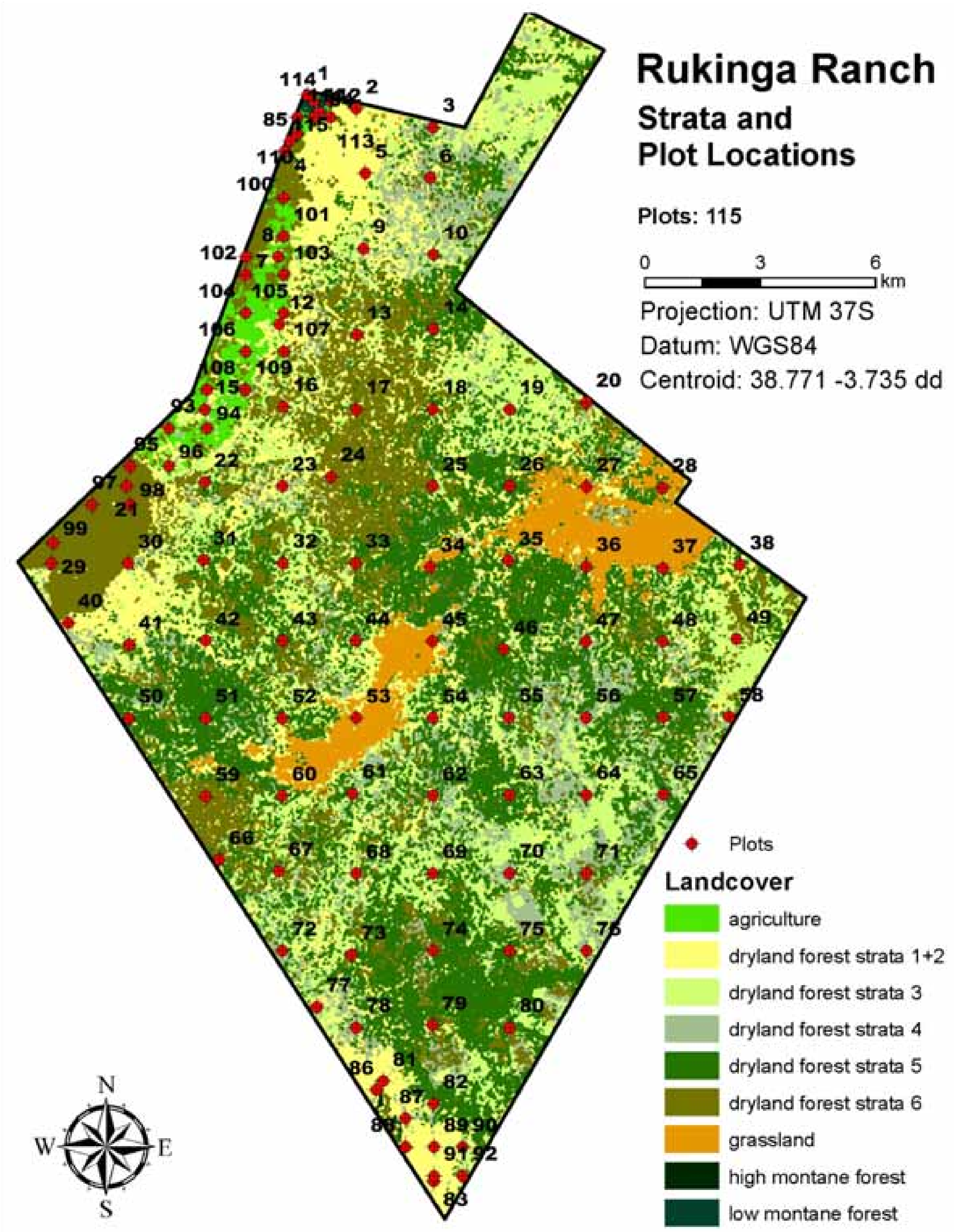


Figure 18. Stratification of the project area and carbon inventory plots

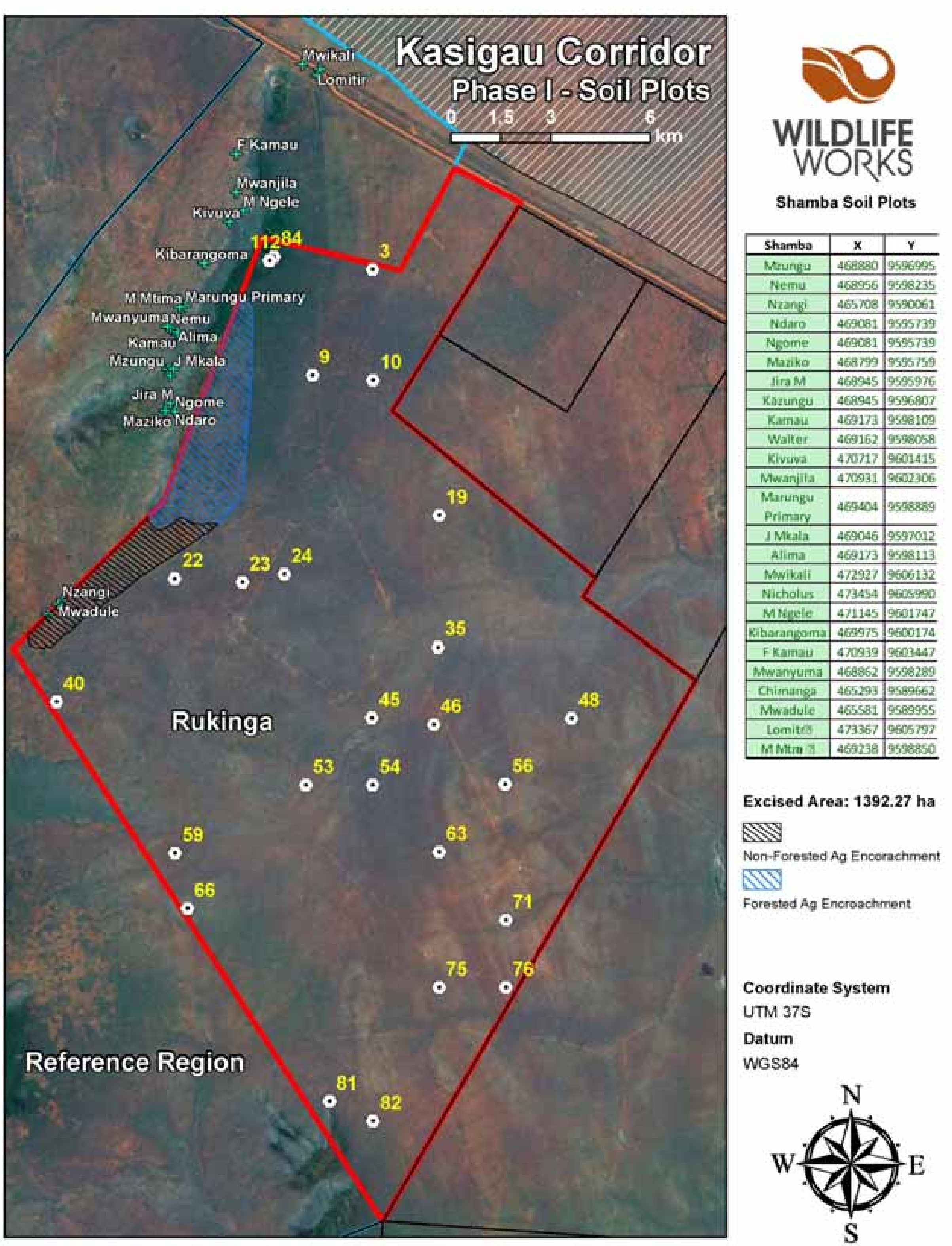


Figure 18. Stratification of the project area and carbon inventory plots

List of Plot Coordinates

A list of plots and corresponding coordinates was provided to Validator, as it was determined to be inappropriately large for this document.

Description of Plot size

The following describe the biomass plots on Rukinga;

- 25m radius circle for large and small trees in Dryland Forest
- 8m radius circle for large and small trees in Montane Forest
- 15m radius circle for shrubs in Dryland forest
- 4m radius circle for shrubs in Montane Forest
- 1m x 1m x 4 square plots at each tree plot location for grasses

Documentation of Allometry

Living Trees

As this is the first project we have encountered calculating aboveground biomass for the species of tree found in Acacia-Commiphora woodland, there exist no allometric equations available for calculating ABB from DBH. As a result we were forced to develop our own method to determine appropriate allometry.

Select trees from dominant species found in repeated plots were harvested from test areas outside of the Project area, and cut into pieces and weighed, for a range of dbh equating to the dominant ranges of dbh found within the project area. This provided a wet weight total aboveground biomass for a range of tree sizes from 10cm to 50cm dbh. A green to dry weight ratio was used to convert to dry weights.

A graph of dbh vs. wet weight was then plotted, as described in the spreadsheet 'AllometricFormulasPower, 01/14/2011 ' provided to the validator.

Shrubs

For dominant shrub species a test plot was created from which two separate methods were produced;

For shrubs/small trees that can become very large, e.g. Cordia, Acacia ruficiens where the shrub is multi stemmed from the ground, with between 2 and 15 stems, average stem diameter was calculated for a range of shrub sizes, by measuring all the stem diameters on the shrub and dividing by number of stems, and then harvesting, bundling and weighing one representative stem of the average diameter from each size class. These classes are small, medium, and large, providing a standard stem weight by shrub size class. The number of stems and size class for each shrub in the sample plot were then recorded, and a shrub total aboveground biomass determined from multiplying the number of stems by the stem weight for that class.

For Grewia, and others where the shrub has many stems, and is non-uniform in distribution of biomass per stem, conservative weight averages were obtained for each size class through destructive harvesting, which was then applied to live sample plots without destructive harvesting requirements. A green to dry weight ratio was then used to convert to dry weights.

Shrub Species	Size Class (S/M/L)	Crown Diameter Range	Crown Height Range	Average Stem Diameter (cm)	Standard Weight/Weight/stem (kg)
Cordia sinensis	S				3
Cordia sinensis	M				15
Cordia sinensis	L				33
Grewia sp.	S	<1m	<1m		1.5
Grewia sp.	M	>1m <2m	>1m <2m		4.3
Grewia sp.	L	>2m	>2m		9
Acacia ruficiens	S			5	23
Acacia ruficiens	M			9	43
Acacia ruficiens	L			12	131

Table 9. List of dominant shrub species and standard weights

Development of Allometry

The allometric equations for the project area, based on the aforementioned, field-collected destructive harvest data, were produced for Wildlife Works by Ryan Anderson of EcoPartners. These equations predict green weight(kg) as a function of DBH(cm), based on the data provided by Wildlife Works in the "AllometricFormulasEXP" spreadsheet. All equations have the form :

$$Biomass = a[DBH]^b$$

The evaluation of goodness of fit is based on a cross-validation statistic, not R^2. We reporting R^2 as well because people are used to seeing it, but we believe the cross validation statistic is a better indicator of fit.

Destructive harvest in a wildlife conservation area is philosophically problematic, especially for trees of large diameter which are many decades if not hundreds of years old. As a result we harvested only a few trees at large diameter. A consequence of this sample size is a tendency for the few large trees we sampled to have an overly large influence on the shape of the regression curve. When only one or two large trees are sampled, and they exhibit biomass much larger than the smaller trees, regression fit by least squares tends to be highly influenced by those trees. This tends to lead to over estimation of biomass for the smaller trees. For model fitting reasons, it is additionally problematic because (a) the uncertainty in measuring the mass of a large tree is larger than a small, easily weighed tree, and (b) the diameter-biomass relationship for large trees is inherently more variable than it is for small trees. The consequence is that the model is heavily influenced by a few points whose response variable values are known with little certainty.

To deal with the highly influential large points that have large variance, we used a weighted regression. A discussion of this technique should be in any regression text, but we used "Applied Regression Including Computing and Graphics" (Cook and Weisber g 1999, Wiley and Sons). The idea is that higher weight in fitting the model should be given to those points that are known with greater certainty. We evaluated weights individually for each model, and only used them in cases where the model residuals demonstrated strong trends in variance. Weights were assumed to be proportional to either 1/BA or $1/BA^2$, where BA is basal area. In one unusual case (*Lannea alata*), the variance appeared higher for small trees than large trees, so we weighted this regression with weights proportional to DBH. We note that the weighting considerably reduced the cross-validated estimate of bias ($\bar{E}$).

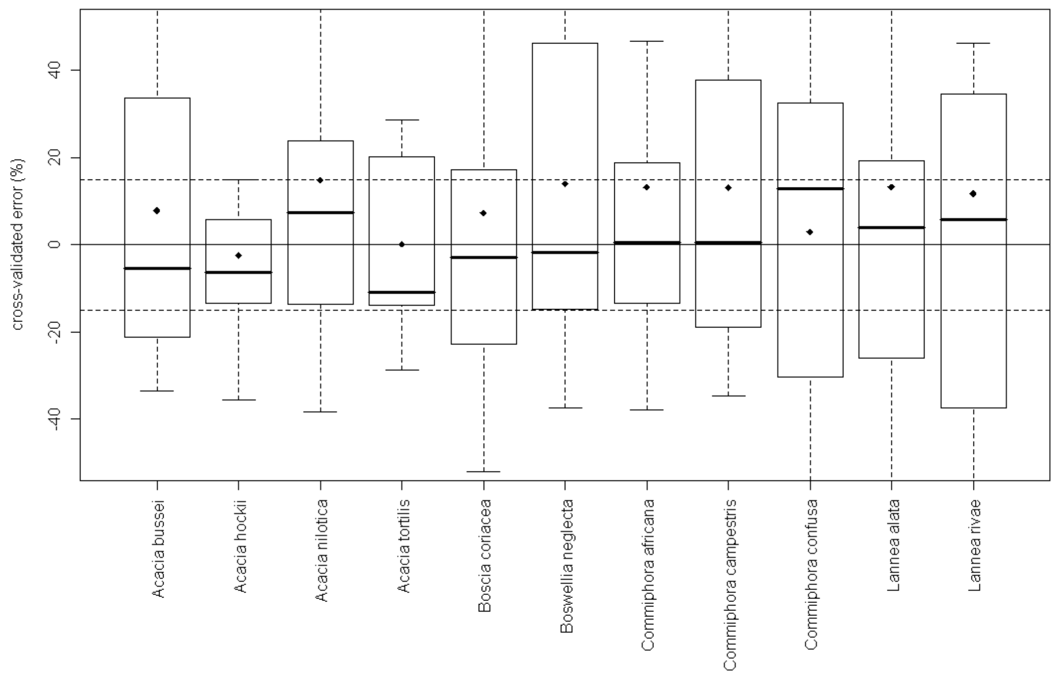
Coefficients for each equation are below:

Species	Weight Type	a	b	N	Max DBH	R^2	$\bar{E}$
Acacia bussei	None	3.3796	1.6416	8	18	.80	7.82
Acacia hockii	None	0.6850	2.1820	17	23	.93	-2.46
Acacia nilotica	None	1.3615	1.9513	10	23	.86	14.83
Acacia tortilis	None	2.6060	1.6175	9	20	.85	0.13
Boscia coriacea	1/BA	0.2033	2.3647	15	34.2	.77	7.30
Boswellia neglecta	$1/BA^2$	1.3025	1.8332	18	37	.40	13.87
Commiphora africana	$1/BA^2$	0.6293	1.9456	17	24	.75	13.17
Commiphora campestris	$1/BA^2$	0.06774	2.8156	17	40	.83	13.072
Commiphora confusa	None	0.1147	2.6634	18	23	.77	2.912
Lannea alata	DBH	0.5603	2.1027	17	17	.85	13.216
Lannea rivae	None	0.1488	2.6421	22	16	.54	11.7
Acacia sp.	None	1.1421	1.9954	44	23	.85	1.99
Boscia sp.	1/BA	0.2033	2.3647	15	34.2	.77	7.30
Boswellia sp.	$1/BA^2$	1.3025	1.8332	18	37	.40	13.87
Commiphora sp.	1/BA	0.10527	2.66544	52	40	.87	11.26
Lannea sp.	None	0.3288	2.3233	39	17	.62	11.18
All species (<35 cm DBH)	None	0.3411	2.3016	166	34.2	.74	9.50

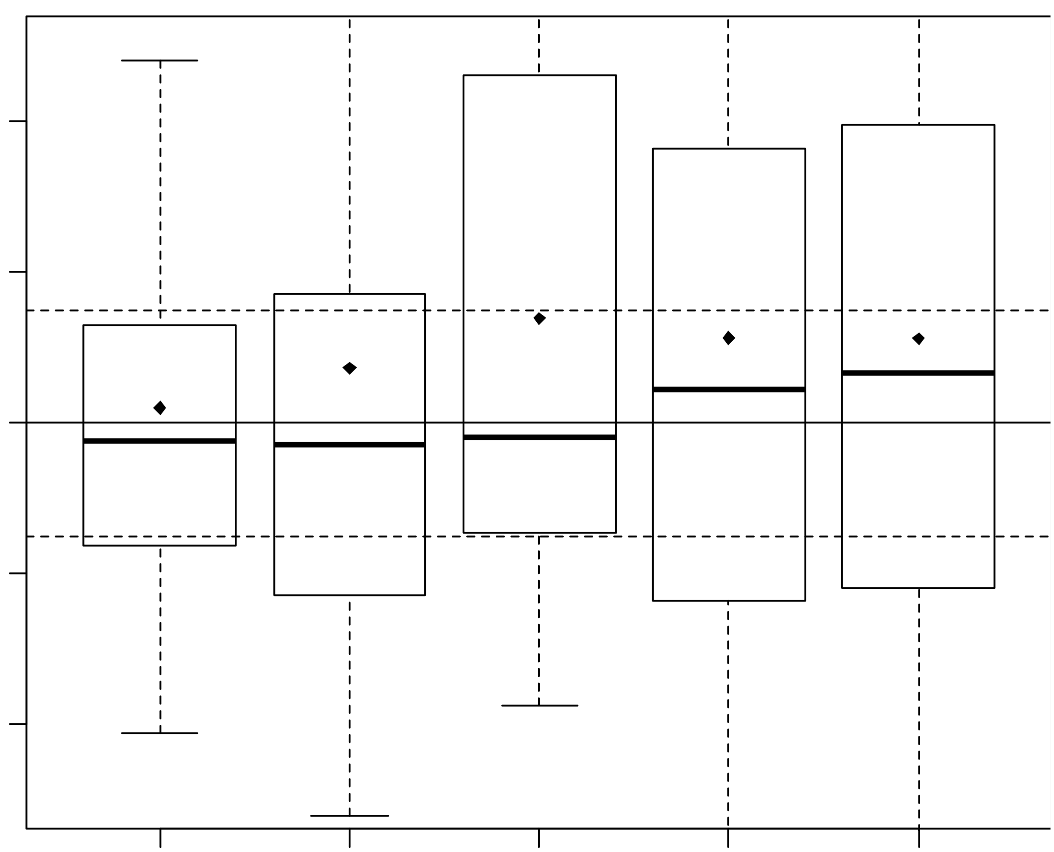
Table 10. Accuracy allometry coefficients for dominant species in Rukinga.

A summary of the cross validation statistics for species appears below. The black diamond is the mean cross validated residual, expressed as a percent. The boxplots show the quartiles (.25, median, .75), and maximum of the cross-validated residuals. The dashed lines indicate +/- 15%, the bias threshold allowed by the MED.

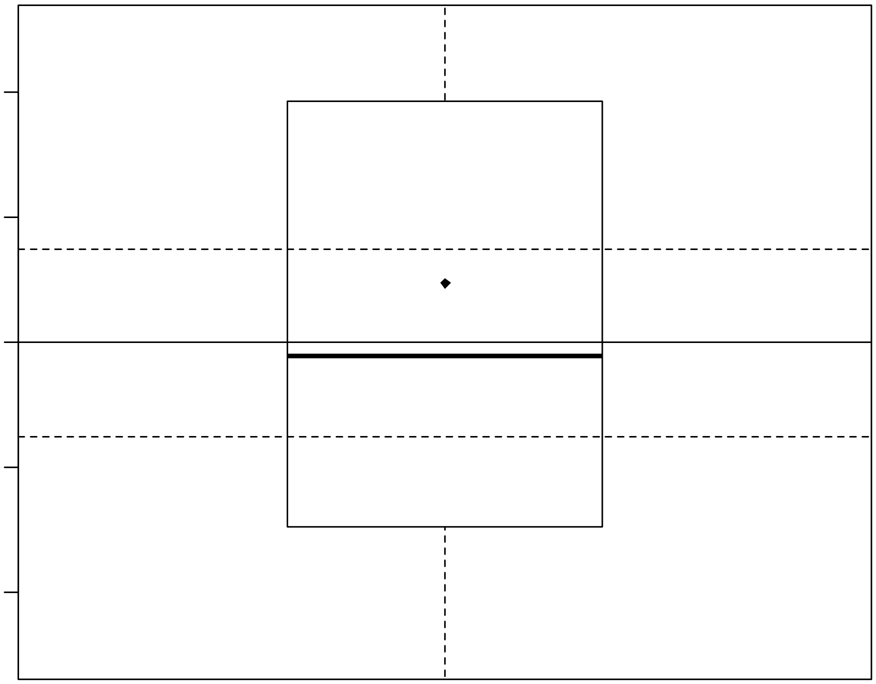
Species level:



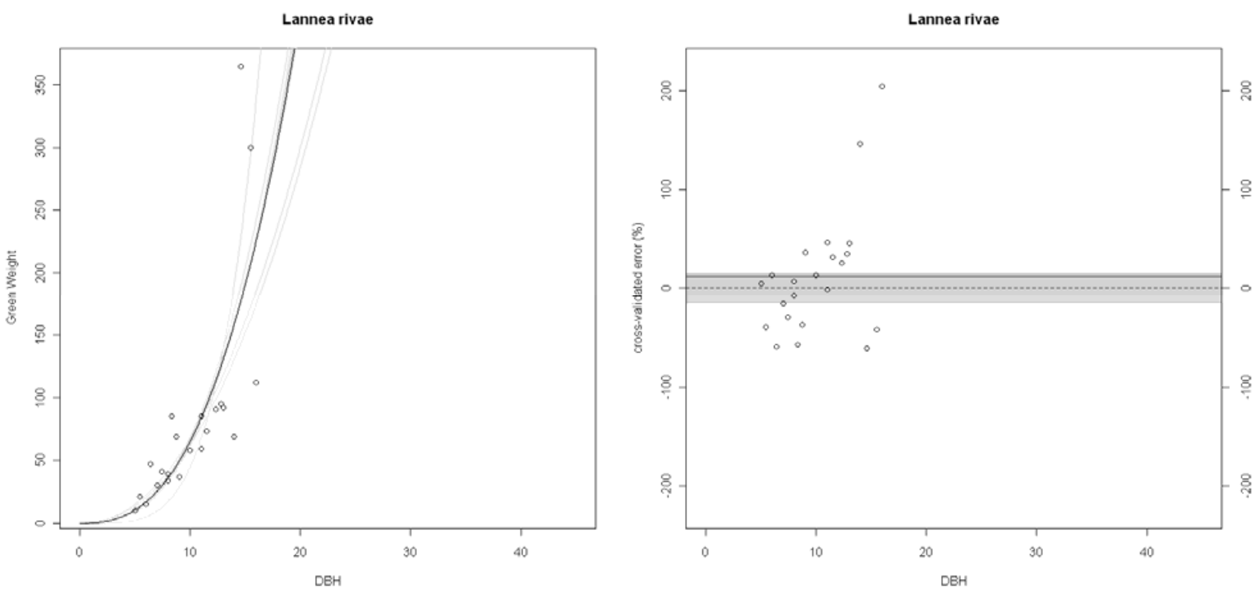
Genus Level:

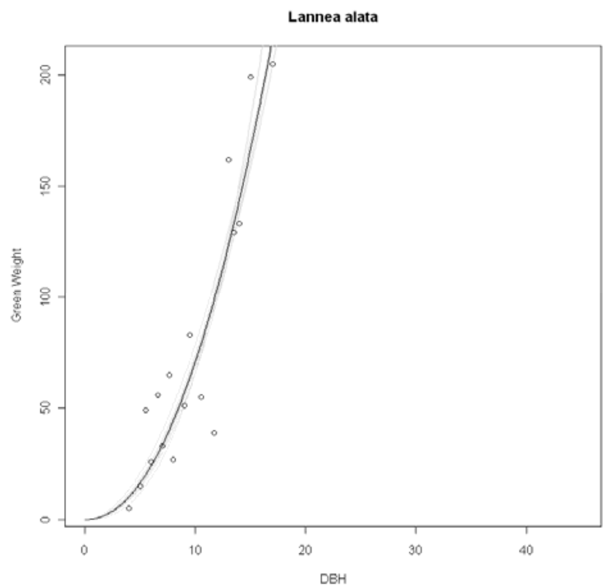


All species combined (<35 cm):



The figures below show the fitted model plotted for each species and the cross validated residuals plotted as a function of DBH. In the plot of fitted models, light grey curves show the f(-i) models fit during cross validation.




Lannea alata
Green Weight
0
50
100
150
200
DBH
0
10
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30
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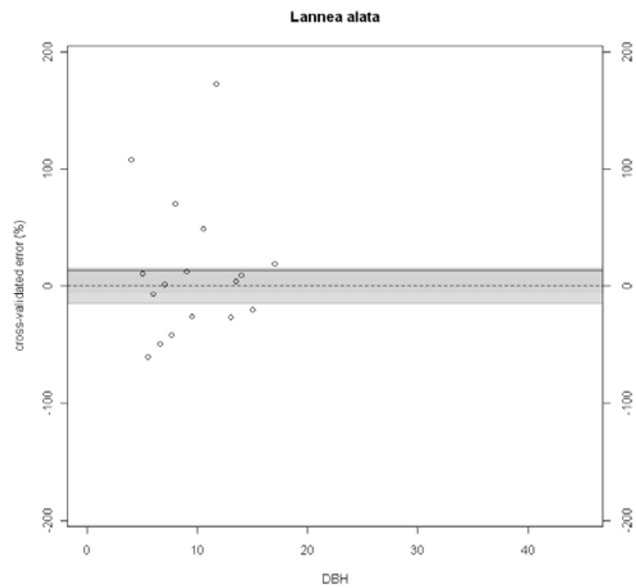
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DBH
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10
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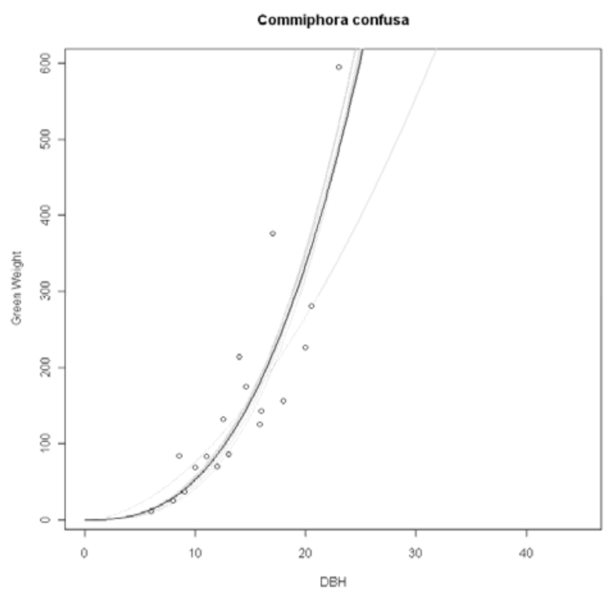
40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200
300
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500
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DBH
0
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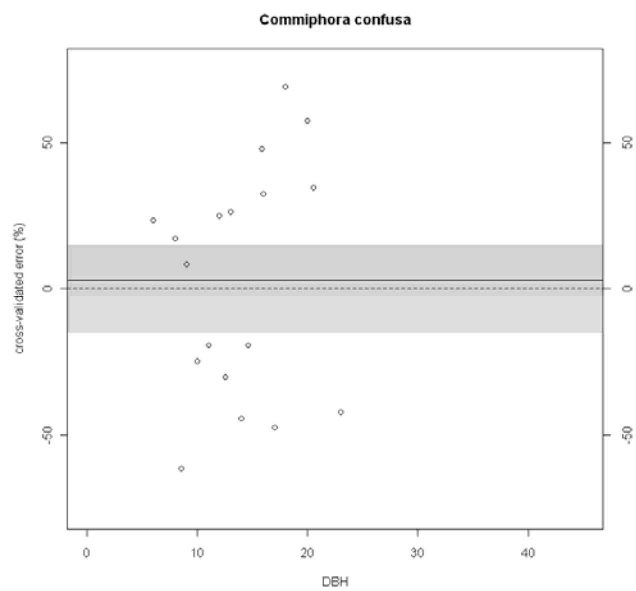
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0
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DBH
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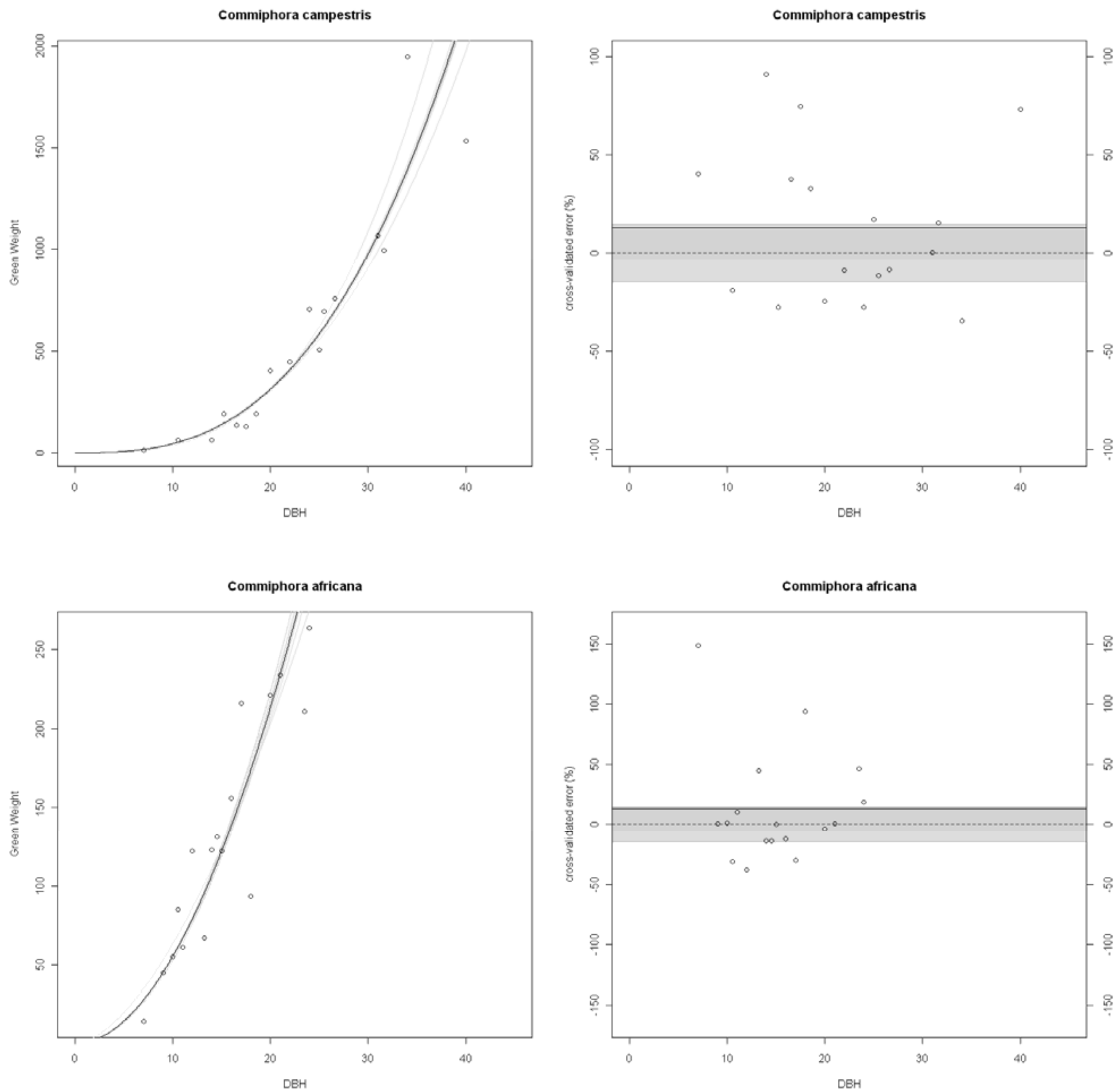
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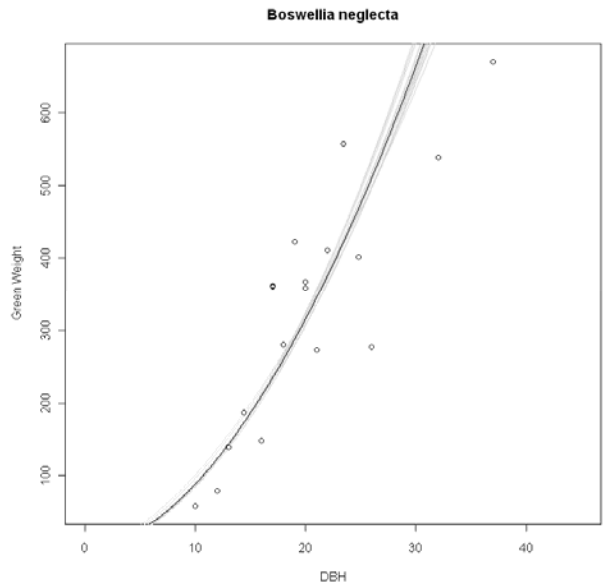
Green Weight
DBH
Commiphora campestris
cross-validated error (%)
DBH
Commiphora africana
Green Weight
DBH
Commiphora africana
cross-validated error (%)
DBH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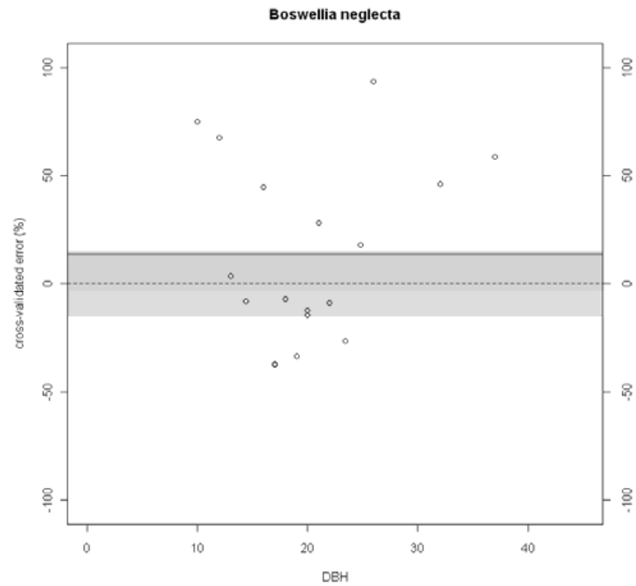
0 10 20 30 40
DBH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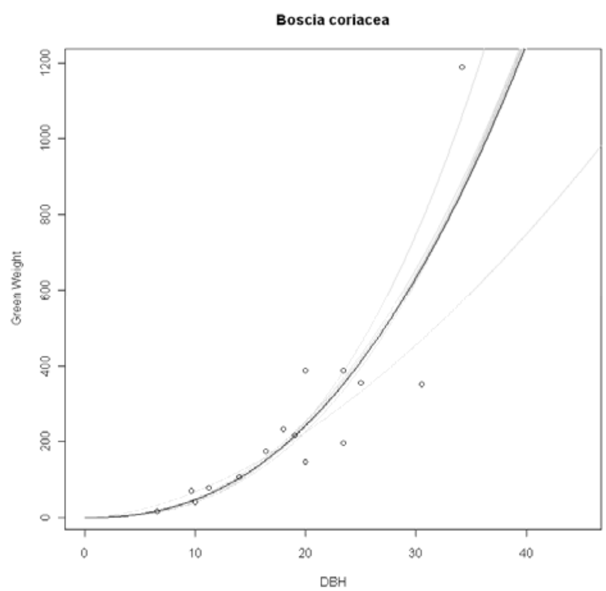
DBH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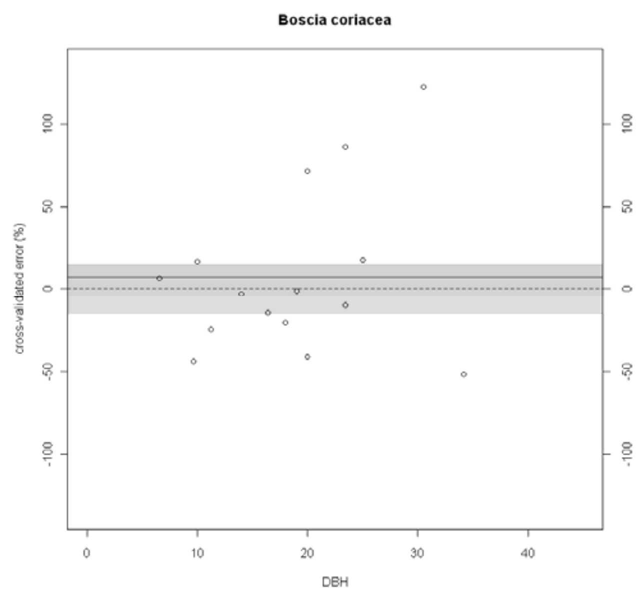
0 10 20 30 40
DBH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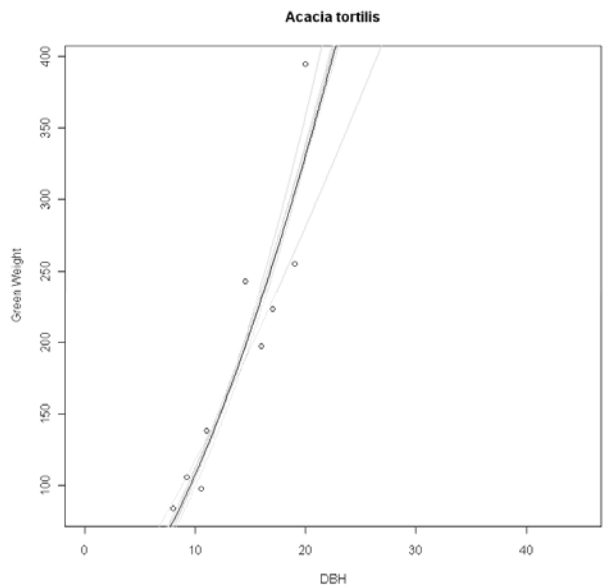
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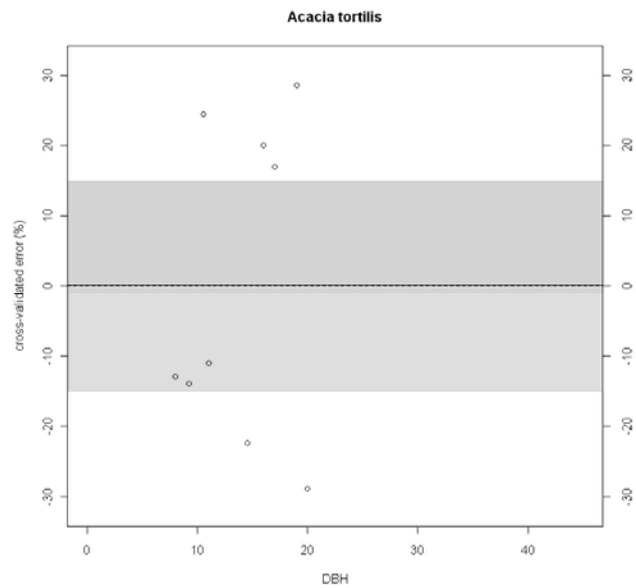
DBH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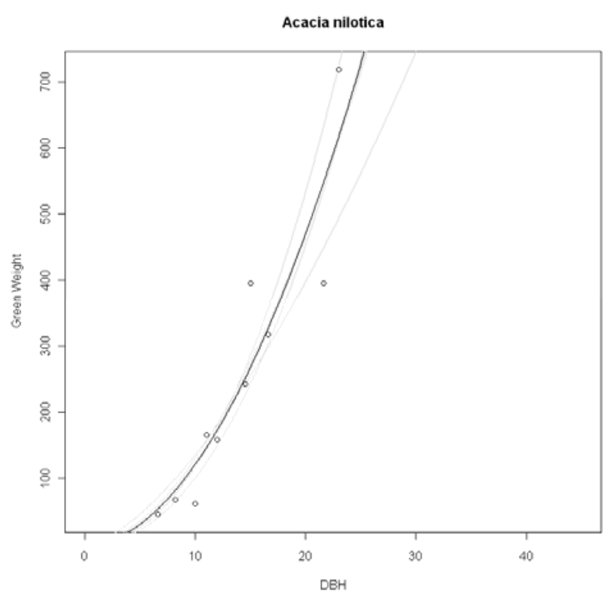
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Green Weight
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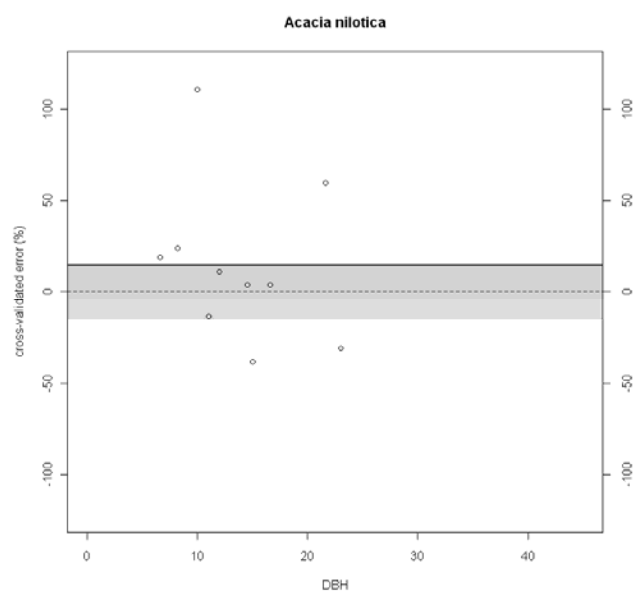
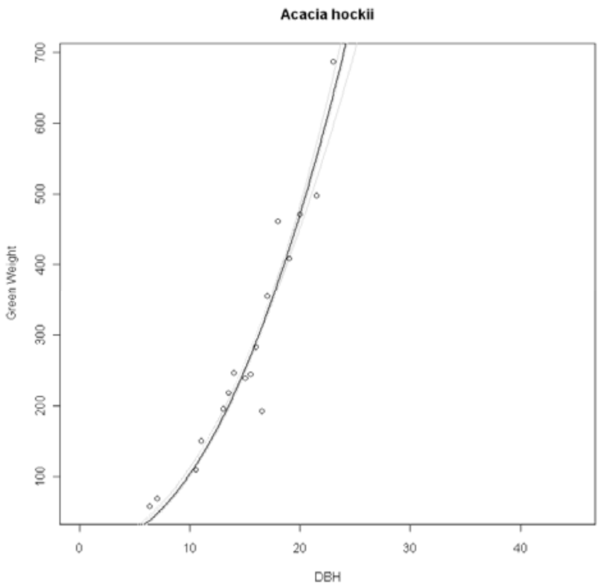

Acacia nilotica
cross-validated error (%)
DBH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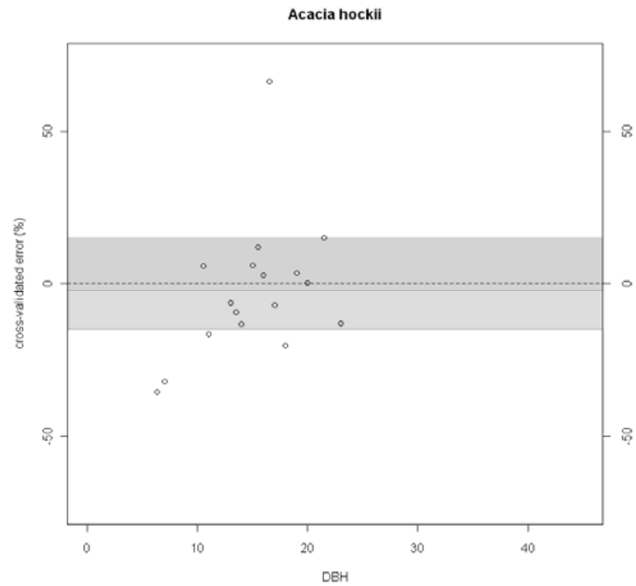
DBH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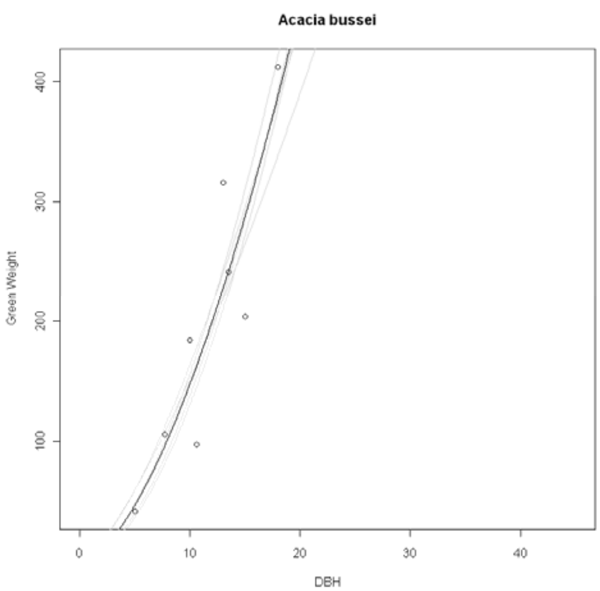
DBH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Green Weight
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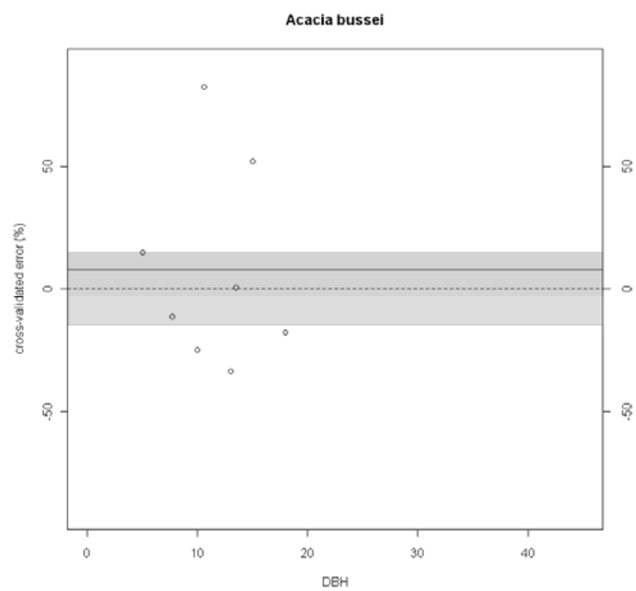
DBH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cross-validated error (%)
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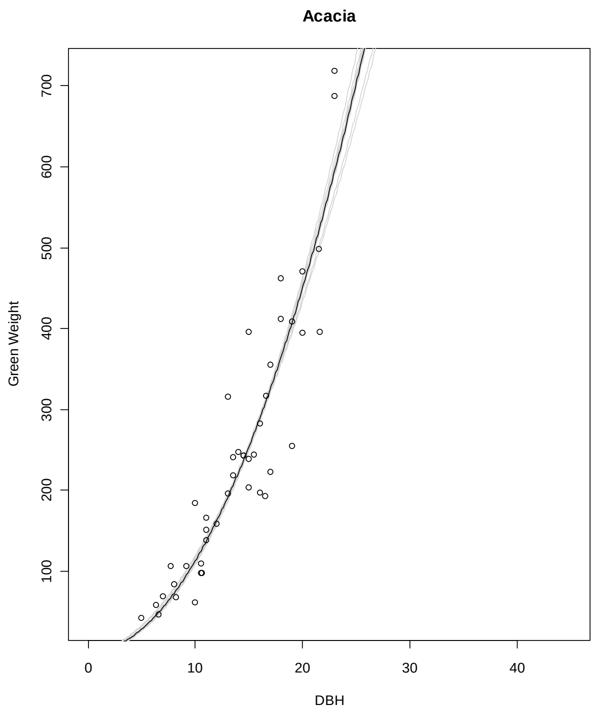
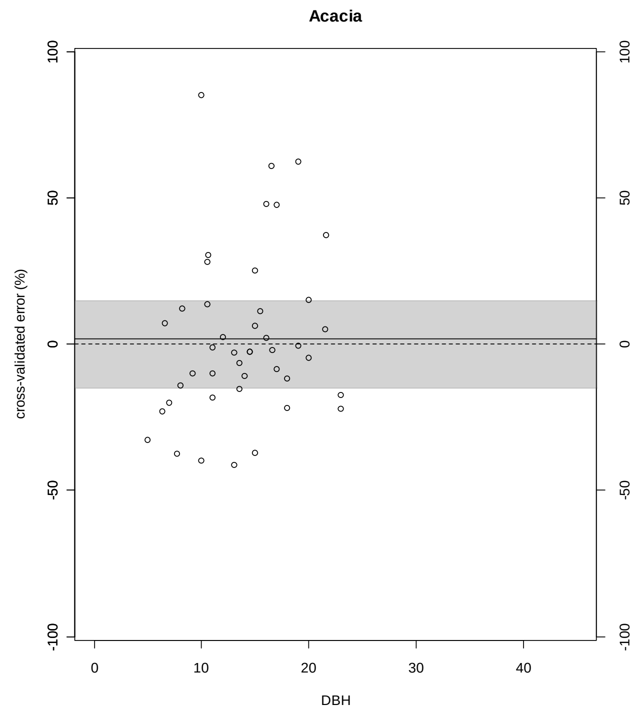
DBH

Genus Level:


Acacia
Green Weight
DBH


Acacia
cross-validated error (%)
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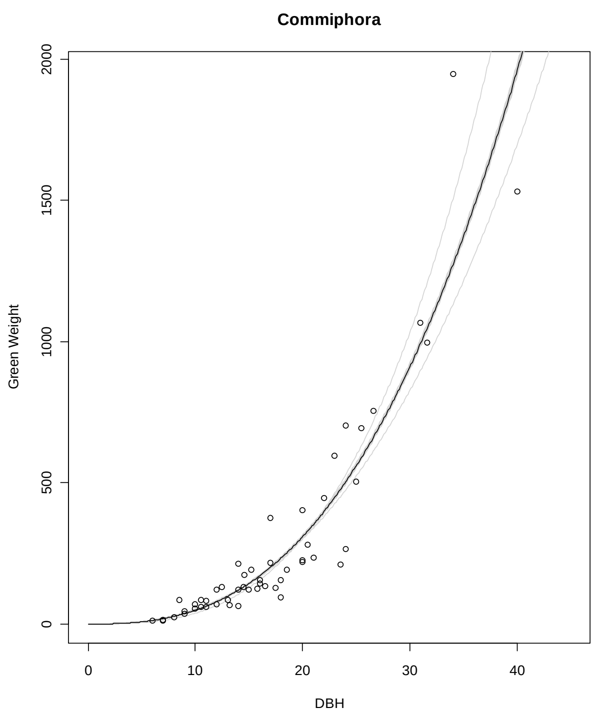
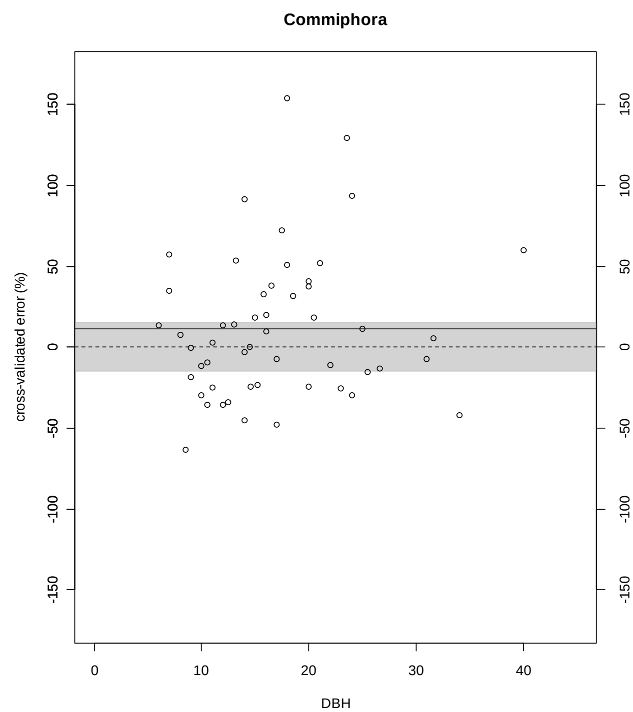

Commiphora
Green Weight
DBH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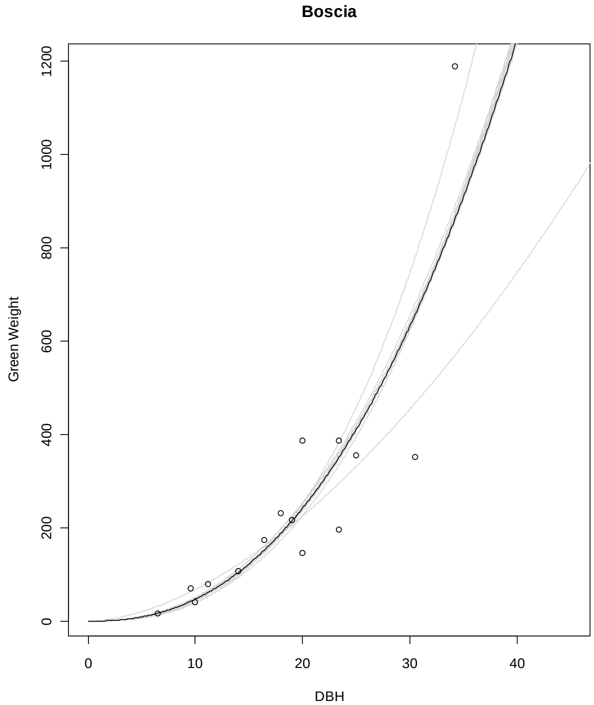
Boscia
Green Weight
DBH
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1200
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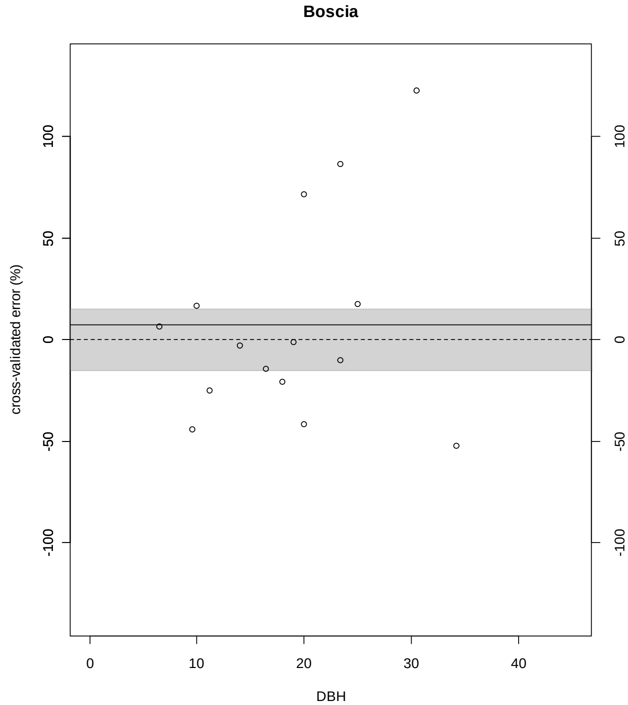
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DBH
-100
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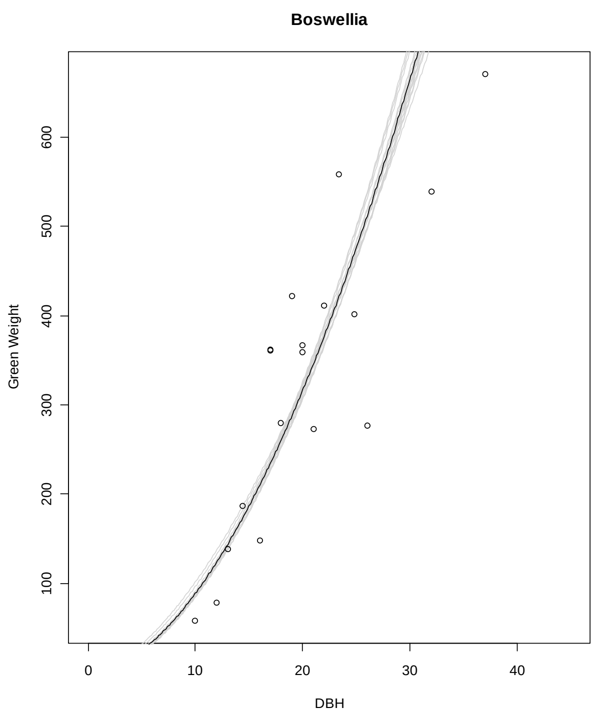
Boswellia
Green Weight
DBH
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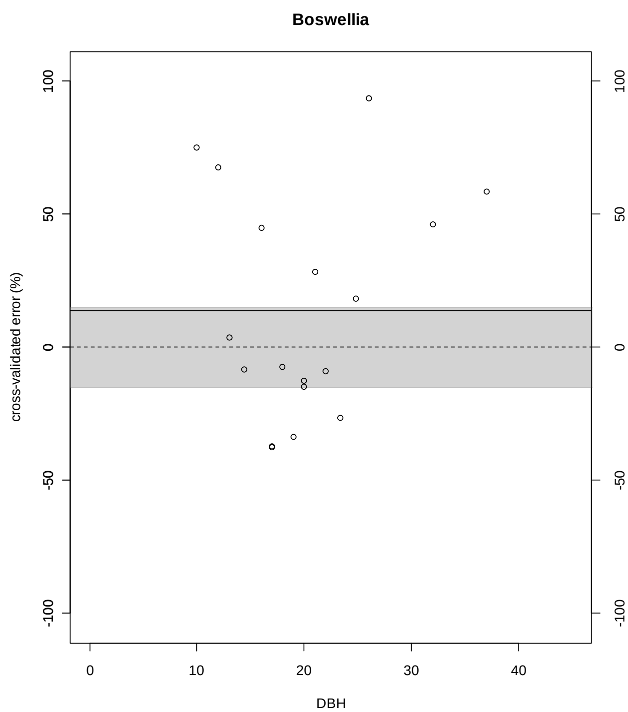
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cross-validated error (%)
DBH
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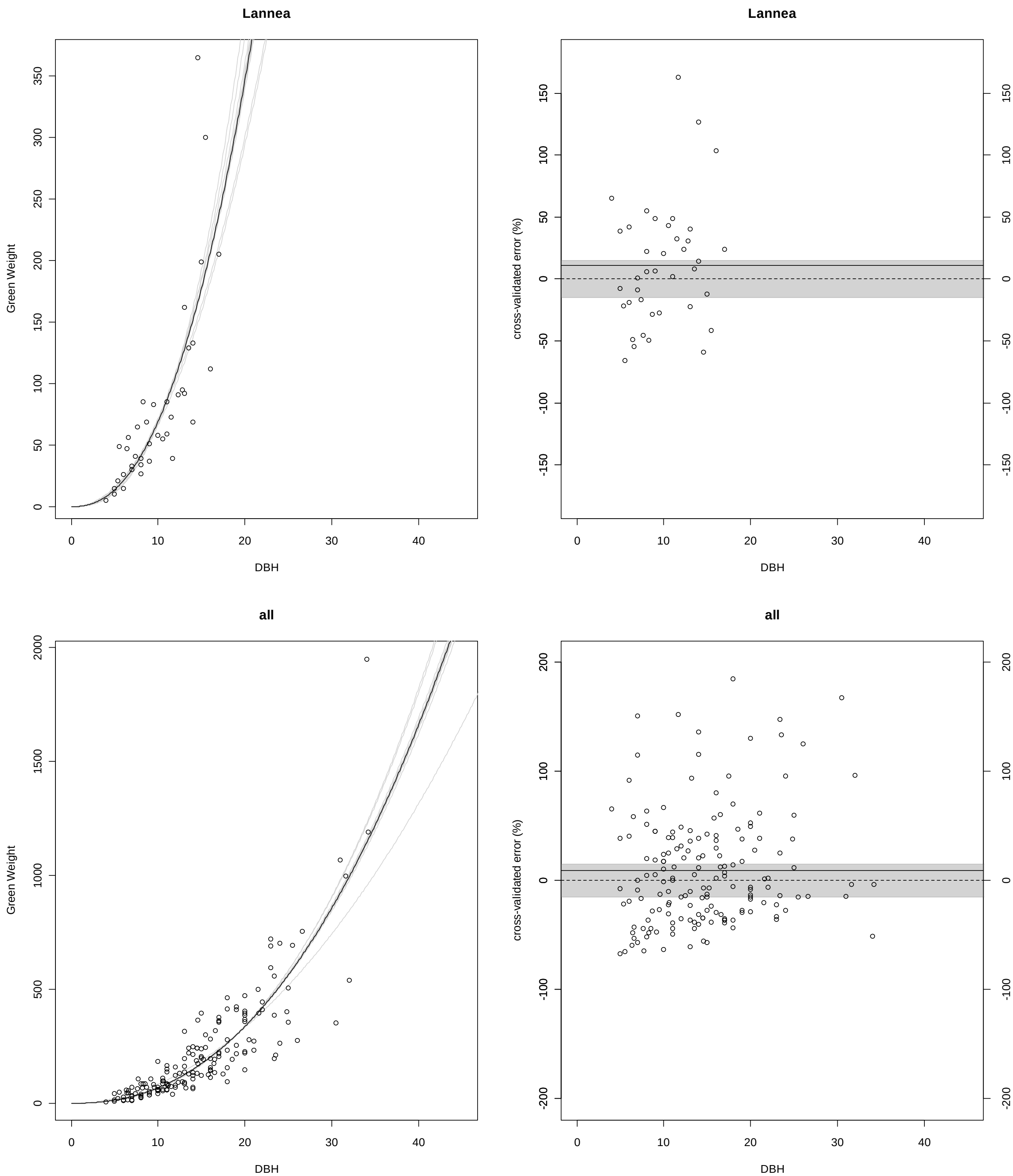
Lannea
Green Weight
DBH
Lannea
cross-validated error (%)
DBH
all
Green Weight
DBH
all
cross-validated error (%)
DBH

Estimated Total Carbon Stock, Standard Error and Sample Size for each Stratum and Pool

The estimated total carbon stock, standard error and sample size for each stratum and each carbon pool is shown in the table below. This summary is based on the exhaustive field sampling procedures explained in '*Standard Operating Procedure Biomass, 01/11/2011*' and '*Standard Operating Procedure Soils, 01/02/2011*'.

Stratum	n	Area (ha)	Trees Carbon Mean (tCO^2e / ha)	Shrubs Carbon Mean (tCO^2e / ha)	Herbaceous Carbon Mean (tCO^2e / ha)	Total Strata Mean (tCO^2e / ha)	Total Strata Carbon Stock (t C02-e)
ag active	12	713.7	67.98	23.08	2.88	172.24	122,925.5
dryland forest strata 1+2	26	6883.6	39.98	8.48	1.41	91.42	629,289.1
dryland forest strata 3	16	5651.1	40.75	2.45	0.99	81.01	457,776.5
dryland forest strata 4	11	2773.4	47.51	3.04	0.77	94.09	260,949.1
dryland forest strata 5	18	8133.4	46.23	2.30	2.14	92.89	755,520.4
dryland forest strata 6	23	4345.5	35.87	7.26	2.36	83.39	362,368.4
grassland	4	1610.9	3.05	1.40	4.85	17.06	27,474.3
montane forest	3	57.1	45.56	33.45	0.00	144.86	8,265.6
Total:		**30,168.66**					**2,624,568.9**

Table 11. Total carbon stocks for trees, shrubs and herbaceous material for Rukinga Ranch

A detailed biometric database containing all carbon pool measurements for all plots for the project are available to the validators for perusal upon request in the '*Rukinga Carbon Trees Shrubs Grass v7, 01/14/2011*' carbon pool database.

Standard errors of the total for each stratum is listed in the table below:

Strata	Sample Size	Mean Stock	Variance	FPC	FPC * a^2 * var / n	Standard Error
ag active	12	172.24	106559.66	0.997	4508238095.9	67143.41
dryland forest strata 1+2	26	91.42	4726.31	0.999	8607012582.3	92773.99
dryland forest strata 3	16	81.01	1348.43	0.999	2689881737.7	51864.07
dryland forest strata 4	11	94.09	1132.37	0.999	791212498.2	28128.5
dryland forest strata 5	18	92.89	752.86	1.000	2765646392.8	52589.41
dryland forest strata 6	23	83.39	3772.49	0.999	3094010378.6	55623.83
grassland	4	17.06	18.72	1.000	12139791.7	3484.22
montane forest	3	144.86	13667.31	0.990	14679751.0	3831.416

Table 12. Standard Errors for each stratum for all carbon pools for Rukinga Ranch

Trees, shrubs, grass (forest)	
Standard Error	149942.73
95% interval	293887.74
Error percentage	**11.20%**

Table 13. Combined standard error percentage for trees, shrubs and grass

A detailed standard error analysis for each carbon pool by stratum is available in the database '*Rukinga Carbon Trees Shrubs Grass v7, 01/14/2011*'

Soil Carbon measurements were not stratified, as test measurements were made using the strata found in figure 10, and it was concluded that stratification did not improve measurement accuracy. Soil samples were measured both inside Rukinga (the project area) and in the reference region at shambas (farms). The table below shows a summary (means) for the soil organic carbon measured inside Rukinga Ranch and in the shambas in the reference region.

	0-30cm				31-100cm				total (1m)	
	bulk density (g/cm^3)	**Carbon (%)**	**Soil Carbon (t/ha)**	**Soil GHG equiv. (t/ha)**	**bulk density (g/cm^3)**	**Carbon (%)**	**Soil Carbon (t/ha)**	**Soil GHG equiv. (t/ha)**	**Soil Carbon (t/ha)**	**Soil GHG equiv. (t/ha)**
Reference	1.50	0.55	24.44	89.63	1.41	0.38	36.65	134.38	61.09	224.01
Rukinga	1.32	0.70	27.38	100.40	1.34	0.92	84.85	311.13	112.24	411.53

Table 14. Mean Soil Carbon Stocks measured inside Rukinga and in the Reference Region

The % soil loss was determined as **0.456** (see section 6.5.5 - *fitting the soil carbon loss model*), and the corresponding total carbon loss is determined by multiplying this percentage loss by the total carbon stock measured inside Rukinga Ranch:

Rukinga Ranch	
Mean Carbon Stock measured in Rukinga	411.53 t CO2e
Standard Error of mean carbon stock	21.21 t CO2e
Percent Error at 95% confidence	0.10
Soil Crediting Area (conservatively reduced)	28,776.39 ha
Total soil carbon stock measured in Rukinga	11,842,347.78 t CO2e
Total Soil "loss"	**5,396,221.82 tonnes**

Table 15. Summary for soil carbon stocks in Rukinga Ranch

Standard error for soil stocks measured inside Rukinga Ranch are as follows:

Soil - Rukinga	
total stocks	11,842,347.78
Se total	610,218.21
95% interval	1,196,027.68
Error percentage	**10.10%**

Table 16. Standard error percentage for soil

Details for the soil carbon loss model, including standard error analysis are available in the 'Rukinga 1m Soil Analysis, 01/14/2011' spreadsheet.

Estimated Total Carbon Stock and Standard Error for Entire Project Area

The total carbon stocks for trees, shrubs and grass for Rukinga Ranch, above and below ground, is **2,624,569 tonnes CO2e**.

As it is assumed that soil carbon is not 100% depleted during the deforestation process, soil carbon values are measured inside Rukinga Ranch as well as outside the ranch in the reference region at deforested locations. The percentage soil carbon loss is multiplied by the total carbon stock inside Rukinga to yield the carbon "loss" value, and is **5,396,222 tonnes CO2e**.

The total monitored carbon stock for the Kasigau Corridor Phase I Project is:

8,020,791 tonnes CO2e

The total carbon inventory standard error across all pools is the quadratic sum of errors for all pools for all strata:

Total inventory error	
total stocks	14,466,916.7
Se total	628,370.1775
95% interval	1,231,605.548
Error percent	**8.51%**

Table 17. Total Carbon inventory error

Monitoring of Deforestation in the Project Area

For future monitoring periods, Wildlife Works will measure any deforestation within the project area either through intensification of biomass plots, or assessment of remotely sensed imagery. Any measured deforestation will be directly applied to the project's net emissions totals (i.e. subtracted from emissions reductions) for the with-project scenario. If the level of deforestation within the project area falls below the *de minimus* level as stated in IPCC 2006, it shall be excluded.

VCS FINAL VALIDATION REPORT

WILDLIFE WORKS KASIGAU CORRIDOR REDD PROJECT PHASE I – RUKINGA SANCTUARY

REPORT NO. 2011-9036

REVISION NO. 01

Date of first issue: 3 February, 2011	Project No.: PRJC-285203-2011-CCS-USA
Approved by: Miguel Rescalvo Regional Manager. North Americal	Organizational unit: Sustainability and Innovation Climate Change Services USA
Client: Wildlife Works Inc.	Client ref.: Jeremy Freund

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Climate Change & Environmental Services
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San Francisco, CA 94104
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Fax: +1 415-318-3901

http://www.dnv.com

Det Norske Veritas (U.S.A.), Inc. (DNV) has performed a validation of the “The Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary” (hereafter called “the project”) in Kenya on the basis of Voluntary Carbon Standard 2007.1 (VCS), as well as criteria for consistent project operations, monitoring and reporting. This validation report summarizes the findings of the validation.

The validation consisted of the following three phases: i) a desk review of the project design, the baseline and the monitoring plan, ii) follow-up interviews with project stakeholders and the issuance of the finding list, and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

The total emission reductions from the project are estimated to be 4 525 767 tCO2e over the 30-year crediting period (1 January, 2005 to 31 December, 2034). This includes project emissions, the total confidence deduction, a 20% leakage deduction applied to years 2011-2034, and the VCS AFOLU buffer deductions currently assessed at 20%. This estimate assumes the baseline does not change during the baseline reevaluation.

In summary, it is DNV’s opinion that the “The Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary” as described in the VCS Project Document dated 31 January 2011 meets all relevant VCS 2007.1 requirements and correctly applies the VCS approved methodology element VM0009 – Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.

Report No.: 2011-9036	Date of this revision: 3 February, 2011	Rev. No. No. 1
Report title: VCS Validation Report – Wildlife Works Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary		
Work carried out by: Sam Stevenson Gordon Smith		
Work verified by: Guy Pinjuv		

Key words:
VCS
Project Validation
REDD
Kenya

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Abbreviations

AFOLU Guidelines	Agriculture, Forestry and Other Land Uses Section of Guidelines for National Greenhouse Gas Inventories 2006
CAR	Corrective Action Request
CCBA	Climate Community and Biodiversity Alliance
CDM	Clean Development Mechanism
CL	Clarification Request
CO_2	Carbon Dioxide
DNA	Designated National Authority
DNV	Det Norske Veritas
DR	Document Review
EB	Executive Board
GHG	Greenhouse Gas(es)
GPG LULUCF	Intergovernmental Panel on Climate Change's Good Practice Guidance for Land-Use Land Use Change and Forestry
GWP	Global warming potential
m	Meters
MED	Methodology Element Documentation
MoV	Means of Verification
PD	Project Document
REDD	Reduced Emissions from Deforestation and Degradation
SCS	Scientific Certification Systems
tCO_2e	Tonnes CO_2 equivalent
VCS	Voluntary Carbon Standard
VCSA	VCS Association
VCU	Voluntary Carbon Unit
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

TABLE OF CONTENTS

1 INTRODUCTION

Wildlife Works, Inc. (Wildlife Works) has commissioned Det Norske Veritas (U.S.A.), Inc. (DNV) to validate the “Kasigau Corridor REDD Phase I – Rukinga Sanctuary” in Kenya. This report provides a description of the steps involved in conducting the validation and the findings of the validation based on the Voluntary Carbon Standard 2007.1 (VCS), as well as criteria for consistent project operations, monitoring and reporting.

The validation team consisted of the following personnel:

Role/Qualification	***Last Name***	***First Name***	***Country***
Project manager	Stevenson	Samuel	USA
VCS Validator / VCS REDD AFOLU Expert	Smith	Gordon	USA
Technical reviewer	Pinjuv	Guy	USA

1.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project’s baseline, monitoring plan, and the project’s compliance with the VCS 2007.1 are validated. This is to ensure that the project design, as documented, is reasonable and meets the identified criteria. Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of emission reductions.

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the VCS Project Description (VCS PD). The VCS PD is reviewed against the criteria stated in the Voluntary Carbon Standard 2007.1 (VCS), and the approved VCS methodology VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests, version 1.0.

The validation is not meant to provide any consulting for the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

1.3 VCS Project Description

The “Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary” has been developed by Wildlife Works Inc., a project proponent based in California, USA. The project is implemented on land known as the Rukinga Sanctuary, which is wholly owned by the Rukinga Ranching Co., Ltd. The leasehold on the title will be due for renewal in 2038, at which point it can be renewed once again for up to 99 years under Kenyan law.

The project proponent is Wildlife Works, Inc. and the project developer is Wildlife Works Carbon LLC. DNV has confirmed that Wildlife Works, Inc. has the right to all and any reductions generated by the Project during the Project Crediting Period /2/.

The project is 30 169 hectares with an average canopy cover of 39%, with mature tree heights ranging from 5-10 meters (m), and therefore conforms to the latest VCS definition of "forest" /26/ (see pg 13).

The main project activity is to prevent deforestation caused by subsistence farming activities. The objective of the project activity is to prevent the conversion of forest to cropland for annual crops, typically maize that ultimately results in net greenhouse gas (GHG) emissions into the atmosphere. The primary agents of deforestation are the growing population of the local Taita and Kamba people living in the Reference Area. Agricultural clearing in the Reference and Leakage Areas is permanent and cultivation activities do not shift.

The project start date is 1 January, 2005, which is the date Wildlife Works assumed financial responsibility for the project area and began specific GHG mitigation activities within the project area **/4/**. The selected crediting period is from 1 January, 2005 to 31 December, 2034. The total emission reductions from the project are estimated to be 4 525 767 tCO2e over the 30-year crediting period. This includes project emissions, total confidence deduction, a 20% ex-ante leakage deduction applied to years 2011-2034 as per VM0009 and the VCS AFOLU buffer deductions currently assessed at 20%. This estimate assumes the baseline does not change during the baseline re-evaluation.

1.4 Level of Assurance

DNV provides reasonable assurance that the emission reduction estimations for the "Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary Project" are conservative and meet the VCS criteria and approved methodology, VM0009.

Estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment given a lack of past project data that this is appropriate given the conditions of the project and find the assessment to conform to the requirements in the approved methodology VM0009.

To ensure complete transparency, DNV has included any clarification or corrective actions that were raised in this validation report in Appendix A.

2 METHODOLOGY

The validation consisted of the following three phases:

- A desk review of the project design and the baseline and monitoring methodology.
- Site visit and interviews with project stakeholders.
- The resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customized for the project. The protocol used shows in a transparent manner the criteria, means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organizes, details and clarifies the requirements a VCS project is expected to meet.
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of two tables. The different columns in these tables are described in Figure 1. The completed validation protocol for the "Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary"" is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective Action Requests (CAR) are issued where:

- Mistakes have been made with a direct influence on project results.
- Validation protocol requirements have not been met.
- There is a risk that the project would not be accepted as a VCS project or that emission reductions will not be certified.

The term Clarification (CL) may be used where additional information is needed to fully clarify an issue.

Validation Protocol Table 1: Requirement Checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organized in seven different sections. Each section is then further sub-divided. The lowest level constitutes a	*Gives reference to documents where the answer to the checklist question or item is found.*	*Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions*	*This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) due to non-compliance with the checklist question (See below).A request for Clarification (CL) is*

checklist question.			*reached.*	*used when the validation team has identified a need for further clarification.*

Validation Protocol Table 2: Resolution of Corrective Action Requests and Requests for Clarification			
Draft report corrective action requests and requests for clarifications	***Ref. To Table 1***	***Project participants' response***	***Final conclusion***
If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	*Reference to the checklist question number in Table 1 where the Corrective Action Request or Clarification Request is explained.*	*The responses given by the project participants during the communications with the validation team should be summarized in this section.*	*This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 1, under "Final Conclusion..*

Figure 1: Validation Protocol Tables

2.1 Review of Documents

The project document /1/, dated 31 January, 2011 and previous versions for "Kasigau Corridor REDD Phase I – Rukinga Sanctuary" was submitted by Wildlife Works, Inc., along with additional background documents related to the project design and baseline, which were assessed as part of the validation. The project documentation followed the guidance set out in VCS 2007.1.

The following table lists the documentation that was assessed during the validation:

Documents provided that relate directly to the project:

/1/ Wildlife Works Carbon LLC, *VCS PD for* Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" with VCS template and supporting document, 31 January, 2011 and previous versions.

/2/ "Carbon Rights Agreement" between Wildlife Works Inc. and Rukinga Ranching Company – 15 Febuary' 2009.

/3/ Leasehold title to Rukinga Ranch – 1 January, 1971.

/4/ Re: - Management Authority for Rukinga Ranch (1 January, 2005).

/5/ Audit Report of Wildlife Works EPZ by Kenya National Environmental Management Authority – December, 2006.

/6/ Shareholder list, Rukinga Ranching Company – Effective from AGM meeting minutes on 9 December, 2009.

/7/ Rukinga Ranch Company/ Wildlife Works Inc. / Wildlife Works EPZ financial statements and projections – As of 13 January, 2011.

/8/ CCB validation report conducted by Scientific Certifications Systems – 20

December, 2009.

/9/ Image Classification Protocol (as of 14 January, 2011).

/10/ How to Use the Classification Tool (as of 14 January, 2011).

/11/ Logistic regression model for deforestation (as of 14 January, 2011).

/12/ Field measurement protocol – Standard Operating Procedure Biomass (as of 14 January, 2011).

/13/ Field measurement protocol – Standard Operating Procedure Soils (as of 14 January, 2011).

/14/ Soil lab report of measured soil carbon concentrations (Rukinga 1m Soil Analysis, 14 January, 2011).

/15/ Forest Biomass Data (Rukinga Carbon trees Shrubs Grass v7.xlsm, 14 January, 2011).

/16/ Forest biomass sampling quality control comparisons (QC report.xlsx, 14 January,2011).

/17/ Data used to develop tree biomass allometric equations (AllometricFormulasPower.xlsx, 14 January, 2011).

/18/ Letters to shareholders of Rukinga Ranching Co. Ltd. Pertaining to an Extraordinary General Meeting of Rukinga Ranching Co Ltd. To be held at Free World Country Club, Voi at 10:00am Wednesday December 9th, 2009.

/19/ Wildlife Works Inc. Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination for the Kasigau Corridor REDD Project, Phase I – Rukinga (14 January, 2011).

/20/ Rukinga return analysis v4.xlsx (27 January, 2011)

/21/ Leakage Model Expanded (14 January, 2011).

/22/ Grid Data RefArea flaggedPointsv2.xlsx (14 January, 2011).

Background documents related to the design and/or methodologies employed in the design or other reference documents:

/23/ Approved VCS methodology: "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests version 1.0" 11 January, 2011.

/24/ VCS Association, *Voluntary Carbon Standard 2007.1*, November 2008.

/25/ VCSA, VCS Sectoral Scopes (http://www.v-c-s.org/sectoral_scopes.html)

/26/ VCSA, *Guidance for Agriculture, Forestry and Other Land Use Projects, 18* November, 2008.

/27/ VCSA, *Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination*, 18 November, 2008

/28/ VCSA, *Update to the VCS 2007.1: Tool for Non-Permanence Risk Analysis and Buffer Determination,* 8 September, 2010.

/29/ VCS VT0001 *Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities Version 1.0, 21 May, 2010.*

/30/ CAR *Forest Project Protocol version 3.2* August 31, 2010

2.2 Follow-up Interviews

During 10-14 January, 2011, DNV performed interviews with project stakeholders at the project site in Rukinga, Kenya to confirm selected information and to resolve issues identified in the document review. Representatives of Wildlife Works, Inc. were interviewed. The main topics of the interviews are summarized in Table 1.

Table 1 Interview Topics

Interviewed Organization	Interview Topics
Wildlife Works, Inc.	✓ Project start date. ✓ Demonstration of additionality. ✓ Emission reduction estimates. ✓ Monitoring plan. ✓ Baseline determination. ✓ Buffer determination. ✓ Leakage rates. ✓ Resources, training, procedures of management structure.

Table 2. Participants at Project Site (Rukinga, Kenya)

Name	Position	Organization
Mike Korchinsky	President	Wildlife Works, Inc.
Jeremy Freund	VP, Carbon Development	Wildlife Works Carbon LLC
Rob Dodson	General Manager	Wildlife Works, Inc.
Patrick Kabatha	Biodiversity Specialist	Wildlife Works, Inc.
Hassan Sachedina	VP, Conservation Enterprise	Wildlife Works Carbon LLC
Laura Crown	Office Manager	Wildlife Works, Inc.

2.3 Resolution of Any Material Discrepancy

To guarantee the transparency of the validation process, the concerns raised by DNV and the response provided by the project proponent and the consultant are documented in Table 2 of the Validation Protocol in Appendix A.

3 VALIDATION FINDINGS

3.1 Project Design

The project avoids deforestation and forest degradation caused by clearing for subsistence agriculture. Clearing is often preceded by degradation in the form of removal of larger trees with dense wood during illegal charcoal making operations. The project encompasses a variety of activities to monitor and protect project lands, provide local people with alternative ways of sustaining themselves, and providing sustainably produced charcoal.

Quantification of deforestation was performed by human interpretation of a time series of LANDSAT images of the reference area, classifying each point of a sample as forest, non-forest, built, cloud/shadow or no image. Methods described in approved VCS Methodology VM0009, Version 1.0 were used to statistically weight each forest state observation and calculate a logistic curve representing cumulative baseline deforestation over time.

Starting vegetation and soil carbon stocks were measured within the project area. Vegetation sampling was stratified by vegetation type. Soil carbon was measured using unstratified random sampling. Destructive sampling of trees and shrubs was used to construct allometric equations to predict tree biomass as a function of diameter and shrub biomass as a function of height. Loss of soil carbon was estimated by measuring carbon stocks in farmed fields and finding the difference between stocks in fields and in undisturbed forest.

The project avoids deforestation within the project boundary by controlling project lands through ranger patrols and relationships between Wildlife Works staff and members of surrounding communities. The project provides alternatives to subsistence agriculture to avoid leakage in the form of displacing land clearing from within the project boundary to outside the project boundary. The project is developing a sustainable charcoal production program to avoid displacement of charcoal production from within the project boundary to other locations.

Baseline emissions are calculated as a function of the baseline area predicted to be deforested each year, multiplied by the carbon stock per hectare in woody biomass, soil carbon loss as a decay function since conversion to agriculture. The project avoids emissions to the extent that monitored deforestation is less than predicted baseline deforestation, adjusted for changes in biomass carbon stocks.

The project is eligible for crediting under the VCS because it meets the applicability requirements of approved VCS Methodology VM0009 as explained in section 3.2.1 below.

DNV finds that the project does conform to VCS AFOLU guidance /26/, as well as conforming to the applicability requirements of VCS Methodology VM0009. DNV also finds that the project proponent has appropriately defined a reference area, appropriately measured deforestation over time within the reference area, and appropriately monitored starting biomass and soil carbon stocks within the project boundary. DNV has also confirmed that the project is implementing leakage mitigation activities and has performed baseline measurements needed to quantify whether or not leakage occurs over time.

Project Boundary

The project area covers 100% (30,169 hectares) of the Rukinga Sanctuary. At the time of the project start date, 93% of the project area was forested for 10 years prior to the project start date. The project boundary was confirmed by DNV by reviewing the two documents provided by Wildlife Works, the leasehold title to Rukinga Ranch /2/ and the Carbon Rights Agreement between Wildlife Works Inc. and Rukinga Ranching Co. /3/.

Project Duration, Crediting Time and Project Start Date

Wildlife Works took financial responsibility for all conservation activities within the Rukinga Sanctuary (Project Area) on 1 January, 2005. As such, the project start date and project crediting period is 1 January, 2005 – 31 December, 2034. Although Wildlife Works was performing conservation activities centered around the ecofactory prior to 2005, all activities were located outside of the Project Area and thus do not affect the project start date or project crediting period of Phase I of this project. DNV confirmed that the project start date and project crediting period was determined properly through reviewing the contract signed between Wildlife Works EPZ and Rukinga Ranching Company, Ltd. /4/ and the Carbon Rights Agreement /2/. A 30-year crediting period was selected, with 1 January, 2005 as the start date. The project will therefore end on 31 December, 2034.

Project Ownership

DNV can confirm the project ownership by Wildlife Works by reviewing two documents provided by Wildlife Works /2/ and /3/. In addition, DNV can confirm that the project is not included in any emission trading program and is not subject to binding greenhouse gas (GHG) emissions limits /1/.

Project Eligibility Under the VCS

This project has not applied to nor been rejected by other GHG crediting systems.

3.2 Baseline

The project falls into sectoral scope 14 as defined by VCS /24/ . The project start date is 1 January, 2005. The project applies a new VCS methodology VM0009 "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" /25/, which was approved on 11 January, 2011. The project baseline is constructed according to the approved methodology. The project proponent elected to use the linear model baseline alternative provided within VM0009.

3.2.1 Applicability

DNV was able to verify that the project meets all applicability criteria of the methodology through document review and interviews **/1/**:

- DNV confirmed that in fact the primary driver of deforestation is the conversion of forest to cropland for annual crops and harvesting of wood to support the illegal charcoal trade by visiting the project site. Evidence of forest conversion to agriculture was evident both in the reference area and in the immediate surroundings of the project area. The existence of an illegal charcoal trade was very evident through makeshift roadside charcoal sellers.
- DNV confirmed that the project area has been tropical dryland forest for at least 20 years with the review of Landsat imagery dating back to 1987.
- DNV confirmed that the project area meets the FAO 2010 and residing designated national authority's (DNA) definition of "forest" for the project country for a minimum of 10 years prior to the project start date /24/.
- DNV confirmed that the project is located in a semi-arid tropical region through its site visit to Rukinga, Kenya.

- DNV confirmed that the project is not mandated by any enforced law, statute, or other regulatory framework by reviewing the relevant laws and regulations outlined in the project document, leasehold title, management authority agreement, and the audit report performed by the Kenya National Environmental Management Authority **/1/ /3/ /4/ /5/**.
- DNV confirmed by reviewing soil maps (**/1/** section 6.5) and field observation that the project area does not contain organic or peat soils.
- DNV confirmed that the reference area meets the requirements outlined in section 6.3.1 and 6.3.2 of the approved VCS methodology, "VM0009, "Methodology for Avoided Mosaic Deforestation of Tropical Forests."
- DNV confirmed that as of the project start date, historic imagery in the reference region exists, with sufficient coverage to meet the requirements of section 6.4.2 of VM0009.
- DNV confirmed that a wide range of project activities have been implemented to mitigate deforestation by addressing the agents and drivers of deforestation as described in section 10.1 of VM0009 (see section 6.1 in Project Document).
- DNV confirmed that the project start date and end date and crediting period are clearly defined in the Project Document (see Section 6.3) **/1/**.
- DNV confirmed that the project proponent has access to the leakage area by randomly visiting a leakage plot used to create the leakage model during the site visit.
- DNV confirmed that no activity-shifting leakage had occurred prior to the estimation of the lag period **/1/**.
- DNV confirmed that the project area does not include lands designated for legally sanctioned logging activities by reviewing the title for the Rukinga Sanctuary /3/ **/4/**.

3.2.2 Baseline Scenario

The selected baseline scenario is ongoing deforestation from subsistence agriculture. The rate of deforestation was calculated by defining a reference area that is near the project area and has similar conditions and drivers of deforestation and then observing the proportion of the reference area that is deforested at each of several points in time, ranging from 1987 to 2005.

DNV concludes that the selected baseline scenario appropriately applies to the project area because:

- There are settlements to the west and north of the project area and active deforestation is occurring on the outskirts of these settlements.

- There is a major highway near the eastern boundary of the project area and validators observed large amounts of locally produced illegal bush charcoal for sale and being transported along this highway.
- Observations of time-series land cover images show rapid deforestation continuing to occur within the reference region.
- Prior to the project start date, subsistence farmers had begun clearing land for farms within the project area, near the western boundary of the project, with the settlement apparently terminated by coordination with local village leaders and increased ranger patrolling of project lands beginning around the time of the project start.

It is DNV's opinion that the selection of the continuation of the pre-project practice of the conversion of forest to cropland as the baseline scenario is deemed to be appropriate.

3.2.2.1 The Cumulative Deforestation Model

A pilot study estimated the variance of land cover state observations. The project calculated that fewer than 1 900 observation points would be needed to meet statistical precision goals. The project elected to observe 2 000 points. Points were assigned by GIS software, in a regular grid pattern within the project boundary. LANDSAT imagery was obtained for the area, for 11 different years from 1987 to 2005. To build the Cumulative Deforestation Model, imagery was used from 1987 until the project start date (2005). For some years, images from different times within the year were tiled to create complete or relatively complete coverage of the project area. The project developed an image interpretation protocol and the protocol was used to guide classification of each point at each time for which imagery was obtained. 8 821 vegetation state observations were made.

In the region where the project is located, most deforestation occurs in a mosaic pattern. A key element of the methodology is having a consistent decision rule for distinguishing (a) areas of forest with nearby deforested fields, from (b) remnant patches of trees among fields that are classified as deforested. The image classification protocol states that if the forest fragment is surrounded by cleared area and the point is within a forest fragment but is less than one field width from the edge of the fragment, the point is classified as deforested.

Points that switched back and forth between forest and non-forest were identified. 164 points were flagged as having unlikely state transitions. Imagery for each flagged point was reviewed, and inconsistencies were removed.

Each vegetation state observation was given a weight, using the procedure described in VM0009. A commercial statistical software package was used to fit a logistic curve to the observed changes in forest state over time. The statistical uncertainty in the logistic model is 5.9% at the 95% confidence level.

Population was tested to see if it added explanatory power to the model. Population did not add power and was left out of the final deforestation model.

As allowed by the methodology, the project developer elected to be credited according to a linear deforestation rate that is cumulatively less than the logistic model at all times within the project life.

3.2.2.2 The Soil Carbon Loss Model

Soil carbon stocks were measured to a one-meter depth in undisturbed forest within the project boundary and in fields near the project that had been in agricultural use for at least 10 years. The average carbon stock was calculated for forest soil and for agricultural soil and the difference assumed to be the loss resulting from deforestation and conversion to agriculture. The observed 45% loss of forest soil carbon is within the common range of soil loss given in published studies of other locations around the world. Carbon loss was assumed to occur at a declining exponential rate, starting from the date of deforestation. The exponential rate was chosen to match the rate graphed in Figure 10 of Methodology VM0009.

During the validation process, the project proponent and validator became aware of an inconsistency in stated soil loss rates between the text of the approved methodology VM0009 Version 1.0 and the rate graphed in Figure 10 of the methodology. The validator will work with the methodology developer to write a corrected version of the methodology that eliminates this inconsistency.

3.2.2.3 Baseline Scenario for Selected Carbon Pools

The project developer has elected to count aboveground and belowground carbon in live trees and shrubs, aboveground and belowground carbon in herbaceous vegetation, and carbon in the top meter of soil.

No commercial harvesting of wood for long-lived wood products occurs within the project area. Very small amounts of wood are retained in subsistence use. Branches are used in wattle-and-daub walls of farm huts. Few trees are suitable for using as posts, and few posts are used in local construction or farming.

The cumulative deforestation model provides the baseline rate of deforestation for the project area. When a hectare is deforested, the carbon in woody biomass is assumed to be emitted to the atmosphere as CO_2.

The project is expected to reduce burning of stumps during clearing, which may reduce emission of methane from the burning. However, the project does not claim avoided methane from biomass burning as an emission reduction. Not claiming the avoided emission is conservative. Relatively small amounts of biomass are burned during land clearing in this area. Tree trunks appear to be left to decompose on site, used for domestic fuel, or removed prior to deforestation during illegal charcoal production. The project counts decomposition as emission and done not claim to reduce total wood fuel and charcoal emissions. Most tree branches are moved to the edges of fields to function as fencing. Because the amount of biomass burned is small, not counting avoided methane emissions from burning does not cause material inaccuracy in emissions accounting.

Woody debris decomposition rates in the area are not well documented. When asked how long some individual pieces of woody debris on tree measurement plots had been dead, local field staff gave estimates ranging from six to eighteen months for Class Two and Class Three woody debris. Pieces that local staff identified as being dead for at least 12 months were very light—for example, a few kilograms for a 20-cm diameter, 4-meter long tree trunk. Decomposition of buried dead wood is even less well documented. Soil sampling pits in forest revealed significant amounts of tough, live roots between 0.5 and 2 cm in diameter. However, hand tilling soil within a year of deforestation did not appear to be impeded by roots. As is common, it appears that decomposition of buried dead wood is faster than decomposition of aboveground dead wood.

Especially when trees with dense wood (and presumably slower decomposing wood) are removed for charcoal before land clearing for farming, it appears that little carbon stock remains in woody debris one year after clearing. Counting woody debris pieces on a couple of sites gave densities on the order of 20 pieces per hectare greater than 15-cm in diameter. Even if the points where woody debris was counted had unusually high woody debris mass, it is unquestionable that within one year of deforestation the carbon stock in the remaining wood is substantially less than the carbon stock in the dead wood in undisturbed forest. Because the project elected not to count avoided emissions from woody debris in the forest, it is conservative not to count any carbon that may remain stored in biomass that survives more than a year after deforestation.

Soil carbon stocks in undisturbed forest and in fields that had been cleared at least 10 years previously were measured by sampling. The difference between the average soil carbon stock in forest and the average soil carbon stock in tilled fields was taken to be the soil carbon loss on clearing. Soil carbon loss dynamics are not well documented in this ecosystem. As noted above, the soil carbon loss function used to calculate soil emissions after deforestation was set to match Figure 10 in the approved methodology.

3.2.3 Project Boundary

The project area covers 100% (30,169 hectares) of the Rukinga Sanctuary. At the time of the project start date, 93% of the project area was forested for 10 years prior to the project start date. The project boundary was confirmed by DNV by reviewing the two documents provided by Wildlife Works, the leasehold title to Rukinga Ranch /2/, the Carbon Rights Agreement between Wildlife Works, Inc. and Rukinga Ranching Co. /3/.

3.2.4 Additionality Assessment

As per the approved VCS methodology, "VM0009 – Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0," the additionality of the project is demonstrated through the latest version of the VT0001 VCS Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities /24/.

Identification of Alternative Land-use Scenarios

DNV has confirmed that the alternative land use scenarios identified by Wildlife Works are appropriate. It was also determined that the identified alternative land uses are consistent with enforced mandatory laws and regulations.

DNV confirmed that the project is not mandated by any enforced law, statute, or other regulatory framework by reviewing the relevant laws and regulations outlined in the project document, leasehold title, management authority agreement, and the audit report performed by the Kenya National Environmental Management Authority **/1/ /3/ /4/ /5/**.

Investment Analysis

DNV confirmed the project proponent's simple cost analysis. DNV reviewed the financial statements for Wildlife Works and has confirmed that the project proponent has been spending approximately USD$300 000-$400 000 per year without any significant income to offset the costs to implement mitigation activities such as school building, scholarships, ranger patrols, and reforestation of deforested indigenous forests **/7/**. It is therefore DNV's conclusion that without the revenue from the sale of GHG credits, the project activities are economically unsustainable

Step 4: Common Practice Analysis

Though it is common practice to protect wilderness areas and provide sustainable development support for rural African communities in Africa, governments and donor agencies do not have a history of protecting the private lands. This project is the first AFOLU Project Activity of its type in Kenya. As such, it can be reasonably concluded that the project is not common practice.

In summary, it is demonstrated that the project activity is not a likely baseline scenario due to the need of financial revenues to offset mitigation activities, and that the emission reductions are additional to what would have happened in the absence of the project activity.

3.2.5 Leakage

Following methodology VM0009, the project developer has randomly located plots for measuring leakage. Baseline amounts of degradation and deforestation have been measured on these plots. The needed number of plots was calculated using the observed variance of forest state observations across the reference area.

Leakage model parameters were calculated from the field measurements and compared to the cumulative deforestation model. The leakage lag was calculated as the difference between the deforestation curve and the leakage curve, and was given in the Project Document.

As required by the methodology VM0009, leakage is measured empirically post project start date from the shifted leakage curve. At the time of the next verification of offsets generated by the project, the leakage plots can be re-measured and the change in degradation and deforestation calculated. These measurements and calculations are expected to support quantification of the amount of leakage, if any, that has occurred. Thus leakage will be empirically assessed during the next verification cycle.

As part of the project validation, the validator is to assess the project proponent's leakage ex-ante estimation that is likely to occur during the life of the project. Leakage is defined as displacement of deforestation from within the project area to outside the project area. This project will quantify leakage by measuring the rate of deforestation observed over time within the leakage area. The leakage area is selected as equivalently accessible to drivers of deforestation that would have deforested the project area. Any deforestation on the leakage area that is greater than the baseline rate of deforestation is counted as leakage.

The project is implementing a variety of leakage mitigation activities that are providing alternative livelihoods to local people. Leakage mitigation activities include employment in a clothing factory, work on project monitoring and Rukinga sanctuary protection, development projects through a local women's center, a sustainable charcoal program, schooling, and other activities. These activities are scheduled to be expanded in the future, using funding from the sale of the initial tranche of offsets generated by the project. DNV does not have data on the complete number of people who benefit from leakage mitigation activities, and does not know if these people would have cleared forest for subsistence agriculture in the absence of the project. Also, it is not possible to know for certain the scale at which leakage mitigation activities will be implemented in the future.

If leakage mitigation activities are less than the displaced demand for land, leakage is likely to occur. The current baseline deforestation is 955 hectares per year within the project area. If each farm were to clear 2.5 hectares (the area estimated by the project proponent), this would mean that the project should avoid the establishment of 382 new farms each year to avoid leakage. If the baseline rate of deforestation is adjusted down in the future, clearing for fewer farms would need to be avoided.

We have been unable to find historical leakage observations for any other REDD projects and have no historical data on which to make actuarial projections for this project. As a reference point, we assessed The Climate Action Reserve's default leakage risk for crop displacement activities is identified as 24 percent /30/. As noted, we do not have data on the exact number of people involved in leakage mitigation activities, and do not know the extent to which leakage mitigation activities will be implemented over the life of the project. Also, DNV is unable to determine if people involved in leakage mitigation activities would have cleared forest if they did not participate in leakage mitigation activities.

In the absence of past project data, any estimate of future leakage thus needs to rely on the conditions observed during site visitation, knowledge of other ecosystems, assessment of the agents and drivers of deforestation when judging the appropriateness of ex-ante leakage estimation of this project.

Estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment that this is appropriate given the conditions of the project and is consistent with values proposed by The Climate Action Reserve. DNV thus finds the leakage assessment to conform to the requirements in the approved methodology VM0009.

3.3 Monitoring Plan

The project applies the approved VCS "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0." The monitoring plan is in accordance with the methodology. The monitoring plan specifies how to measure and document real, achieved emission reductions over the life of the project. As required by the methodology VM0009, leakage will be measured ex post from the shifted leakage curve.

All the variables defined in VCS, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" are measured in order to determine and account for emission reductions. Each carbon pool monitored is a separate variable, with the exception that the project has elected to count large and small live trees together.

The baseline is calculated ex-ante. The current baseline is reported in the project document.

Although VCS addresses leakage separately from monitoring, it is useful to consider this project's leakage monitoring as a part of the overall monitoring program. The project document reports computation of a "lag" variable, used to find correspondence between the baseline deforestation model curve and the observed degradation and deforestation measured on leakage plots. Remeasurement of the leakage plots in the future, calculation of total degradation and deforestation on the leakage area, and adjustment by the lag factor will yield a cumulative actual deforestation number that can be compared to the baseline deforestation proportion for the date of the leakage measurement.

At future times when offsets are to be verified, the project developer will map any deforestation that may occur within the project boundary. Biomass carbon stocks will be re-measured using the same protocols as used for the original measurement. Change in carbon stocks within the project area are included in the calculation on net emission reductions as the CPE term of Equation 34 of the approved methodology. Project emissions may be positive (emissions) or negative (a sink resulting from forest growth).

Consistent with the VCS requirements for grouped projects, the data management systems used by Wildlife Works, Inc. are centralized. The general responsibility and authority for registration, monitoring, measurement and reporting activities are defined in the VCS PD. Wildlife Works Inc. has a contract with the landowner, Rukinga Ranching Co. Ltd., to measure, monitor, report, and register offsets generated by avoiding deforestation within the project area. The agreement was ratified in a general meeting of the shareholders of the landowning company. DNV has reviewed this documentation /2/.

The parameters being monitored were discussed with the project proponent. The project proponent has developed sufficient guidance for image classification and monitoring carbon in soils and biomass in order to ensure that reliable field data is collected /9//12//13/.

The frequency of the data collection depends on the specific parameter included in the monitoring plan. DNV found that these are in line with the requirements of the methodology, VM0009.

3.4 Calculation of GHG Emissions and Reductions

DNV considered the VCS Standard /24/, VCS AFOLU guidance /26/, VCS approved methodology VM0009 /23/, conditions observed during site visitation, and knowledge of other ecosystems and forest projects when judging the appropriateness of GHG emission reduction calculations of this project. DNV concludes that all significant emission sources are included in project emission calculations. Calculation equations are published in VM0009. DNV reviewed the calculations in detail and, with the corrections made in response to the CARs, calculations are correctly applied as specified by the VM0009. Factors used in calculations are stated in the project document and are derived from local measurements, VM0009, or widely-referenced public sources. Equations for specifying statistical confidence intervals are specified in VM0009. Statistical confidence intervals are calculated for the baseline deforestation function, allometric equations developed to predict tree biomass, and carbon stocks estimated from sampling. As with any sampling, unbiased measurement and classification errors are expected to increase the statistical error observed in sampling. DNV found no potential sources of bias in counting, other than the conservative exclusions described above. Statistical confidence levels meet required precision levels.

The GHG Sources Determination

GHG sources that are counted are live trees aboveground and belowground biomass, shrub aboveground and belowground biomass, herbaceous aboveground biomass, and soil carbon. Emissions that are negligible or conservatively omitted include woody debris, methane from biomass burning, and fuel consumed in land management. Any sink in long-term wood products is negligible. Credible justification of the selection of the carbon pools are included within the Project Document and DNV assessed that selection conforms to the requirements set out in VM0009.

The Correctness and Transparency of Formulas and Factors Used

The approaches to estimate emission reductions for years 2005-2010 are described in the VCS Project Document. DNV can confirm that the approaches conform to the requirements in the VCS approved methodology “VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.”

Estimated Cumulative Project Lifetime Emission Reductions

As part of the project validation, the validator is to express its estimate of a conservative amount of offsets the project is likely to generate through the life of the project. The project proponent estimates that the project will generate 4 525 767 metric tons CO2e of offsets over the project life. This estimate is calculated using by:

- Extending the current baseline deforestation rate through the project life,
- Assuming that the carbon stock within the project boundary does not change (there is no net tree growth or loss, soil carbon stock change, and no deforestation within the project area), and
- Assuming 20% leakage in years 2011-2034.
- Applying a 20% AFOLU buffer deduction through the entire project crediting period.

There is a high likelihood that at least one of these three factors will change over the project life. The baseline deforestation rate has limited chance of increasing because approximately 95% of the project area is assumed to become deforested by the end of the project life. The baseline could be revised downward if less deforestation is observed over time in the reference area. If the baseline deforestation rate is revised down, the project would generate fewer offsets, all other things remaining unchanged. The carbon stock within the project area could rise or fall over time. A portion of the project area had been deforested in the past and is now re-growing, and is likely to have carbon stock increase. However, even if this formerly deforested area increases to the carbon density of the average stock of the forest in the project area, it would be only about a 6% increase in the total project carbon stock. It is possible that because of drought or disturbance the existing forest carbon stock could decline. Increasing carbon stock within the project area would increase the number of offsets generated by the project, and decreasing carbon stock would decrease the number of offsets generated. There is a chance that the leakage mitigation activities executed by the project will not succeed in mitigating all the demand for land displaced by the project, and leakage may occur. The project may not receive credit for positive leakage, so if there is any leakage it can only reduce the amount of offsets generated by the project.

DNV is to express its opinion as to a conservative amount of offsets the project is likely to generate over the project lifetime. To be conservative, the estimate must be a number such that it is likely that the project will not generate less than the estimated amount of offsets. We note that the factors that could result in increased generation of offsets are highly unlikely to cause an increase in offset generation greater than a few percent. At the same time, it is possible that the factors that could result in the project generating fewer offsets could result in a large reduction in benefits. We have been unable to find historical leakage observations for any other REDD projects and have no historical data on which to make actuarial projections for this project.

In the absence of project data, estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment that this is appropriate given the conditions of the project and is consistent with values proposed by the Climate Action Reserve.

DNV therefore can confirm that the calculation equations and input values are proper as described above, and hence can confirm that the emission reduction estimates are proper, which are on the average 4 525 767 tCO2e per year over the selected 30 year crediting period.

3.5 Environmental Impact

The environmental and socio-economic impacts of the project activities have been assessed within the context of the Audit report conducted by the Kenya National Environmental Management Authority in December, 2006 /5/ and the Climate, Community, and Biodiversity Alliance (CCBA) validation that Wildlife Works, Inc. underwent in 2009 with Scientific Certifications Systems (SCS) /8/. DNV has reviewed all documentation pertaining to the environmental audit and the CCBA validation. In summary, DNV concluded that no negative environmental or socio-economic impacts are expected from project activities.

3.6 Comments by Stakeholders

The relevant stakeholders identified for this project activity include members of the Taita community, the Duruma tribe, and local employees tasked with the implementation and maintenance of the Rukinga REDD project. A local stakeholder process was carried out by soliciting public comments through the internet and postings on local area notice boards. DNV reviewed all comments and found that the process complies with VCS requirements. In addition, DNV reviewed the CCBA project validation report conducted by SCS in 2009 /8/ and stakeholder comments received during the CCBA process /8/. The project area underwent a CCBA project validation on 22 December, 2009. Feedback from such stakeholders regarding the REDD project was very positive /8/.

4 VALIDATION CONCLUSION

Det Norske Veritas (U.S.A.), Inc. (DNV) has performed a validation of the "The Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" in Kenya on the basis of Voluntary Carbon Standard 2007.1 (VCS), as well as criteria for consistent project operations, monitoring and reporting.

The project proponent is Wildlife Works, Inc. DNV has confirmed that Wildlife Works, Inc. has the right to all and any reductions generated by the Project during the Project Crediting Period 1 January, 2005 – 31 December, 2034.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfillment of stated criteria.

The project correctly applies the approved VCS methodology element VM0009 – Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.

The main project activity is to prevent deforestation caused by slash and burn and subsistence farming activities. The project results in reductions of GHG emissions that are real, measurable and give long-term benefits to the mitigation of climate change and have clear socio-economic benefits to the communities surrounding the project area. Emission reductions attributable to the project have been shown to be additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be 4 525 767 *tCO2e over the 30-year crediting period (1 January, 2005 to 31 December, 2034). This includes project emissions, total confidence deduction, a 20% leakage deduction applied to years 2011-2034 as per VM0009, and the VCS AFOLU buffer deductions currently assessed at 20%. This estimate assumes the baseline does not change during the baseline reevaluation.*

Estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment given a lack of past project data that this is appropriate given the conditions of the project and find the assessment to conform to the requirements in the approved methodology VM0009.

The approaches to estimate emission reductions are assessed to conform to the requirements in the VCS and approved methodology VM0009.

Adequate training and monitoring procedures have been implemented.

In summary, it is DNV's opinion that the "The Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" in Kenya as described in the VCS PD of 31January, 2011, meets all relevant VCS 2007.1 requirements and correctly applies the VCS approved methodology element VM0009 – Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.

APPENDIX A

Validation Protocol

Table 3 Requirements Checklist

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
A. *General Description of Project Activity* *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial and temporal boundaries clearly defined?	***/1/***	DR	Section 5.2 - The project area covers 100% (30,169 ha) of the Rukinga Sanctuary. At the time of the project start date, 93% of the project area was forested for 10 years prior to the project start date. The project boundary was confirmed by DNV by reviewing the two documents provided by Wildlife Works, the leasehold title to Rukinga Ranch **/2/**, the Carbon Rights Agreement between Wildlife Works Inc. and Rukinga Ranching Co. **/3/**.		OK
A.2. Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
A.2.1. Does the project design reflect current good practices?	***/1/***	DR, I	The project design outlines current best practices for implementing the project activities. While onsite, DNV witnessed fully operational nurseries, ranger force, a local GIS analyst, and engagement with the		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			community surrounding the project area.		
A.2.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies?	/1/	DR, I	The project proponent uses state of the art GIS and modelling techniques.		OK
A.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/	DR, I	Wildlife Works is working with the REDD Focal Point within the Government of Kenya on future REDD legislation to include sub-national nesting rules.		Ok
A.2.4. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period?	/1/	DR, I	Yes – Procedures outlined within the *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
A.2.5. Does the project make provisions for meeting training and maintenance needs?	/1/	DR, I	Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Is the baseline methodology previously approved by the VCS?	/1/	DR, I	Yes – VM0009 *Methodology for Avoided Mosaic Deforestation of Tropical Forests*		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			Version 1.0.		
B.1.2. Is the baseline methodology the one deemed most applicable for this project and is the appropriateness justified?	/1/	DR, I	Yes – VM0009 was developed specifically for this project.		OK
B.2. Baseline Determination *The choice of baseline will be validated with focus on whether the baseline is a likely scenario, whether the project itself is not a likely baseline scenario, and whether the baseline is complete and transparent.*					
B.2.1. Has the baseline been determined using conservative assumptions where possible?	/1/	I	As with any sampling, unbiased measurement and classification errors are expected to increase the statistical error observed in sampling. DNV found no potential sources of bias in counting, other than the conservative exclusions described above. Statistical confidence levels meet required precision levels. **CAR 5** The coefficients for the deforestation model given in the PD must be corrected to match the coefficients produced by the model and used in calculations of cumulative deforestation. **CAR 6** The PD should describe the method used to determine bulk density of disturbed soil samples, and document that the protocol	CAR 5, 6, 7	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			is well established. **CAR 7** The PD should specify the acceptable degree of error allowed in forest measurements, and how errors larger than acceptable amounts shall be dealt with.		
B.2.2. Has the baseline been established on a project-specific basis?	/1/	DR, I	Yes – The baseline is specific to the characteristics of the reference region that have similar drivers of deforestation.		OK
B.2.3. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	The PD identifies possible risks that could have an impact on the project baseline, including change in legislation. The government of Kenya has shown support for the project and has no recent history of expropriation of private conservation lands.		OK
B.2.4. Is the baseline determination compatible with the available data?	/1/		See section 3.2		OK
B.2.5. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario?	/1/		Encroachment of subsistence farming (the primary driver of deforestation) to the borders of the project area were evident. It was demonstrated to DNV that the project activity, conservation of forest, was not a likely baseline scenario in the project area.		OK
B.2.6. Have the major risks to the baseline been identified?	/1/	DR	Yes – The following risks have been identified: change in legislation, income, crop failure, invasion of cattle grazers due		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			to famine in adjacent communities, drought, wildlife, cash crops, and fire		
B.2.7. Are all literature and sources clearly referenced?	**/1/**	DR	Yes - Factors used in calculations using literature and sources are clearly widely-referenced public sources.		OK
C. Duration of the Project/ Crediting Period/project proponent *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	**/1/**	DR, I	The project start date is 1 January, 2005, which is the date Wildlife Work,s Inc. assumed financial responsibility for the project area and began specific GHG mitigation activities. The selected crediting period is from 1 January, 2005 to 31 December, 2034. **CAR 3** The justification of the project start date must conform to VCS requirements.	CAR 3	OK
C.1.2. Is the assumed crediting time clearly defined?	**/1/**	DR, I	The selected crediting period is from 1 January, 2005 to 31 December, 2034.		OK
C.1.3. Is the project proponent identified and has it been confirmed to be an individual or organization that has overall control and responsibility for a greenhouse gas project?	**/1/**	DR, I	Yes – Wildlife Works, Inc. is the project proponent for this project. Wildlife Works, Inc. assumed financial responsibility for the project area and began specific GHG mitigation activities on 1 January, 2005 when the company entered into an agreement with Rukinga Ranching Company, Ltd.		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
D. Monitoring Plan *The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed (blue text contains requirements to be assessed for optional review of monitoring methodology prior to submission and approval by CDM EB).*					
D.1. Monitoring Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
D.1.1. Is the monitoring methodology previously approved by the VCS?	***/1/***	DR	Yes – VM0009 *Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.*		OK
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	***/1/***	DR	Yes – The monitoring methodology was developed specifically for this project.		OK
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	***/1/***	DR	Yes – VM0009 outlines sufficient practices for a monitoring methodology.		OK
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	***/1/***	DR	Yes – VM0009 outlines sufficient practices and is transparent.		OK
D.2. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
D.2.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	***/1/***	DR, I	Yes – Procedures outlined within the *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
D.3. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
D.3.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR, I	Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.4. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
D.4.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR, I	Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR, I	The selected baseline scenario is ongoing deforestation from subsistence agriculture. The rate of deforestation was calculated by defining a reference area that is near the project area and has similar conditions and drivers of deforestation and then observing the proportion of the reference area that is deforested at each of several points in time ranging from 1987 to 2005. The parameters of the cumulative		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			deforestation model are in line with the requirements outlined in VM0009.		
D.4.3. Will it be possible to monitor / measure the specified baseline indicators?	/1/	DR, I	All the variables defined in VCS, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" are measured in order to determine and account for emission reductions. Each carbon pool monitored is a separate variable, except that the project has elected to count large and small live trees together.		OK
D.4.4. Will the indicators give opportunity for real measurements of baseline emissions?	/1/	DR, I	At future times when offsets are to be verified, the project developer will map any deforestation that may occur within the project boundary. Biomass carbon stocks will be re-measured using the same protocols as used for the original measurement.		OK
D.5. Environmental Impacts and Stakeholders Comment *It is checked to determine if any additional environmental permits are required and if sufficient documentation of environmental impacts are provided.* *It is checked if any comments received from stakeholders are summarized properly*					
D.5.1. Are any additional environmental permits needed for the project activity? If yes, is there any approval documentation provided?	/5/	DR, I	The environmental and socio-economic impacts of the project activities have been assessed within the context of the Audit report conducted by the Kenya National		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			Environmental Management Authority in December, 2006. DNV has reviewed all documentation pertaining to the environmental audit.		
D.5.2. Any comments received from stakeholders should be summarized in the VCS PD.	/8/	DR, I	A local stakeholder process was carried out by soliciting public comments through the internet and posting on local area notice boards. DNV reviewed all comments and found that the process complies with VCS requirements.		OK
D.6. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
D.6.1. Is the authority and responsibility of project management clearly described?	/1/		Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.2. Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/		Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.3. Are procedures identified for training of monitoring personnel?	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
D.6.4. Are procedures identified for maintenance of monitoring equipment and installations?	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.5. Are procedures identified for monitoring, measurements and reporting?	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.6. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.7. Are procedures identified for review of reported results/data?	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
E. Calculation of GHG Emissions by Source *It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.*					
E.1. Project GHG Emissions *The validation of ex-ante estimated project GHG emissions focuses on transparency and completeness of calculations.*					
E.1.1. Are all aspects related to direct and indirect GHG emissions captured in the project design?	/1/	DR, I	GHG sources that are counted are live tree aboveground and belowground biomass, shrub aboveground and belowground biomass, herbaceous aboveground biomass, and soil carbon. Emissions that are negligible or conservatively omitted		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			include woody debris, methane from biomass burning, and fuel consumed in land management. Any sink in long-term wood products is negligible. Credible justification of the selection of the carbon pools are included within the PD and DNV assessed that it was in line with the requirements set out in VM0009.		
E.2. Leakage *It is assessed whether leakage effects i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project) have been properly assessed and estimated ex-ante.*					
E.2.1. Are potential leakage effects beyond the chosen project boundaries properly identified?	***/1/***		Following methodology VM0009, the project developer has randomly located plots for measuring leakage. Baseline amounts of degradation and deforestation have been measured on these plots. The needed number of plots was calculated using the observed variance of forest state observations across the reference area. **CAR 10** Please provide a justification for the estimation of the ex-ante leakage rate for the project crediting period as per the requirements of VM0009 (pg 69, pg 70).	CAR 10	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
E.3. Baseline Emissions *The validation of ex-ante estimated baseline GHG emissions focuses on transparency and completeness of calculations.*					
E.3.1. Have the most relevant and likely operational characteristics and baseline indicators been chosen as the reference for baseline emissions?	/1/	DR, I	DNV finds that the project proponent has appropriately defined a reference area, appropriately measured deforestation over time within the reference area, and appropriately monitored starting biomass and soil carbon stocks within the project boundary.		OK
E.3.2. Are the baseline boundaries clearly defined and do they sufficiently cover sources and sinks for baseline emissions?	/1/	DR, I	DNV finds that the project proponent has appropriately defined a reference area, appropriately measured deforestation over time within the reference area, and appropriately monitored starting biomass and soil carbon stocks within the project boundary.		OK
E.3.3. Are the GHG calculations documented in a complete and transparent manner?	/1/		The approaches to estimate emission reductions for years 2005-2010 are described in the VCS Project Document. DNV can confirm that the approaches conform to the requirements in the VCS approved methodology "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" and that a conservative approach has been taken. **CAR 4**	CAR 4	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			The factor for the root:shoot ratio for trees should be from the appropriate vegetation type for the project location. The vegetation type should be taken from an authoritative public source. **Accepted and Corrected.** The FAO Africover dataset classifies the Project Area as Tropical Dry Shrubland for which the root:shoot ratio for Trees is 0.4. We have changed our root:shoot ratio for Large and Small Trees to 0.4.		
E.3.4. Are uncertainties in the GHG emission estimates properly addressed in the documentation?	**/1/**	DR, I	The statistical uncertainty in the logistic model is 5.9% at the 95% confidence level.		OK
E.3.5. Have the project baseline(s) and the project emissions been determined using the same appropriate methodology and conservative assumptions?	**/1/**	DR, I	The approaches to estimate emission reductions for years 2005-2010 are described in the VCS Project Document. DNV can confirm that the approaches conform to the requirements in the VCS approved methodology "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" and that a conservative approach has been taken		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
E.4. Emission Reductions *Validation of ex-ante estimated emission reductions.*					
E.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	**/1/**	DR, I	The total emission reductions from the project are estimated to be 4 525 767 tCO_2e over the selected 30-year crediting period (1 January, 2005 to 31 December, 2034). This includes project emissions, the total confidence deduction, 20% ex-ante leakage estimate, and the VCS AFOLU buffer determination of 20%. **CAR 8** The table of NERs and uncertainty calculations should be updated in the PD to reflect the amounts and final calculations as verified. **CAR 9** Equations for baseline emissions are not properly applied in the spreadsheet "Rukinga NER analysis v4.xlsx." The incorrectly applied equations address above and belowground biomass of trees and non-tree vegetation, and soil. The incorrectly applied equations are numbered in the methodology as equations 21, 23, 24, 26, and 26. The error is that when calculating 2006 emissions (column D in the spreadsheet), cumulative emissions as of the prior period are not subtracted from the cumulative emissions	CAR 8, 9	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			of the current monitoring period. The terms in the equations that are missing from the calculations are for monitoring period m-1 (for biomass) and i-1 (for soil). Numbers for these terms must be added to the calculations. These terms appear to be properly included and counted in subsequent years, in columns E through AG of the spreadsheet. In the spreadsheet, this error is manifested in cells D24, D25, D28, D29, and D33.		
E.5. ISO 14064-2:2006 clause 5.2: *Does the VCS PD contain the following essential elements?*	*/1/*				
E.5.1. Does the VCS PD contain the following essential elements as set out in ISO 14064-2:2006 clause 5.2.					
E.5.1.1. Project title, purpose(s) and objective(s)?	*/1/*		**CL 1** Please include a reference to the final approved VCS methodology, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests." **CL 2** Please finalize all references to documents, including the title, version, and date. **CL 3** Within the *AFOLU Non-Permanence Risk Analysis and Buffer Determination*, a reference to the project name should be	CL 1-3	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			included within the title.		
E.5.2. Type of GHG project.	**/1/**		Yes – The project activity falls under VCS sectoral scope 14 (AFOLU) REDD Mosaic Deforestation.		OK
E.5.3. Project location, including geographic and physical information, allowing for the unique identification and delineation of the specific extent of the project.	**/1/**	DR	Project location and delination of the specific extent of the project is made clear.		OK
E.5.4. Conditions prior to the project initiation	**/1/**	DR	Section 6.1		OK
E.5.5. A description of how the project will achieve GHG emission reductions and/or removal enhancements	**/1/**	DR	Section 61		OK
E.5.6. Project technologies, products, services and the expected level of activity.	**/1/**	DR, I	Project activities include: 1) Wildlife Works Sustainable Development Initiatives 2) Organic Greenhouse 3) Dryland farming scheme 4) REDD Forest and Biodiversity monitoring 5) Ranger force team 6) Ecotourism 7) School construction and bursary scheme		OK
E.5.7. Aggregate GHG emission reductions and removal enhancements, stated in tonne of CO2e, likely to occur from the GHG project.	**/1/**	DR, I	The total emission reductions from the project are estimated to be 7,542,945 tCO_2e over the selected 30 year crediting period (1 January 2005 to 31 December 2034). This includes project emissions and the total confidence deduction but does not include the VCS AFOLU buffer determination of 20% and assumes leakage to be 0.		OK
E.5.8. Identification of risks that may substantially affect the project's GHG emission reduction or removal	**/1/**	Dr	Section 1.11 - Yes – The following risks have been identified: Change in legislation,	CAR 2	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
enhancements.			income, crop failure, invasion of cattle grazers due to famine in adjacent communities, drought, wildlife, cash crops, and fire **CAR 2** It is our assessment that the buffer determination is a medium and the final buffer withholding percentage should be should be 20% (see Section 3.7"*Buffer Risk Determination" in DNV VCS Verification Report / Verification Statement Revision 1 31 January 2011*)		
E.5.9. Roles and responsibilities, including contact information of the project proponent other project participants, relevant regulator(s) and/or administrators of any GHG Program(s) to which the GHG project subscribes.	**/1/**	DR	Section 1.15 – The project proponent is Wildlife Works Inc. Appropriate contact information is included within the project document.		OK
E.5.10. Any information relevant for the eligibility of a GHG project under a GHG Program and quantification of GHG emission reductions or removal enhancements, including legislative, technical, economic, sectoral, socio-cultural environmental, geographic, site-specific and temporal information.	**/1/**	DR, I	The project area covers 100% (30,169 ha) of the Rukinga Sanctuary. At the time of the project start date, 93% of the project area was forested for 10 years prior to the project start date. The project boundary was confirmed by DNV by reviewing the two documents provided by Wildlife Works, the leasehold title to Rukinga Ranch **/2/**, the Carbon Rights Agreement between Wildlife Works Inc. and Rukinga Ranching Co. **/3/**.		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
E.5.11. A summary of environmental impact assessment when such an assessment is required by applicable legislation or regulation.	**/1/**		The environmental and scoio-economic impacts of the project activities have been assessed within the context of the Audit report conducted by the Kenya National Environmental Management Authority in December DNV has reviewed all documentation pertaining to the environmental audit.		OK
E.5.12. Relevant outcomes from stakeholder consultations and mechanisms for on-going communication.	**/1/**		A local stakeholder process was carried out by soliciting public comments through the internet and posting on local area notice boards. DNV reviewed all comments and found that the process complies with VCS requirements.		OK
E.5.13. Chronological plan for the date of initiating project activities, date of terminating.	**/1/**		The project start date is 1 January 2005, which is the date Wildlife Works Inc. assumed financial responsibility for the project area and began specific GHG mitigation activities. The selected crediting period is from 1 January 2005 to 31 December 2034.		OK
E.5.14. Notification of relevant local laws and regulations related to the project and demonstrate compliance with them.	**/1/**	DR, I	Section 1.10 – Wildlife Works Inc. documents the relevant local laws and regulations and was found to be in compliance with these regulations.		OK
E.5.15. Does the VCS PD contain a Proof of Title which includes either a legislative right, right under local	/1/	DR, I	Section 8.1 – Rukinga Ranching Company Ltd has legal title to the project area land.	CL 4	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
common law, ownership of land, or a contractual arrangement with the owner of the land			A copy of the title deed was provided to DNV. Wildlife Works Inc acquired the carbon rights from the landowner in 2009. **CL 4** It would help to communicate to the reader if the PD were to include a graphic that lists the organizations involved in the project (Rukinga Ranching, WW Inc, WW EPZ, WW Sanctuary, WW Carbon) shows the relationship between them.		

APPENDIX B

Resolution of Corrective Action and Clarification Requests

Table 4 Resolution of Corrective Action and Clarification Requests

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
CAR 1 The monitoring report must be a stand alone document from the project documentation. (VCS Program Normative Document: Double Approval Process Version 1.1 Section 6.2.1) Title page should be included with monitoring period (Jan 1 2005- December 31, 2010), client name, date, name of project, and version number on front cover.		**Accepted.** Monitoring report broken out as a standalone document. The document is entitled 'VCS Monitoring Report Version 1.0'	CAR closed.
CAR 2 It is our assessment that the buffer determination is a medium and the final buffer withholding percentage should be should be 20% (see Section 3.7"*Buffer Risk Determination" in DNV VCS Verification Report / Verification Statement Revision 1 31 January 2011*)		**Accepted and changed to 20%.**	(see Section 3.7"*Buffer Risk Determination" in DNV VCS Verification Report / Verification Statement Revision 1 31 January 2011*) CAR closed.
CAR 3 The justification of the project start date must conform to VCS requirements.		**Accepted and completed. The following text was inserted into Section 5.2 in the PD.** "Wildlife Works took financial responsibility for all conservation activities within the Project Area as of January 1st 2005, as a result of the agreement between Wildlife Works and Rukinga Ranching Company, Ltd., the	The January 1, 2005 project start date is valid because Wildlife Works Inc. took financial responsibility for the project land in 2005 and began implementing project actions within the project area only after this.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
		landowner, a copy of which was provided to the Validators. Wildlife Works began conservation activities, centered around our ecofactory, prior to 2005, but those activities were located outside the Project Area. The VCS rule for AFOLU projects starting after Jan 1 2002 is that they have no specific time requirement for validation and verification. Language exists in the MED to clarify the type of project activities that qualify a project for a historical project start date. Wildlife Works fully conforms to these MED requirements."	Prior to 2005, conservation activities implemented by Wildlife Works Inc. were implemented outside the project area. CAR closed
CAR 4 The factor for the root to shoot ratio for trees shall be from the appropriate vegetation type for the project location. The vegetation type should be taken from an authoritative public source.		**Accepted and corrected.** The FAO Africover dataset classifies the Project Area as Tropical Dry Shrubland for which the root:shoot ratio for Trees is 0.4. We have changed our root:shoot ratio for Large and Small Trees to 0.4.	The sources used for the root to shoot ratios and vegetation types are appropriate. CAR closed.
CAR 5 The coefficients for the deforestation model given in the PD must be corrected to match the coefficients produced by model and used in calculations of cumulative deforestation.		**Accepted and corrected.** The coefficients previously listed in the PD were the result of an obsolete version of the grid classification data file. The new and correct coefficients now match the CDM model.	Coefficients in the PD were changed and now match outputs of the statistical program used to calculate the coefficients of the logistic model of deforestation. The linear model coefficients also were changed, and meet the criteria that the cumulative deforestation predicted by the linear model is less that the

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
			cumulative deforestation predicted by the logistic model in each year of the project life. Further, the linear coefficients were revised to reflect the clarification of the methodology, that the accrual of offsets is at a constant rate, starting from the carbon stock within the project boundary at the time of the start of the project. This clarification avoids the assumption that, in the first year of the project, the cumulative baseline deforestation within the project rises to match the cumulative deforestation in the reference area. CAR closed.
CAR 6 The PD shall describe the method used to determine bulk density of disturbed soil samples, and document that the protocol is well established.		**Accepted and completed. Text inserted into the PD:** "The Bulk Density method used by the outside laboratory that performed the soil testing for the PD is an official FAO methodology for measuring Bulk Density of disturbed soil samples." A copy of the FAO approved protocol was provided to the Validators.	The addition of the following language on page 66 is sufficient: "The Bulk Density method used by the outside laboratory that performed the soil testing for the PD is an official FAO methodology for measuring Bulk Density of disturbed soil samples" CAR closed.
CAR 7 The PD shall specify the acceptable degree of error		Accepted and done. Text inserted into the PD: Quality Control (QC) for Biomass plots was conducting	Quality control guidance was inserted into Section 13.14 of the

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
allowed in forest measurements, and how errors larger than acceptable amounts shall be dealt with.		using the following protocol; 1. An independent QC team not involved in the original plot sampling of each plot is given coordinates for the plot centers for 5% of the original plots. The Independent QC team is also given blank plot data recording sheets, plot radius for each carbon pool, a copy of the plot sampling "Standard Operating Procedure – Biomass", dbh tape, compass and long tape, and sent out to measure the plots as though they were doing it for the first time. 2. The QC team returns to headquarters with data sheets which are given to a third party analyst, who are neither on the original nor the QC plot team, for comparison against the original plot data sheets. 3. Any discrepancies are noted, and when all sheets have been compared, the two plot teams are brought together with the VP African Field Operations or his deputy the Operations Manager to discuss and explain any significant variances (±15%) 4. The monitoring team lead is informed if more than 1 QC plot contains significant discrepancies from the original data sheets, and further QC plots may be required to establish the extent of the quality errors. 5. The Monitoring Team Lead and/or senior carbon staff makes a determination as to whether a plot needs to be revisited: For a given plot, the number of trees that fall outside the	PD. CAR closed.

Draft report corrective action requests and requests for clarifications		Summary of project participants’ response	Final conclusion
		±15% threshold for change since original measurement is counted. If greater than 10% of trees in that plot fall outside the threshold, and QC has been performed on the plot within 1 year from original measurement, the plot must be re-measured. If QC has been performed on a plot greater than 1 year after original measurement, the threshold described above shall be relaxed to 15%.	
CAR 8 The table of NERs and uncertainty calculations should be updated in the PD to reflect the amounts and final calculations as verified.		**Accepted and updated.** The table of NERs now matches the final calculations as verified.	CAR closed.
CAR 9 Equations for baseline emissions are not properly applied in the spreadsheet "Rukinga NER analysis v4.xlsx". The incorrectly applied equations address above and belowground biomass of trees and non-tree vegetation, and soil. The incorrectly applied equations are numbered in the methodology as equations 21, 23, 24, 26, and 26. The error is that when calculating 2006 emissions (column D in the spreadsheet) cumulative emissions as of the prior period are not subtracted from the cumulative emissions of the current monitoring period. The terms in the equations that are missing from the calculations are for monitoring period m-1 (for biomass) and i-1 (for soil). Numbers for these terms must be added to the calculations. These terms appear to be properly included and counted in subsequent years, in columns E through AG of the		**Alternative Changes Applied** After discussing this CAR with the validators, it was agreed that this CAR is not applicable. However, it led to some clarifying language in the PD to ensure that a conservative linear deforestation rate was used.	The project baseline is constructed according to the approved methodology. The project proponent elected to use the linear model baseline alternative provided within VM0009. As allowed by the methodology, the project developer elected to be credited according to a linear deforestation rate that is cumulatively less than the logistic model at all times within the project life. CAR Closed.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
spreadsheet. In the spreadsheet, this error is manifested in cells D24, D25, D28, D29, and D33.			
CAR 10 Please provide a justification for the estimation of the ex-ante leakage rate for the project crediting period as per the requirements of VM0009 (pg 69, pg 70).		**Accepted and competed.** The following language was added to the Section 11.3 'Estimation of Ex-ante NERs' in the PD: The project activities described in detail in Section 10 Leakage and Section 6.1 Baseline Scenario Overview, were specifically designed to mitigate deforestation and human-wildlife conflict, and therefore by default serve to mitigate leakage and uphold project permanence. Wildlife Works is of the opinion that the project will suffer little to no leakage, due to our exceptional attention to leakage mitigation. However, in the absence of precedent for estimating ex-ante leakage emissions, Wildlife Works chose to use a conservative value of 20%. Applying this factor to gross NERs yields an estimate of total net NERs over the project lifetime of: Ex-Ante NERs=7,542,945-(7,542,945*0.20) Ex-Ante NERs=**6,034,356** This analysis is available as a spreadsheet and accounts for an estimate of 20% leakage. It includes project emissions and a total confidence deduction. A chart of the projected NERs over the life of the project is presented below. Actual leakage values will be measured empirically at each monitoring period, and will vary from these conservative ex-ante estimates.	Estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment that this is appropriate given the conditions of the project and is consistent with values proposed by The Climate Action Reserve. DNV thus finds the leakage assessment to conform to the requirements in the approved methodology VM0009. CAR 10 Closed.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
CL 1 Please include a reference to the final approved VCS methodology, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests."		**Completed.** Included a reference to the final approved VCS methodology, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests." Abbreviated to MED after the first instance.	CL closed.
CL 2 Please finalize all references to documents including the title, version, and date.		**Completed.**	CL closed.
CL 3 Within the *AFOLU Non-Permanence Risk Analysis and Buffer Determination*, a reference to the project name should be included within the title.		**Completed.**	CL closed.
CL 4 It would help to communicate to the reader if the PD were to include a graphic that lists the organizations involved in the project (Rukinga Ranching, WW Inc, WW EPZ, WW Sanctuary, WW Carbon) shows the relationship between them.		**Accepted and completed.** Graphic added in section 5.3.2	CL closed.
CL 5 Please fix the typo on page 45 bullet point 2 from "lara" to "laws".		**Done.**	CL closed.
CL 6 Page 26. "No Image" bullet: Before the last two words, insert "not"?		**Done.**	CL closed.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
CL 7 Page 43. Capitalize "co" in CO2e.		**Done**	CL closed.
CL 8 Page 43. Section 6.6.4. First paragraph is truncated and incomplete.		**Done**	CL closed.
CL 9 Page 76. What are the units for the total area? Hectares?		**Accepted.** Changed table values to ha to match total. Changed unit of measure to ha.	CL closed.

VCS Monitoring Report

for the first monitoring period (m_1)
January 1, 2005 to December 31, 2010

The Kasigau Corridor REDD Project
Phase I - Rukinga Sanctuary

Version 1.0
February 2nd, 2011

Table of Contents

1 Project Details

1.1 Summary Description of Project

Through a combination of dryland forest protection and extraordinary community sustainable development activities, this project is estimated to avoid the emission of over 6 Million metric tonnes of CO2e which would have been emitted due to slash and burn deforestation over the 30 year project life, or on average approximately 201,145 metric tonnes per year across the Carbon Pools of Above and Belowground Biomass (forest carbon), and Soil Carbon.

The Project Area is home to a fantastic diversity of mammals (over 50 species of large mammal, more than 20 species of bats), birds (over 300 species) and important populations of IUCN Red List species such as Grevy's zebra (*Equus grevyi*), Cheetah (*Acinonyx jubatus*), Lion (*Panthera leo*) as well as over 500 African elephants (*Loxidonta africana*) seasonally.

The project is clearly additional (under the project financial additionality tool) and the Baseline far from being hypothetical is an extension of actual deforestation that was occurring aggressively in the reference region immediately adjacent to the Project Area at the time Wildlife Works came on the scene, and that has been demonstrated clearly from historic satellite image analysis.

1.2 Sectoral Scope and Project Type

This project falls under VCS sectoral scope 14: Agriculture, Forestry and Other Land Uses, under project activities Reduced Emissions from Deforestation and Degradation (REDD), and most specifically, Avoiding unplanned mosaic deforestation and degradation (AUMDD). This project falls into this category by the definition provided in the VCS Program Update of May 24th 2010, by virtue of the fact that > 25% of the boundary of the Project Area is within 50m of land that was anthropogenically deforested in the ten years prior to the project start date, as illustrated in the PD Template 'Kasigau Corridor Phase I VCS Template PD'. This project is not a grouped project.

1.3 Project Proponent

The Project Proponent for the Kasigau Corridor REDD Project – Phase I Rukinga Sanctuary is Wildlife Works Inc., a California Corporation in good standing. Wildlife Works Inc. acquired the carbon rights from the landowner, Rukinga Ranching Company Ltd. after a process of Free Prior and Informed Consent, through a Carbon Rights Agreement/Easement that was approved by a full vote at an AGM of the Shareholders at Rukinga on February 13th 2009, at which AGM the Shareholders present were given an explanation of the potential of the Carbon project, a copy of which has been provided to the Validator, and following which the Shareholders unanimously approved the pursuit of this opportunity by the Managing Director and majority shareholder of the land, Mike Korchinsky. This decision was ratified again unanimously by an extraordinary general meeting of shareholders of Rukinga Ranching Company Ltd on December 9th, 2009.

The carbon project is managed in the field in Kenya by Wildlife Works Carbon LLC, a joint venture of Wildlife Works, Inc. and Colin Wiel Investments II, in return for which Wildlife Works Carbon LLC is eligible for a share of the proceeds from the sale of the carbon credits generated by the project. Details of this arrangement are specified in the Membership Agreement of Wildlife Works Carbon LLC, which was provided to the Validator.

Contacts

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Founder & CEO – Mike Korchinsky
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Fax: +1-415-332-8057
Email: mike@wildlifeworks.com

Wildlife Works Carbon, LLC.:
President – Mike Korchinsky

1.4 Other Project Participants

See above (Section 1.3)

1.5 Project Start Date and Project Crediting Period

The Project Start Date and the Crediting Period Start Date are both January 1st, 2005. The VCS Project Crediting Period is January 1st 2005 through December 31st, 2034 (30 years). This monitoring period (m_1) is the first monitoring period and started on January 1st, 2005 and ends on December 31st, 2010.

1.6 Project Location

The Kasigau Corridor REDD Project is located in SE Kenya, in the Marungu Sublocation, Voi Division, Taita Taveta District, Coast Province, Kenya, approximately 150 kms NW of the city of Mombasa.

This Phase I PD covers all the land known as Rukinga Sanctuary which is all that 74,516 acres (30,168.66 ha) of land originally known as LR 12263, historically reduced by subdivisions 12263/1 and 12263/2 at dates prior to the start date of this project.

Rukinga is part of that land that forms a corridor of land (the Kasigau Wildlife Corridor) between the Tsavo East National Park and the Tsavo West National Parks to the East of the Marungu range. The Project Area and Reference Region are clearly delineated in Figure 1 in the PD in section 5.1, and the shape files representing the boundaries have been made available to the project validator. The land within the project boundary has been tropical dryland forest[1] for at least 20 years and has been a primary forest since recorded times[2].

1.7 Title and Reference of Methodology

This project uses VM0009 'Methodology for Avoided Mosaic Deforestation of Tropical Forests', approved by the VCS for sectoral scope 14 on January 11th, 2011.

2 Implementation Status

2.1 Implementation Status of the Project Activity

All project activities described in the PD are underway during this monitoring period. The following is a brief list of project activities currently underway:

[1] UN IPCC, Good Practice Guidance for LULUCF, Table 3A.1.8;
[2] Earliest record that has been located is dated 1895 which identifies the area as forested [Hobley 1895 – Upon a Visit to Tsavo and the Taita Highlands – The Geographical Journal 1895 Vol 5 No 6 pp 545-561]

Organic clothing factory, organic greenhouse / nursery, Jojoba cash-crop development, farmland co-op establishment, ranger patrol recruiting and expansion for leakage area, sustainable charcoal project, forest/biodiversity monitoring program, Ecotourism center, school construction and bursary scheme and reforestation / outplanting program.

- These extensive project activities are described in full detail in the PD, section 6.1 Baseline Scenario Overview, page 16. These project activities were designed to mitigate deforestation and human-wildlife conflict, and therefore *by default* serve to mitigate leakage and uphold project permanence.

- Leakage is directly measured for this project through the empirical measurement of forest degradation plots (see PD, section 10 Leakage). Leakage mitigation activities are thoroughly described in this section in the PD (see pg. 55). Non-permanence risk is assessed using the VCS Tool For AFOLU Non-Permanence Risk Analysis and Buffer Determination, and has been double validated by DNV and ESI. All project activities described in the PD in Section 6.1 Baseline Overview and Section 10 Leakage serve to uphold project permanence.

2.2 Deviations from the Monitoring Plan

There has been no major deviation from the monitoring plan described in the PD, section 13 Monitoring, or in the monitoring standard operating procedure documents: 'Standard Operating Procedure Biomass' and 'Standard Operating Procedure Soils'.

2.3 Grouped Project

This project is not a grouped project; this section is therefore not applicable.

3 Data and Parameters

3.1 Data and Parameters Available at Validation

The following data were measured and available at the time of validation for this monitoring period:

POOL	Data Unit	Source	Purpose of Data	Comments
Above-ground large tree biomass (AGLT)	t CO2e	Woody biomass	Major pool included	
Below ground large tree biomass (BGLT)	t CO2e	Woody biomass	Major pool included	
Above-ground non-tree biomass (AGNT)	t CO2e	Woody biomass	Major pool included	
Below-ground non tree biomass (BGNT)	t CO2e	Woody biomass	Major pool included	
Soil (Soil)	t CO2e	Soil Organic Carbon	Major pool included	SOC reduction meausured

3.2 Data and Parameters Monitored

Data Unit / Parameter:	
Data Unit:	**AGLT**
Description:	Above-ground large tree biomass
Source of data:	Above ground woody biomass
Description of measurement methods and procedures to be applied:	Standard silvicultural techniques, Full measurement procedure described in 'Standard Operating Procedure Biomass'
Frequency of monitoring/recording:	Yearly
Value monitored:	Biomass / CO2e
Monitoring equipment:	DBH tape, compass, height stick, measuring tape
QA/QC procedures to be applied:	See ' QC Procedure Biomass'
Calculation Method:	Allometric relationships
Any Comment:	DBH / wet weight allometry developed with destructive harvesting techniques

Data Unit / Parameter:	
Data Unit:	**BGLT**
Description:	Below-ground large tree biomass
Source of data:	Below ground woody biomass
Description of measurement methods and procedures to be applied:	Standard root:shoot ratio applied
Frequency of monitoring/recording:	Yearly
Value monitored:	Biomass / CO2e
Monitoring equipment:	n/a
QA/QC procedures to be applied:	n/a
Calculation Method:	Root:shoot
Any Comment:	0.4 for tropical shrubland (IPCC, 2006)

Data Unit / Parameter:	
Data Unit:	**AGNT**
Description:	Above-ground non tree biomass (shrubs)
Source of data:	Above ground woody biomass (shrubs)
Description of measurement methods and procedures to be applied:	Size class estimation. Full measurement procedure described in 'Standard Operating Procedure Biomass'
Frequency of monitoring/recording:	Yearly
Value monitored:	Biomass / CO2e
Monitoring equipment:	Compass, height stick
QA/QC procedures to be applied:	n/a
Calculation Method:	Size class, standard weight with stem count
Any Comment:	Destructive harvest performed to yield size classes, number of stems counted

Data Unit / Parameter:	
Data Unit:	**BGNT**
Description:	Below ground non-tree biomass
Source of data:	Below ground non-tree (shrub) woody biomass
Description of measurement methods and procedures to be applied:	Standard root:shoot ratio applied
Frequency of monitoring/recording:	Yearly
Value monitored:	Biomass / CO2e
Monitoring equipment:	n/a
QA/QC procedures to be applied:	n/a
Calculation Method:	Root:shoot
Any Comment:	0.4 for tropical shrubland (IPCC, 2006)

Data Unit / Parameter:	
Data Unit:	**SOIL**
Description:	Soil Organic Carbon (SOC)
Source of data:	Soil pits within Rukinga Sanctuary (undisturbed) and in Shambas in the Reference Region (ag conversion)
Description of measurement methods and procedures to be applied:	$1m^3$ (1m x 1m x 1m) soil pits. See 'Standard Operating Procedure Soils' for detailed measurement procedure
Frequency of monitoring/recording:	Beginning of project
Value monitored:	Biomass / CO2e
Monitoring equipment:	Shovel, tarp, sample bags, mixing equipment
QA/QC procedures to be applied:	oversampling
Calculation Method:	Official FAO methodology for measuring Bulk Density of disturbed soil samples, performed by Crop Nutrition Services, Nairobi.
Any Comment:	Sampled in 2 lifts: 0-30cm and 31-100cm for research and analysis purposes.

Data Unit / Parameter:	
Data Unit:	**Leakage**
Description:	Represented by forest degradation (charcoal burning)
Source of data:	2 square ha (145m x 145m) leakage plots monitored using walking transects.
Description of measurement methods and procedures to be applied:	2 walking transects per plot to determine antropogenically clearing relative to intact forest. Specific leakage training provided to each team member. See 'Standard Operating Procedure Leakage' for detailed leakage monitoring plan.
Frequency of monitoring/recording:	Each monitoring period
Value monitored:	Degradation percentage (0% - 100%)
Monitoring equipment:	GPS
QA/QC procedures to be applied:	Measurement redundancy
Calculation Method:	MED equation [9] , leakage lag period, equation [33] cumulative leakage model
Any Comment:	Leakage data collected in this (first) monitoring

	period is used to calculate the leakage lag period, δ_{LE}, and build the cumulative leakage model, against which empirical measurements of leakage will be compared. Subsequent empirical measurements of leakage are used to calculate leakage deductions. Ex-ante estimates of leakage have no bearing on actual leakage calculations.

3.3 Description of the Monitoring Plan

The following is a brief overview of the monitoring plan. Wildlife Works' detailed monitoring plan is described in detail in the PD under Section 13.4 Monitoring of Carbon Stocks in the Project Area. *(Standard Operating Procedure Biomass, 1/10/2011 and Standard Operating Procedure Soils, 1/1/2011 provided to the Validator for detailed procedures)*

In order to most accurately estimate biomass in the sanctuary, with reasonable time and expense, we divided the sanctuary into three major ecosystem types, as there is a high perceived variation in average biomass across these pools, with larger trees in high density in the montane forest strata, medium to large trees and lots of shrubs in the dryland forest strata and scattered trees, very few shrubs and heavy grass cover in the savannah grassland areas. We ultimately used 9 strata, summing to the total land area, to depict homogeneous patches of landcover in Rukinga.

It should be noted that our ex-ante monitoring was conducted in February and March 2009, the dry season in this area. We believe this will yield an extremely conservative biomass estimates, as the dominant tree species enter into estervation to preserve moisture. During this season, the trees lose all leaf mass, and the perennial grasses senesce. Wildlife Works executive management supervised the data collection teams at the initial plots, to ensure proper adherence to procedure.

We determined that a systematic random plot sampling technique would be best suited, due to the high degree of perceived variation of type and density of trees and shrubs. A systematic sampling method was used to overlay a 2km x 2km grid over the sanctuary and select sample plot centers at the center point of each square. The upper left corner of the grid was randomly positioned to ensure the ultimate random nature of the individual plots.

To sample soil, coordinates were provided to the soil plot sampling teams by our GIS team, at randomly selected forest plot locations, and they sampled using the method illustrated in the 'Standard Operating Procedure Soils' document provided to the validator.

Leakage plots are assessed differently than both biomass and soil plots. Although they are permanent, they are located in the reference region, and necessarily placed in random spatial locations. They therefore cannot be conspicuously marked as are the biomass plots. The NE corner of each leakage plot is recorded in a GIS system, and the plot is evaluated by the leakage plot sampling team using two walking transects per plot. The teams have been specially trained by Jamie Hendriksen, Wildlife Works' Operations Manager to recognize and measure degradation due to charcoal burning and kilning, a phenomenon which is typical to this particular area. A detailed rendition of the degradation estimation procedure is listed in 'Standard Operating Procedure Leakage' provided to the validators.

Organizational Structure

Wildlife Works has 3 dedicated plot sampling teams, ultimately commanded by Rob Dodson, VP African Field Ops. Each team is directed by a team leader, who is trained in GPS operation and forest techniques, and must demonstrate proficiency in species identification, biometric estimation techniques (calculating DBH, height, measuring angle from north, etc.). These team leads have typically grown into their position with experience and proven acumen in the field, and this position is coveted within the Wildlife Works hierarchy. Current team leaders are: Joel, Mwololo and Ciprian, and they are responsible for data collection and transfer to the Rukinga office. Their names are attached to each and every soil and biomass plot; any discrepancies can be easily traced back to date and time of collection, as well as team members who collected the data.

Soil sampling teams are individually selected from the biomass sampling teams. All biomass sampling team members are trained in soil sampling, and they take turns collecting soil samples, as the work is extremely strenuous and difficult. Soil pits are dug and samples collected according to the procedure described in 'Standard Operating Procedure Soils'. Soil samples are collected in the field and then sent to Crop Nutritional Services ("Cropnuts") in Nairobi. Jeremy Cordingley, president of Cropnuts, has provided Wildlife Works and the validators with the official FAO procedure for measuring bulk density of disturbed soil samples.

As mentioned above, leakage plot teams are specially trained by the VP African Field Ops and the Operations Manager to recognize the specific type of forest degradation typical of the Kasigau Corridor. An internal audit was conducted prior to project validation to ensure consistent measurement techniques; such an audit will be carried out every monitoring period.

Data Collection, Storage and Aggregation

Data collected in the field is systematically translated into excel workbooks developed by Jeremy Freund, VP Carbon Development. These "carbon models" contain dropdown lists and pre-filled formulas to ensure accuracy of entry and minimize human translation error. Data is entered by dedicated office staff, Laurian Lenjo and Catherine Mwalugha, both of whom have been trained by the VP Carbon development. Data entry is cross checked internally, as well as by the Carbon Development Manager in the US, Jessie Parteno. Several programmatic, automated data checks are also run on the data.

Carbon model aggregation is ultimately the responsibility of the VP Carbon Development, and all Carbon accounting procedures were developed by him, and adhere to the MED.

All inventory is stored in the United States in Wildlife Works' San Francisco offices, where it is backed up. The data is also aggregated reported from this location. The Wildlife Works technical team is currently designing an online, spatially-enabled data inventory for biomass, soil and biodiversity information collected by field crews. In the future, GIS server software will be utilized to perform spatial analysis (species distribution modeling) on animal sightings, calculations of biomass and other spatially tagged events.

Field Training

Field training was conducted in February, 2009 for the first tree plot sampling team. This team consisted of;

- A local tree expert who was able to identify all the different acacia and commiphora species encountered in the sampling - Joel Mwandiga
- Mike Korchinsky – CEO, Wildlife Works
- Rob Dodson – VP African Field Operations
- Mwololo Muasa a Wildlife Works employee who subsequently became a permanent team lead and data recorder
- Three casuals to assist with carrying equipment into the field and marking the plots
- A driver
- A ranger for security

The Standard Operating Procedures for Biomass and Soils were produced following refinement of the field techniques by this initial team. Two additional teams have been trained using this procedure, and accompany our permanent team periodically, to ensure consistency in method. Field training is continually performed at Rukinga by Jeremy Freund, VP Carbon Development and Rob Dodson, VP African Field Ops.

Internal Auditing

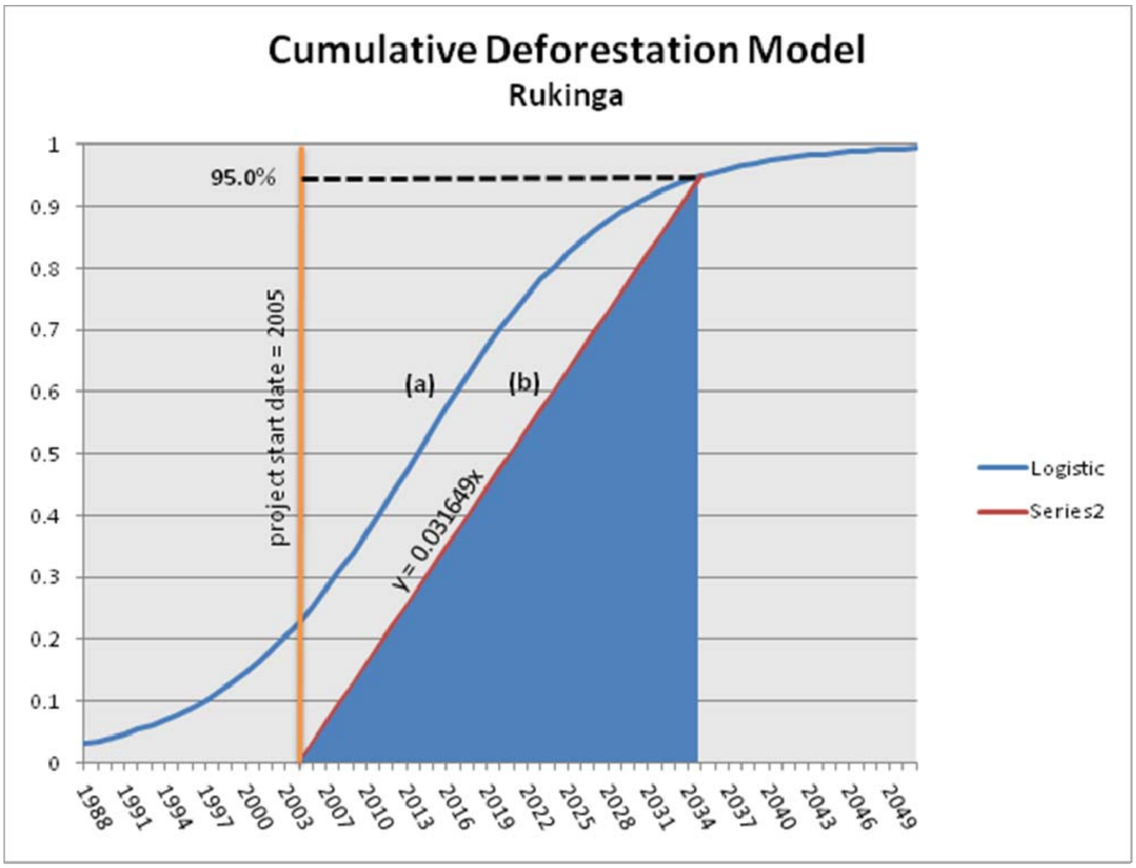
Internal checks are routinely performed on biomass, soil and leakage plots. The VP Carbon Development, VP African Field Operations and Operations Manager routinely embark on "check cruises" to evaluate the employees' work, and often, management will audit individual measurements. Wildlife Works has also instituted an official Quality Control system for biomass plots which has been reviewed by the validators (see 'QC Procedure Biomass'). As mentioned above, once the data is translated into electronic format, various internal checks are performed to eliminate errors. Wildlife Works management continually reviews the work done by other members of management. It is a company policy that no significant results may be published or submitted without at least one set of eyes (other than the author's) having viewed the work in question.

4 GHG Emission Reductions and Removals

4.1 Baseline Emissions

Baseline emissions for this monitoring period (m_1) are as follows:

Wildlife Works chose to use a conservative linear baseline prediction for emissions, which is based on past forest state observations and modeled with a logistical cumulative deforestation model:



Cumulative Deforestation - Rukinga Sanctuary
(a) Logistical CDM modeled from observed historical forest state data; (b) WW selected linear rate, conservatively below CDM

Using this approach, the gross emission reductions for the first monitoring period (January 1, 2005 to December 31, 2010) are as follows, by year:

Year	2005	2006	2007	2008	2009	2010	**TOTAL**
Gross NERs	202,774	238,580	249,290	252,494	253,452	253,739	**1,450,329**
Net NERs to WW, m_1	**162,219**	**190,864**	**199,432**	**201,995**	**202,762**	**202,991**	**1,160,263**
20% Buffer tonnes to VCS, m_1	40,555	47,716	49,858	50,499	50,690	50,748	**290,066**

4.2 Project Emissions

Project emissions for the Kasigau Corridor REDD Project, Phase I - Rukinga are estimated as follows:

- All carbon eligible carbon pools fell under the *de minimus* limit as described in the MED, section 9 Project Emissions and in VCS 2007.1;
- There were no sigificant fire events in this monitoring period (m_1);
- Burning of woody biomass (see MED section 9 Project Emissions) in the project area falls below the *de minimus* threshold for this monitoring period (m_1).

4.3 Leakage

To build the cumulative leakage model, forest degradation must be measured before the end of the first monitoring period to determine the average period of time between degradation and complete deforestation in the reference area. During this monitoring period (m_1), the leakage lag period, δ_{LE}, is measured using empirical leakage plot data. The leakage model is built from this data, and used to measure adjustments for leakage in subsequent monitoring periods. No deductions are applied for leakage in the first monitoring period.

4.4 Net GHG Emission Reductions and Removals

Net NERs for this monitoring period (m_1) are calculated as follows:

Net Emissions Reductions (NERs) to date are quantified from the following components (tonnes CO2e) with 290,066 and 1,160,263 tonnes CO2e to buffer pool and issuance, respectively:

Component	**Value**
Estimated Baseline Emissions, m_1	1,450,329
Uncertainty Deduction	0
Project Emissions, m_1	0
Emissions from Leakage, m_1	0
Gross Total NERs, m_1	1,450,329
NERs to Buffer Pool, double validated* (20%)	290,066
Net Total NERs	1,160,263

5 Additional Information

Supporting documents

Biomass Carbon Stock database:
Rukinga Carbon Trees Shrubs Grass v7

Soil Carbon Stock Database:
Rukinga 1m Soil Analysis

NERs worksheet:
Rukinga return analysis v4

VCS VOLUNTARY CARBON STANDARD

Boden Creek Ecological Preserve Forest Carbon Project

June 15, 2011

Forest Carbon Offsets LLC
600 Cameron Street
Alexandria, VA 22314, USA
Technical Contact: Jeff Waldon, Chief Technical Officer
Phone: +1 540-230-2854, Email: jeffwaldon@forestcarbonoffsets.net
Web: http://www.forestcarbonoffsets.net

Cover Photo: Station #6 Boden Creek Trail, April 3, 3008 03:47h, jaguar likely pair (Miller and Miller 2008).

1.0 Project Description

1.1 Project title

Boden Creek Ecological Preserve (BCEP) Forest Carbon Project (the “project”).

1.2 Type and Category of Project

AFOLU: Reduced Emissions from Deforestation and Degradation

1.3 Estimated Emission reductions over the crediting period

The total predicted avoided emissions over 25 years exceeds 1.4 million mtCO2e

1.4 A brief description of the project

BCEP is located on 5,213 hectares of which 3,980 ha are considered the project area. The goal of the project is to develop the project as a carbon sink by means of conserving and protecting the property which will maintain the biodiversity values of the property and enhance the local economic environment with sustainable livelihoods through private-sector eco-tourism. The climate objective is to avoid emissions from deforestation during the project timeframe.

The project consists of protection of the property for the timeframe of the project through patrols, outreach with and job creation for the local villages, and placing a restrictive covenant on the property deeds for the life of the project. Belize Lodge and Excursions (BLE) is the contractor charged with running an ecotourism operation on the property. BCEP is the entity that owns the property and the entity charged with managing the property. BLE has an ecotourism contract for use of the property from BCEP. Forest Carbon Offsets LLC (FCO) is an agent of BCEP to develop BCEP as a carbon finance project. Conservation Management Institute at Virginia Tech (CMI) is a subcontractor hired to conduct technical analysis on behalf of FCO.

1.5 Project location

The property boundary consists of 5,213 ha of which 3,980 ha are considered the project area. The project area is completely available for aquaculture, industrial logging and commercial agriculture (with the exception of a one-chain buffer around perennial streams) according to Belize’s national plans for agriculture[1] and aquaculture development[2] in the absence of finance from any carbon financing mechanism. The project is situated at Latitude $16^0$17’37” North and Longitude $88^0$48’47” West in the Toledo District, Belize 23 km north of Punta Gorda, Belize (Figure 1: General location of Boden Creek Ecological Preserve). The project’s boundaries are defined by the 931 ha Pine Hill Mennonite Community, the 7,516 ha Seven Hills Estate, the 2,192 ha Manatee Creek Parcel, the 3,866 ha Golden Stream Parcel, and Indian Creek Village.

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[1] National Food and Agriculture Policy (2002-2020). Available at http://www.agriculture.gov.bz/PDF/Policy_Document.pdf accessed 1/21/2010.

[2] National Aquaculture Zoning Plan for Belize: Schedule I (DRAFT). Available at http://www.coastalzonebelize.org/reports/draft_nationa_aquaculture_policy.pdf accessed 1/21/2010.

Figure 1: General location of Boden Creek Ecological Preserve[3]

[3]Source: CIA World Factbook via the University of Texas (http://www.lib.utexas.edu/maps/belize.html

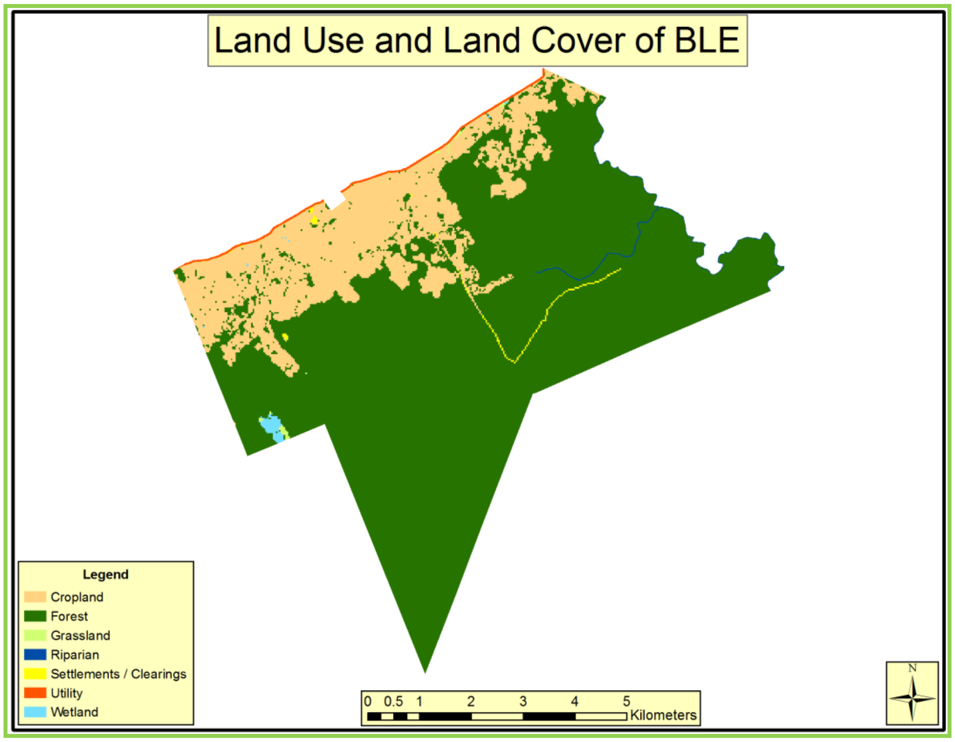

Figure 2: Project Area: Forest vs. Non-Forest Map

1.6 Duration of the project activity/crediting period

- Historical reference period January 1995 through December 2004
- Funding secured for carbon project and developer signed September 2009.
- Start of project 1/1/2005
- Crediting period 2005 to 2029.
- Baseline reset 2015 and 2025.
- Project end date is December 31, 2029.

1.7 Conditions prior to project initiation

The property was purchased from the previous owner who was in the process of converting the property to a mix of agriculture (bananas and citrus primarily). The evidence on the ground of this history is self-evident as a part of the property was cleared and remnant banana and orange trees are still visible. The project started when the property was purchased (2000-2004). The previous landowner received and seriously considered at least one other offer of purchase for conversion so the agent of deforestation was determined to be a class of deforestation agent.

In 2001, a hurricane damaged the biomass on the property. In the period 2004 to 2008, the property owner protected the property with investor funds and sought outside support for a carbon financing project. In 2008/2009, FCO was contracted as an agent of the landowner to perform the due diligence required, collect and analyze the data, and prepare the documentation for the REDD project.

1.8 Project description

The major project activities are:

- Partner with BLE to conduct ecotourism activities at the site to generate jobs for local people,
- Control access to the site through regular patrols,
- Continue to conduct outreach with the local communities,
- Place a restrictive covenant on the property, and
- Monitor results.

The project will use carbon financing to avoid the threat of conversion to citrus, pasture, and/or aquaculture. A successful and financially stable BCEP will provide livelihoods both through management of the property and through the ecotourism operations conducted by BLE. These livelihoods are badly needed in the local communities. Financial stability means that the taxes can be paid, and all the other activities necessary to maintain and protect the property are sustainable. The primary activity for management of the property is patrols and interaction with local communities. These activities ensure the long term protection of the climate and biodiversity values of the project by preventing illegal hunting and harvesting of timber. A substantial monitoring program will be undertaken by BCEP.

1.9 Project technologies, products, services and the expected level of activity

The primary technology employed to achieve the desired results is patrols of the property to prevent incursions and illegal removal of biomass. The following activities will occur:

- Rangers and patrols,
- Assisting forest carbon data collection,
- Assisting biodiversity data collection,
- Ecotourism services,
- Accounting,
- Personnel management,
- Maintenance, and
- Restrictive covenants.

Monitoring will occur regularly with verification audits no less frequently than every 5 years.

1.10 Compliance with relevant local laws and regulations related to the project

BCEP complies with all applicable local, district, and national labor standards. BCEP follows all applicable environmental laws including the Belize Environmental Protection Act Chapter 328, Revised Edition 2000.[4] Belize has the following relevant labor laws:

- International Labour Organization Conventions Act,
- Labour Act,
- Labour (Subsidiary Laws),
- Protection Against Sexual Harassment Act,

[4] See www.belizelaw.org.

- Protection Against Sexual Harassment Commencement Act Order,
- Public Safety Act,
- Trade Unions Act,
- Trade Unions Regulations,
- Trade Unions and Employers Organizations (Registration, Status and Recognition) Act, and
- Trade Unions and Employers Organizations (Registration, Status and Recognition) Act (Commencement) Order.

The project team conducted an exhaustive law review for the PDD:

- Belize Private Forests (Conservation) Act, Chapter 217, Revised Edition 2000.
    - This is a revised edition of the law, prepared by the Law Revision Commissioner under the authority of the Law Revision Act, Chapter 3 of the Laws of Belize, Revised Edition 1980 - 1990.
- Forests Act, Chapter 213, Revised Edition 2003.
    - This is a revised edition of the Subsidiary Laws, prepared by the Law Revision Commissioner under the authority of the Law Revision Act, Chapter 3 of the Substantive Laws of Belize, Revised Edition 2000.
- Forest Fire Protection Act, Chapter 212, Revised Edition 2000.
- Water and Sewage Act, Chapter 222.
    - Defines riparian protection as "that the flow of the stream does not fall below the minimum quantity necessary to secure the interest of public health and the protection of the rights of riparian and other land-owners." (p. 46)
- Water Industry Act, Chapter 222.
- Belize Agricultural Health Authority Act, Chapter 211.
- Fisheries Act, Chapter 210.
- Timber Industry Act, Chapter 341.
- Land Utilization Act, Chapter 188.
    - The Minister may, for the better utilization of land, make regulations-
        - to demarcate areas, water catchment areas or watersheds and prohibiting the clearing of any vegetation within those areas;
        - to provide for such other measures as may be required to prevent soil erosion; restricting the construction of buildings within stipulated distances from the middle line of any road or street;
        - to demarcate specific areas as special development areas and to stipulate the type of development that will be permitted within those areas;
        - for the clearing of any forest or the felling of any trees; and
        - to provide for all such other things as may be necessary for the better carrying out of the provisions of this Part of the Act.
- Citrus (Processing and Production) Act, Chapter 277.

From this analysis and based on personal communication with the Ministry of Natural Resources and the Environment and the Belize Forest Department, it is clear that the BCEP property could easily be converted legally to a citrus plantation. The only caveat is that there should be a one-chain riparian buffer on either side of Golden Stream and Boden Creek (personal communication with the Ministry of Natural Resources and Environment, Belize), even though this one-chain buffer is not required by law. There are no property disputes within the project area per personal communication with the Belize

Forestry Department and the legal resources assisting with the claims of the 38 Mayan villages of southern Belize.

1.11 Identification of risks

Political Risk

Risks to the project from instability in the Government or a change in leadership at BCEP or BLE are considered minimal. In any case, BCEP has agreed to a restrictive covenant for the life of the project to ensure permanence once carbon finance becomes available. The restrictive covenant is envisioned as a commitment by the landowner on the title to comply with the project plan over the life of the project. The purpose of this restrictive covenant is (in the unlikely event that the land changes hands) to bind any new owners to compliance with the CCB and VCS project plans e.g. no removal of forest, regular monitoring, patrols, and outreach to the local communities.

Risk from Oil and Gas Development

To the best of FCO's knowledge no oil or mineral resources occur on the project site and exploration for mineral resources is not occurring nor is it expected to occur. If oil or gas is discovered on the site, it would belong to the Government of Belize. Similar sites in Belize where oil extraction is taking place have minimal above ground disturbance. Section 26 paragraph 6 of the National Petroleum Act states:

> "(6) Subject to this Act, where, in the course of conducting petroleum operations pursuant to a contract, the rights of the owner or lawful occupier of any land are disturbed or damage to any crops, trees, buildings, stock, works or other property thereon is caused, the contractor is liable to pay the owner or lawful occupier fair and reasonable compensation in respect of the disturbance or damage according to the respective rights or interests of the owner or lawful occupier concerned. The amount of compensation payable shall be determined by agreement between the parties or if the parties are unable to reach agreement or the agreed compensation is not paid, the matter may be treated in accordance with the Arbitration Act."

Based on this, the contractor for the Government extracting the oil would be responsible for compensating the owner of the credits for any reversals suffered as a result of the oil extraction process.

Natural Risk

The greatest natural risk to the project is a direct hit by a hurricane. Hurricane Iris struck the project site in 2001 resulting in a blow down of trees. Therefore, this area is currently in a state of ecological regeneration as is much of the Toledo District likewise impacted in this natural cycle.

Leakage Risk

Since the risk to the forest is determined to be a class of deforestation agents that convert land in Belize to agricultural uses, and the most conservative agricultural use, from a carbon sequestration standpoint is citrus development, a market leakage analysis was conducted following methodology module "Estimation of emissions from activity shifting for avoided planned deforestation (LK-ASP)". A reduction in claimed avoided emissions was made to account for leakage risk.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions

No GHG emissions have been created by this project. The objective of this project is to avoid emissions.

1.13 Other forms of environmental credit

No other environmental credit has been created by this project. The co-benefits of the project have been validated to the Climate, Community, and Biodiversity 2nd Edition Gold Standard at the project level by SCS July 14, 2010.[5]

1.14 Project rejected under other GHG programs

This is the first and only application for this project to a GHG program.

1.15 Project proponents roles and responsibilities

BCEP is the project proponent. BCEP has hired FCO to develop the strategy, implementation, and monitoring of the carbon credits generated by this project. FCO has hired CMI Virginia Tech to collect initial data, develop the monitoring protocol and conduct the baseline study for the monitoring program. Supporting documents are available by contacting FCO. BLE is the partner actually conducting the ecotourism enterprise. Decisions on implementation of the project activities are the responsibility of the BCEP board. FCO will be a member of the BCEP board at least through 2014.

1.16 List of commercially sensitive information

Land titles, economic analysis, and inventory data.

[5] CCB Website: http://www.climate-standards.org/projects/index.html

2.0 VCS Methodology

2.1 VCS methodology applied

VM0007 REDD Methodology Modules (http://www.v-c-s.org/methodology_rmm.html). In particular the following methodology modules were used for this project:

- REDD-MF
- M-MON
- T-ADD
- T-BAR
- X-UNC
- X-STR
- BL-PL
- LK-ASP
- CP-AB
- T-SIG
- E-BB
- A/R Methodological tool "Estimation of direct nitrous oxide emission from nitrogen fertilization" (Version 01) with correction for percentage of nitrogen in applied fertilizer (NC_{SFi})

2.2 Justification of the choice of the methodology

Based on the methodology and the reference for the methodology, VCS "Tool for AFOLU Methodological Issues", this project qualifies because of a reduction in emissions of carbon dioxide from planned deforestation in the project scenario. This methodology is applicable because:

- Land in the project area qualified as forest at least 10 years before the project start date,
- No peat soils are present on the project site,
- Project proponents can show ownership of the project site and ownership of the carbon rights for the project area,
- Baseline deforestation in the project area falls within the category of planned deforestation (VCS category APD),
- Baselines shall be renewed every 10 years after the start of the project except where triggers lead to a more frequent renewal,
- No areas registered under the CDM or any other carbon trading scheme are included within the project site. Validation under the Climate, Community, and Biodiversity Alliance for co-benefits has been disclosed,
- The baseline condition is conversion of the property to a permanent deforested state of citrus agriculture,
- No reforestation is proposed for the project, and
- Leakage avoidance activities do not include either agriculture lands flooded to increase production, or intensifying livestock production.

The project is considered under the category “Avoided Planned Deforestation”. This project qualifies because:

- Conversion of forest lands to a deforested condition is legally permitted,
- Documentation is available to clearly demonstrate with credible evidence that the land would have been converted to non-forest use if not for the REDD project, and
- Post deforestation land use does not include reforestation.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project

The approach to measuring carbon stock in the project was based upon the “Sourcebook for Land Use, Land-Use Change and Forestry Projects” (Pearson et al 2005). These methods comply with the Intergovernmental Panel on Climate Change’s 2006 Guidelines for National GHG Inventories for Agriculture, Forestry and Other Land Use.

Emrick and Dorr (2008) identified 10 general cover types at BCEP and created a preliminary vegetation map using a 2003 Quickbird image that covered approximately 50% of BCEP. Two of the 10 types, Wet Tropical Broadleaf Forest and Mixed Cohune/Tropical Broadleaf Forest, accounted for over 95% of the forested area at BCEP. Observations during subsequent field visits indicated that these boundaries corresponded poorly to the forested vegetation types. As a result FCO concluded that accurately mapping separate forest types in a young forest recovering from a series of disturbances would be difficult if not impossible. Therefore FCO classified the entire forested area at BCEP as *Lowland Broad Leafed Wet Forest* (Meerman and Sabido 2001).

Thus, for the purposes of assessing carbon stocks at BCEP, FCO classified the landscape into one of the six Land Use Land Cover classes (Forest Land, Crop Land, Grass Land, Wetlands, Settlements and Other Land) defined by IPCC (2006).

<u>Carbon Pools</u>

The carbon pools selected for measurements were the above ground tree (> 5cm diameter at breast height) and below-ground biomass. Non-tree above ground and below ground biomass were either not measured (lianas), or measured and set aside for a future revision of the project (palms and cecropias). Down or standing dead wood and leaf litter were also not measured. Omitting these potential carbon pools resulted in a conservative estimation of carbon stocks. It was determined that some existing trees may be harvested in the baseline scenario. These few trees were analyzed from the inventory data and found to be insignificant. In the baseline scenario, emissions attributable to biomass burning were analyzed and included, as were avoided emissions from fertilizer use.

Table 1: Carbon Pools and Sources of Emissions

Carbon pools	Included / excluded	Justification / explanation of choice
Above ground	Included	Recovering secondary tropical forests have high growth / carbon accumulation rates and rapidly fix key nutrients in the above and below ground biomass (Vitousek and Stanford 1986, Vitousek 1991, Guariguata and Ostertag 2001, Hughes et al 1999).
Below ground	Included	Recovering secondary tropical forests have high growth / carbon accumulation rates and rapidly fix key nutrients in the above and below ground biomass (Vitousek and Stanford 1986, Vitousek 1991, Guariguata and Ostertag 2001, Hughes et al 1999).
Dead-wood	Excluded	Excluded to be conservative and make the monitoring cost-effective.
Harvested wood products	Excluded	The standard practice in Belize for conversion of forest to agricultural lands is to remove valuable timber species and then bulldoze and burn the remaining trees. This pool was analyzed for significance and found to be de minimis.
Litter	Excluded	Excluded to be conservative and make the monitoring cost-effective.
Soil organic carbon	Excluded	Excluded to be conservative and make the monitoring cost-effective.
Fuel Wood Collection	Excluded	While some fuel wood collection was occurring prior to the project and would presumably occur in the baseline scenario, an analysis was conducted based on local population data and found that this pool is de minimis and therefore excluded.

Sources	Gas	Included / excluded	Justification / explanation
Biomass burning	CO_2	Excluded	CO_2 emissions are accounted for by biomass changes in the above ground and below ground biomass pools.
	CH_4	Included	CH_4 emissions from land clearing and burning are included in the stock change model for the baseline. No biomass burning is proposed as a project activity.
	N_2O	Included	N_2O emissions from land clearing and burning are included in the stock change model for the baseline. No biomass burning is proposed as a project activity.
Combustion of fossil fuels	CO_2	Excluded	Conservatively omitted from both the baseline and project scenarios.
	CH_4	Excluded	Conservatively omitted from both the baseline and project scenarios.
	N_2O	Excluded	Conservatively omitted from both the baseline and project scenarios.
Use of fertilizers	CO_2	Excluded	Conservatively omitted from both the baseline and project scenarios.

	CH_4	Excluded	Conservatively omitted from both the baseline and project scenarios.
	N_2O	Included.	The baseline scenario of citrus agriculture would utilize chemical fertilizer.

2.4 Description of the identified baseline scenario

Prior to the start of the project, the previous owner was in the process of removing timber and converting the property to a banana plantation. The baseline scenario therefore is considered to be a continuation of that process of conversion. As far as is known, no written plan was produced for this process by the previous landowner so proxy areas were analyzed to support a rate of conversion consistent with current practice in the area.

Carbon financing will stabilize the protection and maintenance budget which includes patrols, monitoring, outreach to local communities, road maintenance, trail maintenance, and other activities.

Additionality Analysis

Per instructions from the methodology, the following analysis is offered of alternative baseline scenarios according to the procedure presented in "VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities"

This tool is applicable because a) the proposed project activities will not violate any Belizean law, and b) the use of this tool results in identification of the most plausible baseline scenario of the several possible baseline scenarios identified below.

Some of the alternative land uses are more likely and pose a much larger deforestation threat than others. The following is a "ranking" of the three most likely alternative land uses. Each alternative is considered legal in Belize.

1. Conversion to Agriculture (continuation of the preproject land use)

The most likely alternative land use scenario is the conversion to agriculture, and it is the most pervasive driver for deforestation and land use change in the project area. Agricultural products could include cattle, citrus, bananas, aquaculture, cacao, rice, and other products. The conversion of forestland in Belize to agriculture is both a national and regional trend. The FAO (2003) estimated that by 1989 about 217,241 hectares, or about 10%, of the national land area had been converted from forest to agricultural land. Furthermore, by the first half of the 1990's 25,000 hectares of forested land were being lost yearly due to conversion to agricultural land (FAO 2003).

Suitability of soils for conversion to agriculture, particularly citrus were evaluated using the literature. According to Baillie (1993) soils throughout the Project Area are derived from mudstones, sandstones limestone deposits. Soils are moderately shallow clays that are fairly well drained. The soils are underlain by flat-bedded mudstones with some minor sandstones and limestones. Most soils are clay and well-drained while calcium and magnesium are present. The soils are moderately acidic.

Citrus soils need 1) to be moderately acidic, 2) well-drained, and 3) without a deficiency of calcium and magnesium and soils in the project area meet all necessary criteria (Baillie 1993).

BCEP is bordered and in close proximity to several farms involved in the production of banana, citrus, and cattle. The owner has indicated that some of these landowners expressed an interest in buying portions of BCEP in order to expand their operations. Furthermore, the previous owners of BCEP operated a citrus, banana and cattle operation on the project site which ceased only after the current owner purchased the property (Bowen-Jones 2001).

2. Purchase of the Land to Operate Ecotourism Lodges

One alternative land use would be the purchase of BCEP by a different owner to operate the ecotourism lodges. The economics of the current operation, running the lodge system and supporting protection of a large conservation area, is not sufficient, and it would be unlikely to change appreciably to allow a different landowner to succeed.

Commercializing the value of the avoided CO_2 emissions will provide the capital required to support the management of the property as a conservation area independent of the ecotourism operation. There are no other ecotourism operations in Belize with a large conservation area and no other outside sources of income either through agriculture or external donors.

3. Purchase of the Land as a Conservation Area

There are privately owned protected areas in the area and throughout Belize. Most landowners, and the landowner at BCEP, that own these properties are members of the Belize Association of Private Protected Areas (BAPPA). Landowners purchase properties for conservation for a variety of reasons. Some establish nonprofit companies to hold the property and some simply hold onto the property out of a desire to protect the biodiversity or other values of the site. There is no inherent financial income stream from owning a private protected area while there are several required expenses. The initial purchase price, annual taxes, maintenance, and protection from trespass are all expenses that can run into the millions of dollars. Landowners that pursue this strategy are required to be relatively wealthy or have outside sponsors or pursue a strategy of income generation that is consistent with conservation such as ecotourism.

Analysis of Alternatives

The ecotourism operation is a separate entity. No financial resources are planned for transfer from the ecotourism operation to the carbon project. At present the ecotourism operation is negative. No income is expected from the carbon project. Simple financial analysis would indicate that without the carbon income the financial situation will be negative. The baseline scenario of agriculture and particular citrus is considered positive since it was underway at the time of the purchase of the project (Bowen-Jones 2001) and the citrus industry is a healthy part of the Belizean economy (Tzul 2010). Therefore at least one of the baseline scenarios is more profitable than the project scenario excluding the carbon project income.

Financial plans for both the ecotourism operation and the carbon project will be made available to the auditors.

<u>Common Practice Analysis</u>

- The practice of converting land to industrial agriculture is commonplace in the region as indicated in Tzul 2010, FCO's land cover analysis, and observations on the ground.
- Two other nearby properties owned by nonprofits are of similar size and are managed as protected areas.
- Both nearby properties are supported by an international donor base not available for the project site making the situations quite dissimilar. The essential difference between this project site and others is that this project site has no external funding source on which to draw in the absence of carbon financing.

2.4 Strategy for reduction of GHG in the baseline scenario

The climate objective is to avoid emissions from deforestation during the project timeframe. The major project activities are:

- Partner with BLE to conduct ecotourism activities at the site to generate income for expenses of maintaining and managing the property,
- Control access to the project site through regular patrols,
- Continue to interact with the local communities,
- Place a restrictive covenant on the titles, and
- Monitor results.

The project will use carbon financing to avoid the threat of conversion to agriculture. A successful and financially stable BCEP will provide livelihoods both for management of the property and through the ecotourism operations conducted by BLE. These livelihoods are badly needed in the local communities. Financial stability means that taxes can be paid, and all the other activities necessary to maintain and protect the property are sustainable.

The primary activity for management of the property is patrols and interaction with local communities. These activities ensure the long term protection of the climate and biodiversity values of the project by preventing illegal hunting and harvesting of timber. Employment within local communities makes local communities stakeholders in protecting the property.

A substantial monitoring program will be undertaken by BCEP. The monitoring protocol and baseline study are being designed and initially conducted by staff of CMI and FCO. CMI conducted the initial studies at BCEP and both FCO and CMI have significant field experience in Belize.

3.0 Monitoring

3.1 VCS methodology applied to the project activity:
REDD Methodology Modules (http://www.v-c-s.org/methodology_rmm.html) particularly modules M-MON and LK-ASP.

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches

Purpose of Monitoring

The purpose of monitoring is to:

- Revise the baseline in year 10 of the project,
- Detect carbon stock changes and greenhouse gas emissions,
- Describe leakage of carbon stocks and greenhouse gas emissions attributable to leakage, and
- Estimate ex-post net carbon stock changes and greenhouse gas emissions.

Types of Data and Information to be Reported, Including Units of Measurement

The types of data and information to be reported are reproduced from the methodology in Appendix A.

Origin of the Data

The origin of the data will be from field observations made on an annual basis and verified by a 3rd party auditor at least every 5 years.

Monitoring, Including Estimation, Modelling, Measurement or Calculation Approaches

The monitoring plan is reproduced in Appendix A.

Monitoring Times and Periods, Considering the Needs of Intended Users

The monitoring times will be during the dry season, typically December through April of each year. Each permanent plot will ideally be remeasured each year, but at least in the year prior to the verification event. Monitoring reports will be produced for use by the 3rd party auditors at each verification event.

Monitoring Roles and Responsibilities

BCEP has responsibility for monitoring and has budgeted personnel and funds for this purpose.

Managing Data Quality

The data quality will be assessed at each verification event. The monitoring protocol is available for review and includes a QA/QC component.

3.4 Data and parameters monitored

The monitoring protocol is reproduced in Appendix A.

3.5 Description of the monitoring plan

The monitoring protocol is reproduced in Appendix A. The overall plan is that staff from BCEP will be trained by the Conservation Management Institute to measure each permanent plot each year. At periodic intervals, no less frequently than every 5 years, the data will be summarized, written up within a monitoring report, and verified by a 3rd party auditor.

4.0 GHG Emission Reductions

4.1 Explanation of methodological choice

This REDD Methodology Framework is applicable to project activities that fall within the AFOLU project category "REDD" as defined in the VCS AFOLU Guidance document. By choosing the appropriate modules on the basis of the applicability conditions mentioned in each of the modules, a project-specific methodology can be constructed. Prior to project initiation, the project site was being deforested. This project avoids planned deforestation by means of the purchase of the property for the purpose of protecting it.

4.2 Quantifying GHG emissions and/or removals for the baseline scenario

In order to estimate potential carbon stock changes over the life of the project, a detailed description of a plausible and realistic baseline scenario is required. Based upon FCO analysis of alternative land use scenarios, the conversion to agriculture is the most likely land use in the baseline scenario. Of the various agricultural conversion options common in the area, citrus conversion is used as a likely, and most conservative from a biomass perspective, choice for performing the calculations necessary to describe the scenario.

Estimate of Greenhouse Gas (GHG) Loss in the Baseline Scenario

In order to estimate GHG loss und the baseline scenario the following variables are required:

1. Area of forest available for conversion,
2. Baseline carbon stocks,
3. Forest growth/biomass/carbon accumulation annual rates,
4. Maximum carbon stocks for secondary tropical forest in Belize,
5. Deforestation/conversion rates,
6. Allocation of deforestation among agro-ecosystems,
7. Carbon stocks in agro-ecosystems,
8. Fate of commercial timber and long-lived wood products,
9. Losses of biomass attributable to fuel-wood collection,
10. Avoided emissions from fertilizer use,
11. Avoided emissions from biomass burning, and
12. Avoided emissions from transportation fuel use.

1. Area of forest available for conversion

Of the total area of the property, 5,213 ha, 3,980 ha is available for the project. A reduction of 1,233 ha was made to account for land that was not forested at least 10 years prior to the start of the project plus land that is within a 1 chain buffer of perennial streams. This figure is based upon Landsat TM data and represents the total forest areas minus a one-chain buffer along perennial streams. An additional 228 ha of forest was conservatively removed from the project (from the forest class) to account for the discrepancy between the title acreage and the GIS boundary file.

2. Baseline Carbon Stocks

Baseline carbon stocks consisted of above ground biomass and below ground biomass. The mean carbon pool in 2011 was based on field measurements conducted in 2009 and 2011 and independently verified. The allometric equation for biomass prediction published in Chave et. al. (2005) for wet forest stands (without Height) was used to predict above ground biomass. A factor of 50% was used to convert biomass to carbon. The Chave et. al. equation requires the use of specific gravity for each species of tree (Zanne 2009). All trees were not identified to species as is commonly reported in the literature (Chave et. al. 2005) so a weighted average specific gravity for the site was developed based on the specific gravity for known trees on all plots. That weighted average (.6253) was used for all trees that were not identifiable to species.

Below ground biomass was estimated based on above ground biomass using the equation found in Pearson et al (2005).

An uncertainty level of 25.33% was calculated using module “Estimation of uncertainty for REDD project activities (X-UNC)”.

3. Forest Growth / Biomass/Carbon Accumulation Annual Rates

A critical factor in calculating changes in carbon pools under the baseline scenario is the recovery of the forest from the impact of Hurricane Iris. Recovering secondary tropical forests have long been recognized to have high growth/carbon accumulation rates and rapidly fix key nutrients in the above and below ground biomass (Vitousek and Stanford 1986, Vitousek 1991, Guariguata and Ostertag 2001). Published rates of carbon accumulation and/or growth rates for young secondary *Lowland Broad Leafed Wet Forest* specifically for Belize are not available. However, Guariguata and Ostertag (2001) in a review of neotropical forest succession studies, reported above ground biomass accumulation rates of up to 100 t/ha over a 15 year period or a 6.7% accumulation rate /year.

Hughes et al. (1999) in a study conducted in the Los Tuxtlas region of Mexico, calculated mean yearly above ground biomass accumulation for a series of different aged secondary tropical forests. This study is particularly pertinent to carbon accumulation rates at BCEP because:

- The general vegetation composition of the communities is similar to those of BCEP.
- The ages of the forest stands used in their study encompass the age distribution of the forest at BCEP over the entire project (i.e. space for time substitution).
- Environmental variables (soils, bedrock geology, and climate) and land use history are similar to BCEP.

Using the data from Hughes et al (1999) the average annual above ground biomass accumulation rate for secondary tropical forests of all ages was 6.3%/year. Because southern Belize has substantially higher rainfall compared to the Los Tuxtlas region of Mexico the 6.3% rate was determined to be an appropriate and conservative figure to estimate biomass accumulation within the project area.

4. Maximum Carbon Stocks for Secondary Tropical Forest in Belize

The published steady state maximum for carbon stocks in tropical forest in southern Belize is 318 C tons/ha (Gibbs et al 2007).

5. Rate of Deforestation and Agricultural Conversion

Based on FCO analysis of proxy areas, the deforestation rate for the baseline scenario is considered to be 10.8% Six proxy areas were selected using the methodology described in "REDD Methodological Module: Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation (BL-PL)". An uncertainty level of 7.43% was calculated using module "Estimation of uncertainty for REDD project activities (X-UNC)".

6. Allocation of Deforestation/Conversion among Agro-Ecosystems

Under the baseline scenario, forest cover at BCEP would be converted to mixed agricultural uses. The conversion of tropical forest to mixed agriculture (i.e. citrus / banana plantations, pasture) does not result in a complete loss of carbon from the ecosystem. Each new agro-ecosystem will fix carbon albeit at a much lower rate compared to tropical forest. The one exception would be aquaculture where carbon fixation would be minimal. As opposed to citrus plantations, conversion to aquaculture will result in a 100% loss of carbon from the ecosystem.

7. Carbon stocks in agro-ecosystems

Of the terrestrial agro-ecosystems citrus plantations fix the most carbon, so citrus conversion was chosen as the most conservative assumption. Based on the best available literature, we determined an undeniably conservative estimate is 50% above the average found in Morgan et. al. (2006) or 141 kg/tree dry weight. Converting that weight to tons C/ha requires a presumption of tree density which is provided in Spreen et. al. (2010) as 107 trees/acre at year 20. That estimate then works out to 37 tons C/ha. Based on the literature, the other terrestrial agro-ecosystems had substantially lower maximum carbon stocks.

8. Fate of Forest Resources Lost to Agricultural Conversion (Long-lived Wood Products)

The standard practice in Belize for conversion of forest to agricultural lands is to remove valuable timber species and then bulldoze and burn the remaining trees. An analysis was conducted based on the inventory data and found that the available timber for a long-lived wood products pool was de minimis.

9. Loss of biomass attributable to fuel-wood collection

According to Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation (BL-PL), if pre-project, unsustainable fuel wood collection was occurring within the project boundaries, modules BL-DFW and LK-DFW shall be used to determine potential leakage. BCEP pre-project, limited fuel wood extraction was occurring on the portion of the property that is excluded from the above-ground biomass carbon pool. Given the estimated 1997 populations of the two villages pre-project at 751 (Toledo Maya Cultural Council 1997) individuals, and after applying Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01) (T-SIG), the impact on this carbon pool was determined to be de minimis. Therefore emissions from fuel wood collection are not included in the baseline scenario, and monitoring leakage from fuel wood collection is not included in the monitoring plan.

10. Avoided emissions from fertilizer use

Avoided emissions from fertilizer use for the baseline was calculated using CDM A/R Methodological tool "Estimation of direct nitrous oxide emission from nitrogen fertilization" (Version 01). A low rate recommended by the Belize Citrus Growers Association (Tzul 2011) is 3.3 lbs of fertilizer (19-9-19)/tree-year. This rate was determined to be indisputably conservative and was used to calculate an annual application of .21 metric tons fertilizer/ha-year application rate in the baseline scenario.

11. Avoided emissions from biomass burning

In the baseline scenario, land clearing would include piling and burning of biomass on the site. An analysis of emissions from biomass burning was conducted to determine CH_4 and N_2O using module "Estimation of greenhouse gas emissions from biomass burning (E-BB)". Avoided emissions from CO2 release are omitted because they are accounted for by biomass changes in the above ground and below ground biomass pools.

12. Avoided emissions from transportation fuel use

Emissions from transportation fuel use are conservatively omitted in both the baseline and project scenarios.

4.3 Quantifying GHG emissions and/or removals for the project

GHG emissions and/or removals for the project are described for the same pools and variables as the baseline scenario with the addition of activity shifting leakage which only applies to the project scenario.

1. Area of forest available for conversion

Same as baseline.

2. Baseline carbon stocks

Same starting point as baseline.

3. Forest growth/biomass/carbon accumulation annual rates

Since the forest is recovering from a hurricane event, a growth multiplier (6.3% per year) is used on an annual basis to estimate ex ante C stocks based on the literature (Hughes et al 1999). Given the phase of growth that the forest is experiencing right now and for the life of the project, a more sophisticated sigmoidal growth model is not warranted.

4. Maximum carbon stocks for secondary tropical forest in Belize

Same as baseline, 318 tons C/ha.

5. Deforestation/conversion rates

No reductions or removals are planned for the life of the project.

6. Allocation of deforestation among agro-ecosystems

N/A, no conversion is allowed in the project.

7. Carbon stocks in agro-ecosystems

N/A, no conversion is allowed in the project.

8. Fate of commercial timber and long-lived wood products

No reductions or removals are planned for the life of the project.

9. Losses of biomass attributable to fuel-wood collection

No reductions or removals are planned for the life of the project.

10. Avoided emissions from fertilizer use

No fertilization is anticipated as a project activity.

11. Avoided emissions from biomass burning

N/A, no conversion is allowed in the project. In the event of ex-post fires occurring, the REDD Methodological Module: Estimation of greenhouse gas emissions from biomass burning (E-BB) Sectoral Scope 14 will be applied.

12. Avoided emissions from transportation fuel use

Emissions from transportation fuel use are conservatively omitted in both the baseline and project scenarios.

13. Activity shifting leakage

Leakage was determined using module “Estimation of emissions from activity shifting for avoided planned deforestation (LK-ASP)”.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project

Total uncertainty was calculated according to module “Estimation of uncertainty for REDD project activities (X-UNC)” for the above ground biomass pool and the proxy area analysis to determine deforestation rate by summing the uncertainty of each pool and subtracting 15% resulting in a combined project uncertainty of 21.58%. This percentage of the claimed avoided emissions was removed. The other pools and calculations were determined from the literature and considered to be undeniably conservative.

Table 2: Annual avoided emissions 2005 to 2029 in mtCO2e

Year	Project Emissions	Baseline Emissions					Total Avoided Emissions	Risk Buffer (15%)	Net Total
	Leakage	Biomass Change	Fertilizer Use	Non-CO2 Biomass Burning	Uncertainty Deduction	Total Baseline Emissions			
2005	236	8,480	76	1,863	2,248	8,171	7,935	1,190	6,745
2006	485	17,449	152	1,988	4,227	15,362	14,876	2,231	12,645
2007	760	27,321	228	2,121	6,403	23,269	22,509	3,376	19,132
2008	1,062	38,180	304	2,264	8,793	31,956	30,894	4,634	26,260
2009	1,394	50,112	381	2,416	11,417	41,492	40,098	6,015	34,083
2010	1,758	63,213	457	2,579	14,295	51,953	50,195	7,529	42,665
2011	2,158	77,585	533	2,752	17,450	63,420	61,262	9,189	52,073
2012	2,503	90,002	609	2,926	20,184	73,353	70,850	10,627	60,222
2013	2,947	105,940	685	3,110	23,679	86,056	83,109	12,466	70,643
2014	2,217	79,706	706	910	17,548	63,775	61,557	9,234	52,324
2015	1,924	69,170	706	0	15,078	54,798	52,874	7,931	44,943
2016	2,045	73,528	706	0	16,018	58,216	56,170	8,426	47,745
2017	2,174	78,160	706	0	17,018	61,848	59,674	8,951	50,723
2018	2,311	83,084	706	0	18,081	65,710	63,399	9,510	53,889
2019	2,457	88,319	706	0	19,210	69,815	67,358	10,104	57,254
2020	2,611	93,883	706	0	20,411	74,178	71,567	10,735	60,832
2021	2,776	99,797	706	0	21,687	78,816	76,041	11,406	64,634
2022	2,951	106,085	706	0	23,044	83,747	80,796	12,119	68,677
2023	3,137	112,768	706	0	24,486	88,988	85,851	12,878	72,974
2024	3,334	119,872	706	0	26,019	94,560	91,225	13,684	77,541
2025	3,544	127,424	706	0	27,648	100,482	96,938	14,541	82,397
2026	3,768	135,452	706	0	29,381	106,777	103,010	15,451	87,558
2027	4,005	143,986	706	0	31,222	113,470	109,464	16,420	93,045
2028	4,257	153,057	706	0	33,179	120,583	116,326	17,449	98,877
2029	4,526	162,699	706	0	35,260	128,145	123,620	18,543	105,077
Total	61,341	2,205,273	14,722	22,929	483,985	1,758,938	1,697,597	254,640	1,442,957

5.0 Environmental Impact

The Project does not anticipate any negative biodiversity impacts within the area surrounding the Project. Offsite impacts will be positive since larger habitat and forest areas will improve the long-term viability of fauna and flora populations offsite. Avoiding conversion to agriculture also avoids release of sediment and agricultural chemicals into waterways and the Port Honduras Marine Sanctuary. If any negative impact is identified, the BCEP team and the community representative will address such problems with fast and effective solutions. The issue will be discussed and mitigation actions will be designed.

The Project is not expected to have negative social impacts on the communities surrounding the Project area. It is not expected that the Project will negatively impact any of offsite communities. In the case of any potential negative impacts, representatives of the impacted community will bring it to the attention of the conflict resolution coordinator. No unmitigated social or economic impacts are expected from the Project.

According to personal interviews and official correspondence, Indian Creek Village has never traditionally used the BCEP property for hunting, medicinal plant collecting, or other activities. All hunting has traditional occurred west and north of the village (Toledo Maya Cultural Council 1997).

According to personal interviews and official correspondence, Golden Stream Village has never used the BCEP property for hunting, medicinal plant collecting, or other activities (Toledo Maya Cultural Council 1997).

The Pine Hill Mennonite Community, a Kleine Gemeinde Mennonite community, is reclusive and interacts minimally with others from outside their community. They have no record of using the BCEP property for hunting or other activities. Currently, they receive from BCEP road access to their property through BCEP property.

Project has been awarded Gold Level certification by the Cilmate, Community, and Biodiversity Alliance.

An environmental impact statement is not required for the project. Environmental impacts of the project are conservatively projected to be all positive for biodiversity, water quality, air quality, and climate impacts.

6.0 Stakeholders' Comments

BCEP has actively engaged local stakeholders in designing the project with various onsite consultations. Members of the local communities are the primary employees of BCEP participating in permanent sample plot measuring, setting up remote large mammal camera traps, setting up acoustic recording devices, conducting forest patrols, educating other local community members about forest protection, and engaging in other knowledge transfer activities. Stakeholder involvement has been solicited formally and informally since early 2010 so as to inform stakeholders about the project, to receive their feedback, and to publicize the project for public comment.

- Information posted on the website (http://www.belizelodge.com/home.html) since late February 2010.

- Direct email and phone contact with economist Dr. Jim Bass.
- Direct email and phone contact with Belize ecology specialists Dr. Miller and Mrs. Miller.
- Held meeting with management representatives from TIDE, YCT, and Golden Stream Corridor and Alcaldes and representatives from Indian Creek and Golden Stream March 17, 2010, 5pm to 8pm.
- Direct email and phone contact culminating in meeting with the Belize Association for Private Protected Areas (BAPPA) on March 19, 2010 in Belize City, Belize.
- Visited Indian Creek Village, and sharing the CCB Project PDD with the Indian Creek Village and hosted public meetings at Indian Creek Village and Golden Stream Village, April 10th, 2010. Indian Creek Village meeting had 31 attendees with formal representation from the Indian Creek Village Parent Teacher Association, primary school, water board, Chairman, Secretary, Vice President, and Alcalde. Golden Stream Village meeting had 9 attendees with formal representation including the Alcalde, Chairmen, and others.
- Displayed for all clients of BLE at Indian Creek eco-lodge entrance point since late February.
- Displayed and shared with all BLE employees and their community members through printed materials and presentations with staff stakeholder meeting attended by 7 local women and 16 local men and local men and local women in managerial positions on Wednesday March 17th, 2010 at 5pm.
- The PDD was made available on the CCBA webpage and open to public comments (http://www.climate-standards.org/projects/index.html) beginning February 12, 2010.
- Public meetings held at Indian Creek Village and Golden Stream Village, April 10th, 2010.
- Direct personal meetings with the Alcalde, Chairman, Secretary, and Vice President from the villages of Indian Creek and Golden Stream.
- Notification of Embassy of Belize, Ambassador A. Joy Grant, Mission to the European Comission and to the World Trade Organization, in person and via email.

The plan for continuing involvement by the local communities includes regular public meetings held in the villages by a staff member of BCEP hired for that role. Public comments are available on the CCBA web site.

7.0 Schedule

The project began in 2004 with the title transfer of the last parcel. The crediting timeframe of the project extends from 2009 through 2029 (Table 3: BCEP Project Timeline) and final verification will take place the year after the project ends in 2029.

Table 3: BCEP Project Timeline

Milestone	2004-2009	2010	2011	2015	2020	2025	2029	2030
BCEP Formed, Project Start								
Survey Work Conducted								
Project Start								
CCBA Project Validation								
VCS Project Validation								
Initial financing								
Restrictive covenant								

Second Verification								
Third Verification								
Fourth Verification								
Project End								
Fifth Verification								

8.0 Ownership

8.1 Proof of title

Forest Carbon Offsets, LLC has a legally binding agreement with the landowner which transfers management of the environmental service rights of the property. The agreement also sets out the obligations and responsibilities placed on the landowners for the duration of the project. BCEP follows all applicable environmental laws including the Belize Environmental Protection Act Chapter 328, Revised Edition 2000.[6] Belize ratified the Kyoto Protocol September 26, 2003. BCEP title proof is available if requested from the Department of Land and Surveys, Market Square, Belmopan, Belize (Table 4: BCEP land registry information).

Table 4: BCEP land registry information

Title	Ha	Registry	Date Recorded	Title Search Completed
Block 131A	213	Surveyors Plan Book No. 7, Folio 75	November 28, 2000	August 5, 2009
Block 131	2,882	Surveyors Plan Book No. 4, Folio 54	November 28, 2000	August 5, 2009
Whitney block	2,118	Entry No. 10573, Register 15	February 19, 2004. December 31, 2008. Deed of Conveyance on file.	August 5, 2009
Total ha	5,213			

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program

Not applicable.

9.1 Tool for AFOLU non-permanence risk analysis and buffer determination

Population Surrounding the Project Area

The population density in the surrounding area is very low. It is < 50 people / km2. The Project's boundaries are defined by the 931 ha Pine Hill Mennonite Community, the 7,516 ha Seven Hills Estate, the 2,192 ha Manatee Creek Parcel, the 3,866 ha Golden Stream Parcel, and Indian Creek Village for a total of 14,505 ha. There are three communities located in the Project Zone. The communities are Indian

[6] See www.belizelaw.org.

Creek Village, Golden Stream Village, and Pine Hill Mennonite Community. The population of three communities is roughly 1,250 individual (Table 5: Population surrounding the Project area 2008 midyear population estimates). Population density is roughly 8.6 individuals per km2. Population density in the surrounding area is very low risk.

Table 5: Population surrounding the Project area 2008 midyear population estimates

	Total	Male	Female	% Toledo District rural population
Indian Creek Village	447 (1997 estimate)	(no data available)	(no data available)	~2%
Golden Stream Village	304 (1997 estimate)	(no data available)	(no data available)	~1%
Pine Hill Mennonite Community	500 (2010 estimate, pers. communication)	(no data available)	(no data available)	~2%

Fire

This ecosystem is a wet tropical system with a range of 90 mm/month in the dry season to 750 mm/month in the wet season. Fires in this system are rare events. A superb discussion of fire (Meerman and Sabido 2001) in Belize may be viewed at http://biological-diversity.info/fire.htm. The project area is in the lowest fire risk category.

The best practices for fire prevention in Belize are primarily excluding humans from the property through patrols as is proposed in the project plan.

Hurricanes

The southern region of Belize has one of the lowest frequencies of hurricane landfall in the Caribbean with an average of one landfall every 23 years (Lugo et al. 2000). Since the forest is recovering from Hurricane Iris in 2001, and the trees are smaller and less prone to breakage, the risk of reversal as a result of hurricanes is low for the life of the project.

Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination

The version of the tool used is dated 18 November 2008.

Table 6: Generic AFOLU project risk factors

Project risk	BCEP risk
Risk of unclear land tenure and potential for disputes: Independent third-party title search has confirmed title is held by BCEP with no liens. See section 8.0 Ownership.	Low
Risk of financial failure: BLE has proven track record of repaying loans to Conservation International, The Nature Conservancy and the Ecologic Development Fund. Project proponent manages eco-tourism business that is dependent on protected forest for tourism income.	Low
Risk of technical failure: FCO and CMI have proven long-term track record of	Low

designing, implementing, and monitoring high quality ecosystem management projects and forest carbon projects.	
Risk of management failure: FCO and CMI have proven long-term track record of designing, implementing, and monitoring high quality ecosystem management projects and forest carbon projects.	Low
Economic risk	
Risk of rising land opportunity costs that cause reversal of sequestration and/or protection: Project proponent manages eco-tourism business that is dependent on protected forest for tourism income.	Low
Regulatory and social risk	
Risk of political instability: Belize has low regional political instability. The project area does not include local communities. Local communities are not reliant upon the project area for essential food, fuel, fodder, medicines or building materials where such resources are not readily available elsewhere, or where the project area includes areas of cultural, ecological, economic or religious significance.	Low
Risk of social instability: Belize has low regional social instability. The project area does not include local communities. Local communities are not reliant upon the project area for essential food, fuel, fodder, medicines or building materials where such resources are not readily available elsewhere, or where the project area includes areas of cultural, ecological, economic or religious significance.	
Natural disturbance risk	
Risk of devastating fire: BCEP has no recorded history of devastating fire.	Very low
Risk of pest and disease attacks: BCEP has no recorded history of pest and disease attacks.	Very low
Risk of extreme weather events (e.g. floods, drought, winds): BCEP has hurricane occurrence recorded roughly every 50 to 100 years.	Low
Geological risk (e.g. volcanoes, earthquakes, landslides): BCEP has no recorded history of geological risk.	Very low

Table 7: BCEP specific risks

Risk factor	**BCEP risk**
Land ownership / land management type	
Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.	Very low
Technical capability of project developer	
BCEP, CMI, and FCO have proven capacity to design and successfully implement activities that are likely to ensure the longevity of carbon benefits (e.g., effectively managing protected areas).	Very low
Net revenues/financial returns from the project to all relevant stakeholders	
Higher to pre-project or similar to alternative land-uses. Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized	Very low

legal protection of the land.	
Infrastructure and natural resources	
Low likelihood of new road(s)/rails being built near the BCEP project boundary. BCEP is bordered on two sides with protected areas. Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.	Very low
No high-value non-forest related natural resources (oil, minerals, etc.) known to exist within BCEP project area. Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.	Low
No hydroelectric potential within BCEP project area. Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.	Low
Population surrounding the project area	
Decreasing or increasing, but with low population density (e.g., <50 people/km^2). BCEP project area population is estimated to be less than <50 people/km^2.	Very low
Incidence of crop failure on surrounding lands from severe droughts, flooding and/or pests/diseases	
Frequent (>1 in 10 years)	Low
Project financial plan	
Credible long-term financial strategy in place (e.g., endowment, annuity-paying investments, and the like). Funding BCEP will fund investment trust with annuity payment with guaranteed income for employees of BCEP for lifetime of project.	Low
BCEP has legal easement for ongoing protection tied to land title in place.	Very low

Overall Risk Rating

Overall risk rating is low, or 15%.

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Identifier: http://hdl.handle.net/10255/dryad.235

Appendix A: Monitoring Plan

The overall objectives of the monitoring plan are to detect any reversals in forest cover and to update the growth rate assumption (Guariguata and Ostertag 2001, and Hughes et al. 1999) for baseline renewal after 10 years. To accomplish this, a system of permanent plots has been established and remote sensing will be used to produce a forest/nonforest map. The plot data will be used as ground truth for the mapping work as well as to confirm growth rate assumptions. The map will be produced for each verification audit and the plots will be measured annually and a report of the results produced for each verification audit. There may be years when all plots are not measured due to weather or other factors that cause remeasurement to be too costly or unsafe. In that case enough plots will be measured to support the required precision goals of the methodology or the verification audit will be delayed until such time as enough plots can be remeasured to meet those guidelines.

Fuel wood collection was analyzed and considered de minimis prior to project start and is considered de minimis during the project and will not be monitored during the project.

All data collected as part of monitoring will be archived electronically on DVD (or similar media) in Excel compatible spreadsheets or Arc/View compatible (.shp) files and kept at least for two years after the end of the project. All of the data will be monitored if not indicated otherwise in tables below.

Monitoring data will be collected annually, except in cases where some plots are inaccessible due to high water or other factor making access unsafe, and summarized for periodic 3rd party independent audits. Audits will occur no less frequently than every 5 years. It is the responsibility of the landowner to conduct monitoring either utilizing contractors or in-house staff.

Updating of Strata

The *ex-post* stratification shall be updated if the following conditions occur:

- unexpected disturbances occurring during the crediting period (e.g. due to fire, pests, storms, or disease outbreaks), affecting differently various parts of an originally homogeneous stratum; and
- unplanned forest management activities (illegal reversals) that affect the existing stratification.

Established strata may be merged if reason for their establishing said strata have disappeared.

Data and Parameters Monitored

The following parameters will be monitored during the project activity. These estimates shall be based on measured or existing published data where possible and the project participants will retain a conservative approach: that is, if different values for a parameter are equally plausible, a value that does not lead to over-estimation of net anthropogenic GHG removals by sinks will be selected. Field measurements will be conducted by revisiting the permanent plots.

Procedures for calculating the impacts of changes in these parameters, selection of external data sources (e.g. remote sensing data), post-processing and accuracy assessment, and documentation will follow approved VCS module VMD0015 Version 1.0 “Methods for monitoring of greenhouse gas emissions and removals (M-MON)”.

Data / parameter:	*Project Forest Cover Monitoring Map*
Data unit:	Ha
Description:	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Source of data:	Remote sensing in combination with GPS data collected during ground truthing
Measurement procedures (if any):	The minimum map accuracy should be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Measurement Frequency	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
QA/QC Procedures	Based on plot remeasurements.
Any comment:	If stratification is required in the future due to a reversal, then new strata will be identified using module X-STR.

Data / parameter:	*ADefPA,i,t*
Data unit:	Ha
Description:	Area of recorded deforestation in the project area at time *t (if any occurs)*
Source of data:	Remote sensing imagery
Measurement procedures (if any):	Head's up delineation using GIS and landsat imagery (or higher resolution) using multiple images to get a cloud free image.
Measurement Frequency	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
QA/QC Procedures	Remeasurement of permanent plots.
Any comment:	This is presumed to be zero ex ante.

Data / parameter:	$A_{burn,i,t}$
Data unit:	Ha
Description:	Area burnt at time *t (if any occurs)*
Source of data:	Remote sensing imagery
Measurement procedures (if any):	Head's up delineation using GIS and landsat imagery (or higher resolution) using multiple images to get a cloud free image.
Measurement Frequency	Areas burnt shall be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
QA/QC Procedures	Remeasurement of permanent plots.
Any comment:	This is presumed to be zero ex ante.

Data / parameter:	*ADefLK,i,t*
Data unit:	Ha
Description:	The total area of deforestation by the class of agent of the planned deforestation at time t
Source of data:	Remote sensing imagery
Measurement procedures (if any):	Head's up delineation using GIS and landsat imagery (or higher resolution) using multiple images to get a cloud free image or published data.
Measurement Frequency	Must be reexamined at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
QA/QC Procedures	Groundtruthing using GPS if necessary.
Any comment:	Ex ante, project proponents shall determine and justify the likelihood of leakage based on characteristics of the class of deforestation agent.

Data / parameter:	*CAB,tree,i,*
Data unit:	t CO2-e ha-1
Source of data:	Field measurements applied with allometric equation published in Chave et. al. (2005)
Description:	Carbon stock in aboveground biomass in trees in the project case in stratum *i*
Measurement procedures (if any):	See field methods section.

Measurement Frequency	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
QA/QC Procedures:	Independent 3rd party audit of field measurements utilizing remeasurement of a sample of plots.
Any comment:	Key variable used to calculate with project carbon stocks and year by year growth rate.

Data / parameter:	*DBH,* $_{tree,i,}$
Data unit:	cm
Source of data:	Field measurements
Description:	Diameter at 1.3 meters above the ground of each tree on each plot
Measurement procedures (if any):	See field methods section.
Measurement Frequency	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
QA/QC Procedures:	Independent 3rd party audit of field measurements utilizing remeasurement of a sample of plots. Field observation sheets will include DBH of each tagged tree for evaluation of reasonableness of measurement based on feasible growth rate.
Any comment:	Key variable used to calculate with project carbon stocks and year by year growth rate.

Data / parameter:	*species,* $_{tree,i,}$
Data unit:	unitless
Source of data:	Field observations
Description:	Identify each tree to species or species group whenever possible.
Measurement procedures (if any):	See field methods section.
Measurement Frequency	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
QA/QC Procedures:	Independent 3rd party audit of field measurements utilizing remeasurement of a sample of plots. Field observations sheets will

	include species of each tree tagged for reconfirmation in the field.
Any comment:	Key variable used to determine specific gravity to calculate with project carbon stocks and year by year growth rate.

Variables Used but not Monitored for Boden Creek Ecological Preserve Carbon Project

Variable	Source of Data
Carbon fraction of dry matter in t C t-1 d.m:	Common practice 50% (Pearson et. al. 2005)
Average annual aboveground biomass accumulation rate for secondary tropical forests of all ages was 6.3%/year.	Using the data from Hughes et al (1999) the average annual aboveground biomass accumulation rate for secondary tropical forests of all ages was 6.3%/year.
Combustion factor for stratum i (vegetation type)	Default values in Table 2.6 of IPCC, 2006 (Annex 2).
Combustion Emission factor for stratum i for gas g - source of data	Defaults can be found in Volume 4, Chapter 2, of the IPCC 2006 Inventory Guidelines in table 2.5 (see Annex 2: emission factors for various types of burning for CH4 and N2O).
Total area of stratum	GIS coverages, ground survey data and/or remote imagery (satellite or aerial photographs).
Emission Factor for emissions from N inputs	Updated country-specific data when available. In the meantime, IPCC.
The fraction that volatilizes as NH3 and NOX for synthetic fertilizers	IPCC default
Mass of synthetic fertilizer nitrogen applied adjusted for volatilization as NH3 and NOX	Published rates from Belize Citrus Growers Association
Nitrogen content of synthetic fertilizer type I applied	Producers of synthetic fertilizer purchased and used as recommended by the Belize Citrus Growers Association
Proportion of available area for production of commodity that is currently forested	GIS analysis plus consultation with experts
Total area of planned deforestation over the fixed baseline period	GPS coordinates and/or Remote Sensing data and/or legal parcel records.
Leakage factor for displacement of class of planned deforestation agents	GIS analysis

Field Plot Methods

<u>Sampling Framework</u>

The sample size required to achieve the desired precision and confidence is 20 forest inventory plots. However, to ensure that the full range of variability was captured in the 'Forest Land' – the *Lowland Broad Leafed Wet Forest* - class on the project site, a total of 31 forest inventory plots were allocated. Plots were randomly allocated within the 'Forest Land' land-use and land cover (LULC) class using geographic information systems (GIS) and identified by specific XY coordinates (Table 8).

Table 8: UTM locations of forestry plots used to determine aboveground biomass (coordinates are in WGS 84 zone 16)

Plot ID	X coordinate	Y coordinate
1	307223	1801041
2	310014	1804373
3	306734	1805336
4	309546	1799665
5	310373	1803894
6	305126	1800216
7	307018	1803584
8	307918	1805047
9	307806	1804326
10	306569	1801938
11	307239	1800066
12	310192	1803071
13	307140	1801838
14	308038	1805429
15	305784	1800156
16	307517	1805715
17	309332	1802438
18	308703	1805334
19	307561	1806108
20	307594	1799864
21	304106	1800663
22	304949	1800058
23	308801	1804441
24	311735	1803043
25	312012	1803278

26	312003	1802413
27	303676	1801725
28	304951	1799165
29	302985	1801203
30	306658	1799374
31	307121	1798628

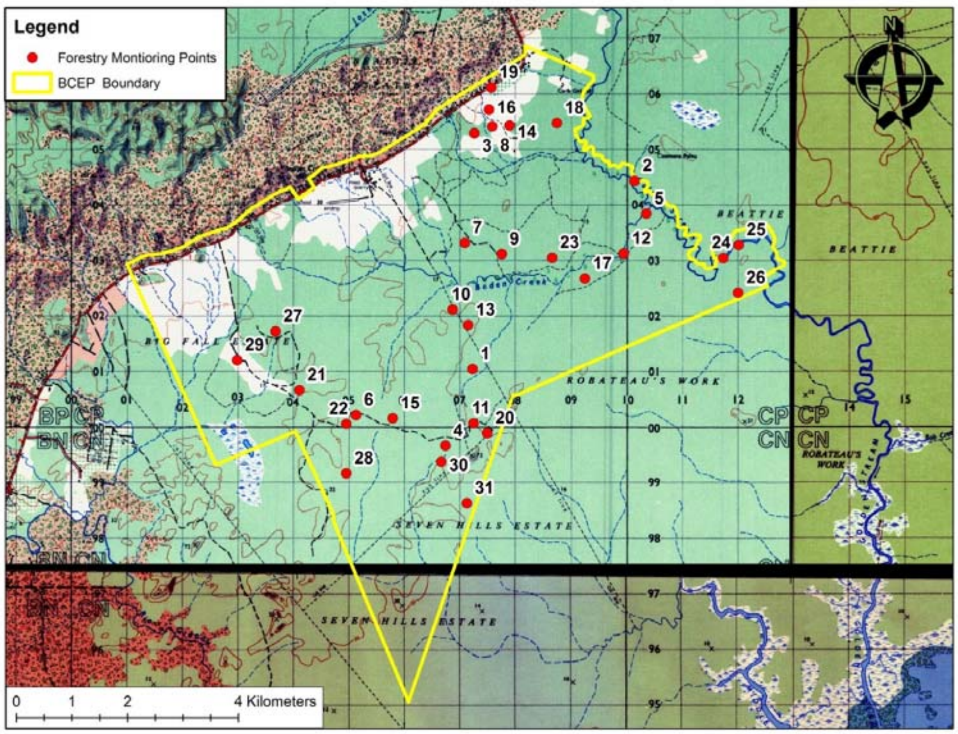


Figure 3. Location of forest sample plots at BCEP.

<u>Field Plot Measurements</u>

The methods for measuring the carbon pools at BCEP were based on the *Sourcebook for Land Use, Land-Use Change and Forestry Projects* (Pearson et al 2005). Because destructive sampling was not practical to measure above ground carbon stocks, published allometric equations were used to determine aboveground biomass based upon the DBH of hardwood trees and the height of palms. The following forest inventory techniques will be used to collect the appropriate data (Pearson et al 2005). All of the 31 plots have been monumented in the field and trees within each plot tagged and numbered. Data collection is based on a nested circular plot design described in Pearson et al (2005). All trees 5 - 20 cm DBH will be tallied within a 4 meter radius of the plot center, all trees 20 - 50 cm DBH will be tallied within a 14 meter radius of plot center and all trees > 50 cm DBH will be tallied within a 20 meter radius from plot center. If a tree splits into separate branches below breast height it is treated as multiple trees. If the tree is growing irregularly, or fallen down, it is measured at 1.3 meters above the ground. If the side branches of a fallen tree are large enough to be measured, DBH is measured from the ground. Palms are selected for height measurements based upon the same criteria. Each tree will be named to species with the help of the local guides, if possible. The DBH will be recorded and each tree will be placed into one of the following height classes:

(A) 0 - 1 meter
(B) 1 - 3 meters
(C) 3 - 6 meters
(D) 6 - 10 meters
(E) 10 - 20 meters
(F) 20 + meters.

Every tree tallied is tagged and given a unique ID number for future monitoring. If a tree is found on the plot without a tag, an effort will be made to determine if the tree lost its tag and can be identified or if it was missed in previous measurement events and should receive a new tag. Regardless, every tree will be tagged at every monitoring event and discrepancies noted in the database. Raw data will be entered in a spreadsheet for data summaries and carbon calculations.

Plot Re-measurement:

The following are detailed procedures for monitoring above ground biomass at BCEP. The following supply list is recommended for re-measurement of established forest monitoring points:

GPS (using WGS 84 Datum)	Data Notebook
30 Meter Fiberglass Measuring Tape	Writing Utensils
Compass	Machete for clearing
Tree diameter at breast height (DBH) tape	1.3m pole or stick (x2)
Clinometer (percent scale)	Fluorescent Orange Flagging

The following are the basic steps necessary to consistently measure aboveground biomass in forest monitoring plots.

Step 1: Navigate to plot center using Global Positioning System (GPS), XY coordinates and appropriate datum (table 8). The plot center should be conspicuously marked with bright colored flagging, and a PVC or rebar center marker. Mark additional trees and plot center with brightly colored flagging (orange or pink) to augment the remaining markings. Replace PVC as necessary.

Step 2: Fill out a data sheet by recording field crew members, date, plot number, slope, azimuth, and any additional notes on plot characteristics or vegetation.

Step 3: Starting from a due north position, begin measuring living trees within 4m of the plot center, measured to the face of the tree, with a minimum diameter of 5.0 cm at breast height (1.3m) using a DBH tape or calipers. Examine each tree making sure it is still living, it is not a liana, and checking if it has been tagged previously. Trees which are greater or equal to 5.0 cm and within 4m of the plot center will be recorded. Continue measuring and recording all trees within 4.0m of plot center in a clockwise direction around the center.

Step 4: Once all of the trees within the 4.0 m class have been measured, all trees greater than or equal to 20.0 cm will be measured and recorded within 14.0 m of the plot center, starting due north and moving in a clockwise direction.

Step 5: Once all of the 20.0cm trees have been measured within 14.0m of the plot center, any trees within 20.0 m of the plot center greater than or equal to 50.0cm will be measured starting due north, and working in a clockwise direction. Figure illustrates the plot design.

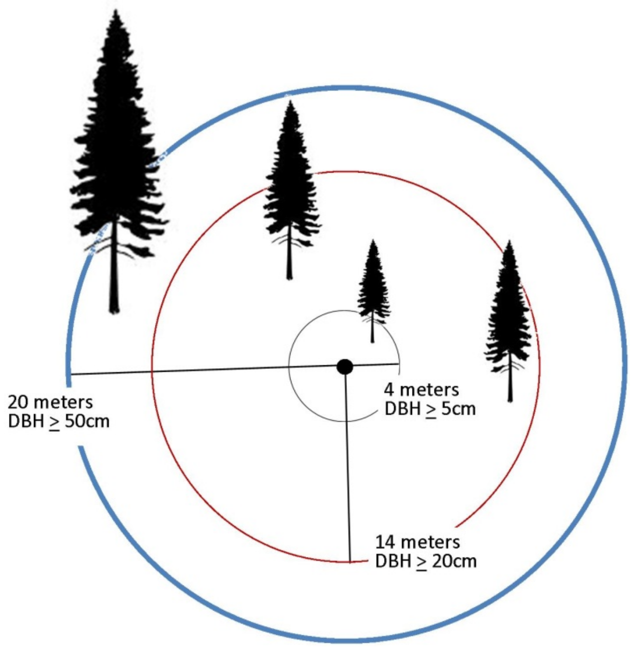


Figure 4. Nested forestry plot design. 4m radius for trees measuring 5cm to < 20cm dbh 14m radius for trees ≥ 20cm to < 50cm dbh 20m radius for trees ≥ 50cm dbh.

Plot Measurement Best Practices

Careful and consistent measurements make it possible for others to replicate identical measurements.

Measurement of DBH

When measuring DBH, set a pole/stick cut to exactly 1.3m on the ground adjacent to the tree and measure the DBH at the top of the measuring stick. When using a DBH tape insure that the tape is wrapped around the tree without any folding or kinks. Measure trees with their natural angle, if a tree is leaning wrap the tape around at the same angle. If a tree is growing straight the tape must be parallel to the ground. If a tree splits into separate branches below breast height it is treated as multiple trees, and if the branch is the appropriate size it is tagged and recorded. If a tree is on a slope, DBH will be measured from the uphill side of the slope. If the tree is growing irregularly, or fallen down, the tree will be measured where it reaches breast height. If the side branches of a fallen tree are large enough to be measured, their DBH will be measured from the ground, not 1.3m from the top of the downed tree.

In all cases the DBH tape should be directly against the bark around the entire circumference of the tree being measured. Vines growing up a tree should be pulled away from the bark, and the DBH measured underneath. If the vine cannot be manually pulled away it can be cut, or the tree diameter estimated using the reverse side of the DBH tape. It is important to leave the majority of vines intact to allow the plots to maintain similar growing conditions to surrounding stands. When applicable, measure above other natural growths at breast height, including irregular tree growths, termite nests, fungal growths, etc. If the natural growths extend out of reach measure just below growth. If the tree has buttresses which would affect the diameter at breast height, measure above the buttresses. If the buttresses extend out of reach, measure as high as possible while remaining accurate. Make a note of the buttresses which can be corrected in later calculations.

Measuring Distance from Plot Center

When measuring the distance from the plot center have one crew member stand at the plot center with the measuring tape zero set on a 1.3 m stick and pull the tape tight. Another crew member will pull the tape, allowing no bends due to trees or snags, and set the measuring end on a 1.3 m pole or stick. If any part of the tree's trunk is in at breast height the tree is considered in.

Previously Tagged Trees

Trees large enough to be recorded in each class will be inspected for previous tags. Trees which have been previously tagged will be recorded with the identification number, adjusted DBH, species (if known), and height (if applicable to the allometric equation). If the tree has not been tagged, they will be tagged with an aluminum uniquely numbered tag and aluminum nail. In this case the new identification number, DBH, species (if known), and height (if applicable to the allometric equation) are also recorded. If the tree species is unknown attempt to identify the tree using any available resources. If the tree cannot be correctly identified, the tree type will be recorded (e.g. hardwood, pine, palm, tree fern, etc.).

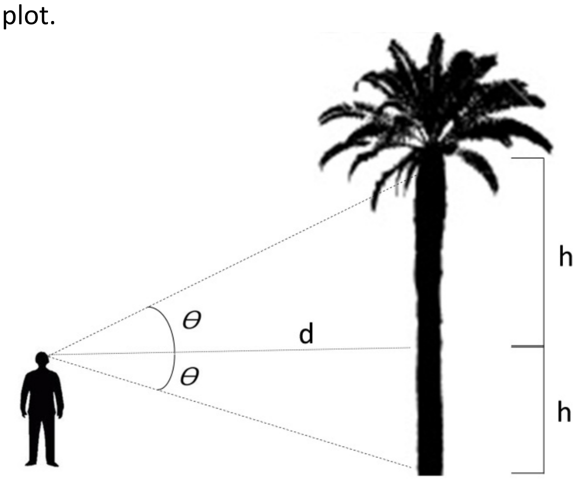
Palms

At BCEP the most common palm is the cohune. Cohune palms in the early years of growth have no true trunk, just a series of palm fronds which slough off as the tree grows. Thus it is impossible to tag young trees for the purposes of monitoring. Thus only cohune palms old enough to have a true trunk will be measured for inclusion in the above ground biomass pool. Once the palm has aged to a point where there is a true trunk at 1.3 m, the DBH is measured and the same rules apply for inclusion in the nested plot design. If the palm is considered in, the height is measured.

Tree Height Measurements

To measure the height of a tree either use a distance range finder and follow the manufacturer's instructions, or use a clinometer. A clinometer can be used more accurately when standing further away from an object. For this reason, it is recommended that the observer stand at least 15 m from the tree being measured. From a vantage point with a clear line of sight, measure and record angle to the top of the trunk (not the leaves) and the base of the tree with a clinometer. Using a fiberglass measuring tape, measure distance from tree to the observer using the 1.3 m poles for consistent measurements. The height can be calculated using simple trigonometry, the two angles, and the distance to the tree (See Figure 5).

Once all of the trees have been measured and tagged, review data sheet to ensure no data points have been forgotten (slope, azimuth, tree measurements, etc.) and recheck plot for any trees missed. If everything is checked, and the team agrees everything has been completed, all gear is collected and the team continues to the next plot.



$$\tan(\theta) = h / d$$

Figure 5. Measuring palm heights in the field with a clinometer.

At the end of each day a designated team member will check that there are completely filled out data sheets for each plot inventoried. Completed data sheets will be stored in a portfolio case that is not taken into the field.

Mapping Methods

Remote sensing methods will follow industry best practices using Landsat TM or higher resolution imagery. Head's up digitizing utilizing trained analysts will be employed to produce a forest/nonforest map of the project area and if necessary the leakage area. A classification accuracy of 90% or better will be achieved.

Areas burned, damaged by wind, or illegally cleared will be mapped using a combination of these methods plus ground surveys with a GPS.

VCS VOLUNTARY CARBON STANDARD

Validation Report:

Name of Verification company:	Date of the issue:
Scientific Certification Systems	June 24, 2011
Report Title:	**Approved by:**
Report of the Validation of the Boden Creek Ecological Preserve Forest Carbon Project	Todd Frank
Client:	**Project Title:**
Forest Carbon Offsets, LLC (representing the Boden Creek Ecological Preserve)	Boden Creek Ecological Preserve Forest Carbon Project
Summary:	
This validation assessed the conformance of the Boden Creek Ecological Preserve Forest Carbon Project ("the Project") to the Voluntary Carbon Standard 2007.1 and its supporting documents, including the selected methodology element. The validation activities included a field visit to the project area as well as interviews with relevant personnel, re-measurement of forest carbon plots, and validation of the Project's methodology for quantifying greenhouse gas (GHG) reductions. The Project is a REDD Avoided Planned Deforestation project. The objective of the Project is to avoid GHG emissions from deforestation of 3,980 ha of forestland in the Toledo District of Belize. The Project's start date is January 1, 2005, and the Project's crediting period is from 2005-2029. The review of Project documentation, the completion of the site visit and the information obtained from subsequent follow-up interviews with project personnel have provided the SCS Lead Verifier with sufficient evidence to determine the fulfilment of the stated criteria. The Project correctly applies the selected methodology element and is in conformance with all applicable requirements of the Verified Carbon Standard (VCS). The Project is designed to lead to reductions of GHG emissions that are real, measurable and give long-term benefits to the mitigation of climate change. In summary, it is the opinion of the SCS Lead Verifier that the Project, as described in the project description (PD) document dated May 16, 2011, meets all relevant Voluntary Carbon Standard 2007.1 requirements and correctly applies the selected methodology.	
Work carried out by:	**Number of pages:**
Ryan Anderson (Lead Validator) Zane Haxton (Validator) Percival Cho (Technical Expert) Robert J. Hrubes (Technical Reviewer)	50

Table of Contents

1 Introduction

1.1 Objective

The validation objective is an independent assessment by SCS of the proposed Project activity against the VCS 2007.1 and its supporting documents, including the selected VCS-approved methodology. Validation has resulted in a conclusion by SCS as to whether the Project is compliant with the requirements of these program documents and whether the Project should be submitted for registration. SCS understands that the ultimate authority to permit the registration of the Project rests with the VCS Board.

1.2 Scope and Criteria

SCS assessed the completeness of the Project Description (PD) to ensure that all requirements of the VCS standards have been addressed. SCS assessed whether or not the PD respects the principles of the VCS standards. Assessment included evaluation of additionality, project design, baseline, monitoring plan, and calculation of baseline GHG emissions.

The scope of the validation audit encompassed desk and site validation activities for the Project against the following requirements of the VCS:

- Voluntary Carbon Standard 2007.1
- Voluntary Carbon Standard Program Guidelines 2007.1
- Tool for AFOLU Methodological Issues
- Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination;
- The selected methodology, “Approved VCS Methodology VM0007”
- Relevant Program Updates.

The selected methodology included the following required and optional documents:

- REDD Methodology Framework (REDD-MF)
- REDD Methodological Module CB-AB
- REDD Methodological Module CB-W
- REDD Methodological Module BL-PL
- REDD Methodological Module BL-DFW
- REDD Methodological Module LK-ASP
- REDD Methodological Module LK-ASU
- REDD Methodological Module LK-ME
- REDD Methodological Module LK-DFW
- REDD Methodological Module E-BB
- REDD Methodological Module E-FFC
- REDD Methodological Module M-MON
- REDD Methodological Module X-STR
- REDD Methodological Module X-UNC

The validation and verification process involved:

- Assessment of the management systems, data handling as well as estimation methods used in calculating and reporting emissions data;
- Assessment of baseline methodology and determination;
- Assessment of and issuance of an opinion on issues of leakage and additionality;

  - Assessment of data accuracy and any assumptions made in the manipulation of that data;
  - Validation that the organization is operating according to the methodology approved by VCS; and
- A determination as to whether the Project could reasonably be expected to achieve the claimed GHG reduction/removals.

The validation assessment was performed using the client-supplied Project Description and other supporting documentation.

1.3 VCS Project Description

As described in Section 1.5 of the PD, the Project consists of 3,980 ha of tropical forest located in the Toledo District of Belize. The objective of the Project is to prevent conversion of the area to agricultural use. As described in Section 1.6 of the PD, the start date of the project is January 1, 2005, and the crediting period extends from January 1, 2005 to December 31, 2029. As described in Section 1.15 of the PD, the Boden Creek Ecological Preserve (BCEP) is the project proponent. BCEP has retained Forest Carbon Offsets to "develop the strategy, implementation, and monitoring of the carbon credits generated by this project." Forest Carbon Offsets has contracted SCS to provide validation services, and therefore Forest Carbon Offsets will be referred to as "the Client" hereafter.

1.4 Level of Assurance

The validation of the Project was conducted to a reasonable level of assurance, as is required by Section 7.3.1 of the Voluntary Carbon Standard 2007.1.

2 Methodology

SCS began reviewing the Project in January 2011, beginning with a thorough desk review of the PD and communication with Forest Carbon Offsets personnel. The PD was audited for compliance with the protocols listed in Section 1.2 of this report. In the course of this review, New Information Requests (NIRs) and Non-Conformity Reports (NCRs) were issued by the SCS Lead Verifier to Forest Carbon Offsets personnel. NIRs were issued when new information was needed to determine the conformity of the Project to the applicable standards, while NCRs were issued when non-conformities were identified. The details of these findings can be found in an appendix to this report.

2.1 Review of Documents

The following documents provided by the Client were reviewed for conformance against the program documents listed in Section 1.2 of this report (where multiple versions of a document were reviewed, only the most recent version is listed here):

Project Documents

- BCEP VCS PDD Final ver 4.docx (the PD)
- BCEP VCS Monitoring Plan Ver 2.docx (the Monitoring Plan)
- Proxy Area Methods.docx (summary of the methodology used for the proxy area analysis conducted by the Client in conformance with Module BL-PL of the selected methodology)

Legal Documents

- 3-379(1) Certificate & Representation Agreement (Scanned).pdf (an agreement attesting that BCEP has clear title to the GHG reductions of the Project, and that the Client has undertaken the Project with the consent of BCEP)
- BCEP%20Block%20131%20Title%20Document.pdf (the "Transfer Certificate of Title" document for "Block 131", comprising 7,118 acres [2880.65 ha] of land, some of which comprises part of the Project area)
- BLE-Block-131.jpg (another version of the "Transfer Certificate of Title" document for "Block 131", with revised information under the "Notings" header);
- BCEP%20Block%20131A%20Title%20Document.pdf (the Transfer Certificate of Title" document for "Block 131A", comprising 527.614 acres [213.525 ha] of land, some of which comprises part of the Project area)
- BLE Block 131A.jpg (another version of the "Transfer Certificate of Title" document for "Block 131A", with revised information under the "Notings" header)
- BCEP%20Recorded%20Deed%20of%20Conveyance%205,230.79.pdf (a "Deed of Conveyance" between Harold Whitney, the prior owner of the Project area, and BCEP, for a third block of land comprising 5,230.79 acres [2,116.90 ha], some of which comprises the project area)

Spatial Documents

- BLE-PropertyMap131.jpg (a map illustrating the location of Blocks 131 and 131A)
- BCEP Proxy Areas.zip (a ZIP archive containing images of the proxy areas used to estimate the baseline deforestation rate in accordance with Module BL-PL of the selected methodology)

Financial Documents

- BCEP Business Plan.xls (financial projections provided to demonstrate financial additionality of the project scenario)
- BLE Only Revenue Projections 4 26 10 JLW with double the occupance and staffing.xlsx (financial projections provided to demonstrate financial additionality of the project scenario)
- BLE Only Revenue Projections 4 26 10 JLW.xlsx (financial projections provided to demonstrate financial additionality of the project scenario)

Several versions of many of these documents were reviewed by the audit team. Only the most recent version of each is included here.

2.2 Site Visit

Following the satisfaction of the majority of the initial findings and an adequate demonstration of preparedness on the part of the Client, the validation team comprised of Ryan Anderson and Zane Haxton was authorized by SCS to conduct a formal site visit, from February 20-22, 2011. During the site visit, the validation team interviewed relevant personnel, toured the Project area, and re-measured six carbon inventory plots. The validation team was accompanied by local Technical Expert Percival Cho during the site visit. Following the site visit, additional NIRs and NCRs were issued; subsequently, responses from the Client were received and reviewed by the validation team.

2.3 Quantitative Analysis

The third step of the verification process focused on an assessment of the quantitative analyses undertaken by the Project Proponent to define the baseline scenario and to estimate the net carbon benefits of the Project. This included a complete review of calculations made by the Project Proponent. Additionally, the validation team generated estimates of carbon stocks from the field data collected during the site visit and compared those estimates to data reported by the Client.

2.4 Follow-up Interviews

The following personnel were interviewed during the course of validation activities:

- Jeff Waldon, Forest Carbon Offsets: Interviewed during site visit and follow-up phone discussions
- Gabriel Thoumi, Forest Carbon Offsets: Interviewed during site visit
- Verl Emrick, Conservation Management Institute: Interviewed during site visit
- Kenneth Karas, Boden Creek Ecological Preserve: Interviewed during site visit
- Carolyn Ching, Verified Carbon Standard: Provided guidance regarding interpretation of the methodology and the VCS definition of materiality
- Naomi Swickard, Verified Carbon Standard: Provided guidance regarding interpretation of the methodology and the VCS definition of materiality

2.5 Final Review and Report Drafting

The last step in the verification process included a final review of the submitted data and drafting of the Validation Report. The validation report was based on the results of the validation assessment. The draft Validation Report was presented to an internal SCS Technical Reviewer who subsequently determined that the Validation Opinion is justified given the evidence presented. The report and opinions contained therein were then presented to the Client for review and comment.

2.6 Resolution of any material discrepancy

Throughout the validation/verification process, there were iterative exchanges between SCS and the Client to gather additional information for review and examination. This exchange included Findings—New Information Requests (NIR), Non-Conformity Reports (NCR) and Opportunities for Improvement (OFI)—that were issued by SCS to the Client. The Client was required to respond to all NIRs and NCRs in order for SCS to render a verification opinion. With issuance of this validation report, all findings have been appropriately addressed by the Client and subsequently closed by SCS. Following the closure of all NIRs and NCRs, SCS is prepared to issue a positive validation opinion for the Project.

3 Validation Findings

3.1 Project Design

The Project is a REDD Avoided Planned Deforestation project that seeks to avoid the conversion of forestland to agricultural use. Section 1.8 of the PD describes the Project and its major activities. The Project's design is consistent with the definition of Avoided Planned Deforestation as articulated in the VCS "Tool for AFOLU Methodological Issues" and "Guidance for Agriculture, Forestry and Other Land Use Projects". As described in Section 1.9 of the PD, "the primary technology employed to achieve the desired results is patrols of the property to prevent incursions and illegal removal of biomass." The validation team observed that Project managers had access to a team of dedicated, competent employees who were capable of carrying out patrols of the property and other needed maintenance.

As described in Section 1.6 of the PD, the start date of the project is January 1, 2005, and the crediting period extends from January 1, 2005 to December 31, 2029. Baseline resets are to occur during 2015 and 2025. The project start date, crediting period, and dates of baseline reset are consistent with the protocols defined in the REDD Methodology Framework (REDD-MF) and the VCS "Guidance for Agriculture, Forestry and Other Land Use Projects".

As described in Section 1.4 of the PD, the property is owned by the Boden Creek Ecological Preserve (BCEP). SCS was able to verify ownership by observing a recorded Deed of Conveyance between Harold Whitney, the prior owner, and BCEP, which describes: "all that piece or parcel of land comprising of 5230.79 acres situate along the East side of the Southern Highway in the vicinity of mile 78…". In addition, Transfer Certificate of Title documents were provided for two blocks of land, Block 131 and Block 131A, comprising 2,880.65 ha and 213.525 ha, respectively. When totalled with the previously discussed parcel, the sum total property area is approximately 5,211 ha. Section 1.5 states that: "the property boundary consists of 5,213 ha of which 3,980 ha are considered the project area." The Project boundary was confirmed by the validation team, as required by the January 21, 2010 VCS Program Update. This was done by visiting selected locations along the boundary and taking/recording GPS coordinates, which were checked against the coordinates provided by the Client.

Section 1.13 of the PD states that the Project has not created any other form of environmental credit. Section 1.14 of the PD also states that the Project has not been rejected by any other GHG program. The validation team did not identify any evidence to the contrary. Thus, we conclude that the Project is an eligible REDD Avoided Planned Deforestation project, and is in compliance with all stated requirements for such projects.

The project meets each of the applicability conditions of the selected methodology. The Client demonstrated that land in the project area has qualified as forest for at least ten years before the Project start date using a combination of satellite imagery and reasonable inferences based on the existing inventory data. The project area does not contain peat soils, as was verified during a site visit by the validation team. Control over the project area and ownership of carbon rights was demonstrated as described above. The baseline scenario described by the Client and validated as documented in this report does not consist of temporarily unstocked land, nor does it constitute reforestation. The project includes no specific leakage avoidance activities, and thus does not include any of the activities prohibited by the methodology's applicability conditions.

The selected methodology also contains several applicability conditions specific to the avoidance of planned deforestation. The Client demonstrated that conversion of forested lands to a deforested condition is legally permitted in Belize. However, during the site visit, it was discovered that the laws of Belize require an environmental impact assessment (EIA) prior to clearing of land greater than 300 acres. The methodology further requires that, where government approval is required for deforestation to occur, the intention to deforest within the project area must be demonstrated by evidence of recent approval from relevant government department (local to national) for conversion of forest to an alternative land use or documentation that a request for approval has been filed with the relevant government department for permission to deforest and convert to an alternative land use. Initially, the Client had identified a specific individual, the previous landowner, as the agent of deforestation. Based on this identification, no evidence was available to demonstrate that the government of Belize had recently approved conversion of the project area, or that a request for approval (i.e., initiation of the EIA process) had been filed with the relevant government department. However, for reasons described in NIR 38A, and independent of the assessment of this requirement of the methodology, the validation team determined that the analysis of a class of agents of deforestation was more appropriate than the identification of a specific agent. The validation team consulted the VCSA with regards to whether the requirement of demonstration of government approval or filing for approval applied to classes of deforestation agents. As communicated in an email from Carolyn Ching to the validation team dated 11 April 2011, the VCSA ruled that "where the agent of deforestation is a class of agents it would not be possible to get governmental approval so it would not be necessary [to demonstrate approval]." Consequently, the validation team determined that the Client had adequately demonstrated that the project area could be legally converted to a non-forest land use.

The methodology additionally requires that documentation must be available to clearly demonstrate with credible evidence and documentation that indeed the land would have been converted to non-forest use if not for the REDD project. Although no written plan or similar documents were available to support the planned baseline land use, the methodology, in the case of identification of a class of deforestation agents, allows a documented history of similar planned deforestation activities by a class of agents, of planned deforestation within the five years previous to without-project deforestation. While visiting the project area, the validation team observed many citrus plantations in the surrounding area. Additionally, the validation team observed portions of the project area (which are excluded from carbon accounting) on which citrus and bananas had been grown by the previous landowner. The previous landowner had a history of land clearing that was documented in a biodiversity assessment contracted by the project proponent (Bowen-Jones 2001). Consequently, the validation team determined that there was adequate evidence that the land was likely to have been cleared in the absence of the project.

The validation team concluded that the project is in compliance with the eligibility requirements of the selected VCS methodology.

Conformance:	Yes	☒	No	☐	N/A	☐

Non-Conformity Reports: NCR 2011.4
NCR 2011.5

New Information Requests: NIR 2011.1
NIR 2011.2
NIR 2011.3
NIR 2011.18
NIR 2011.24
NIR 2011.25
NIR 2011.45
NIR 2011.46

Opportunities for Improvement: None

3.2 Baseline

As required by the REDD Methodology Framework (REDD-MF), the client applied the VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" to demonstrate the additionality of the Project. Application of the Tool is described in Section 2.4 of the PD. In accordance with the Tool, the Client presented three credible land-use scenarios: conversion to agriculture, purchase of the land to operate eco-tourism lodges, and purchase of the land as a conservation area. The Client adequately demonstrated that conversion to agriculture is the most likely scenario. The tool requires a common practice analysis, by which the extent of similar activities in the immediate vicinity of the project is assessed. Several privately owned lands managed for conservation purposes do exist in the vicinity of the project area. The Client identified *lack of access to funding* as an essential distinction between the project and existing similar activities in the surrounding area. Financial analyses prepared by the Client and reviewed during the audit confirmed that the project proponent would likely be unable to implement the project in the absence of carbon finance.

Quantification of GHG emissions and removals was conducted by the Client according the requirements of the BL-PL Module and is described in Section 4.2 of the PD. While a number of possible agricultural uses, such as pasture for livestock and row crop production, were discussed during the site visit, the Client felt that conversion to citrus production was a feasible baseline scenario that was conservative (in the sense of carrying the highest average carbon mass per ha of any agricultural crop). The validation team indeed observed citrus plantations in the vicinity of the project area during the site visit, and agreed with this assessment. The baseline carbon stock in post-deforestation land use was estimated by the Client based on available literature, with some modifications from published stocks made to ensure conservativeness. The validators performed an independent literature review to confirm the conservativeness of the assumed baseline carbon stock in citrus plantations.

Common practice for land clearing in Belize, as described by the technical expert contracted by the audit team, is to harvest merchantable species prior to burning of remaining biomass. The project includes emissions from biomass burning using the protocol described in module E-BB, but does not account for baseline carbon stored in wood products. The Client demonstrated that, because of the relatively young age of the forest in the project area, the amount of carbon stored in wood products, as calculated using the procedures in the CP-W module, would be less than 5% of the anticipated total carbon benefits over the life of the project. Consequently, the wood products pool was excluded from all calculations of baseline and project carbon stocks, in accordance with VCS guidance for assessing the significance of carbon pools.

The baseline scenario also accounts for avoided emissions from the use of fertilizer as described in the CDM tool "Estimation of direct nitrous oxide emission from nitrogen fertilization." The baseline fertilizer application rate was determined based on recommendations published by the Belize Citrus Growers Association. The conservativeness of the selected fertilizer application rate was assessed by the verifiers by comparison with peer-reviewed literature. Although no peer-reviewed literature specific to Belize was available, the listed rates were judged to be conservative in comparison to fertilizer application rates published from studies in the United States.

As described in Section 1.7 of the PD, it was determined during validation that it would be most appropriate to conduct the baseline analysis by identifying a "class of deforestation agents" in line with Part 1.1 of the BL-PL Module. Because a valid verifiable plan did not exist for determining the rate of deforestation in the baseline scenario, a proxy analysis was conducted in accordance with the BL-PL module.

No deviations were sought or approved with regard to the setting of the baseline scenario.

Conformance:	Yes	☒	No	☐	N/A	☐

Non-Conformity Reports: NCR 2011.35

New Information Requests:
NIR 2011.9
NIR 2011.10
NIR 2011.11
NIR 2011.20
NIR 2011.21
NIR 2011.22
NIR 2011.23
NIR 2011.26
NIR 2011.27
NIR 2011.31
NIR 2011.38A
NIR 2011.40
NIR 2011.46

Opportunities for Improvement: None

3.3 Monitoring Plan

The project will be monitored in conformance with approved VCS methodology VM0007. Pools selected for monitoring include above and below ground biomass in live trees. The Client has elected to exclude the dead wood, litter and soil organic carbon pools. The wood products pool and emissions from fuelwood extraction were estimated to be *de minimus* based on ex-ante estimates of project carbon benefits. Activity shifting leakage is accounted for using the LK-ASP module.

The methodology requires ongoing monitoring of biomass stocks and land cover within the project area. The monitoring methodology is described in Appendix A of the PD. The methodology makes use of a network of permanent nested fixed area sample plots. Biomass of sampled trees is computed using allometric equations reported by Chave et al (2005). Specifically:

AGB=ρ*EXP(1.239+1.98*LN(DBH)+0.207*(LN(DBH))^2 - 0.0281*(LN(DBH))^3)

Where ρ is a species-specific density factor. Belowground biomass is computed using the allometric equation reported by Pearson et al (2005):
BGB = =EXP(-1.0587+0.8836*LN(DBH))

The validation team determined, on the basis of available scientific literature, that these equations were appropriate for the project area. Additionally, the Client conducted a validation exercise as required by the CP-AB module. Monitoring of biomass stocks is to be conducted annually, and is the responsibility of the landowner, with third party verification occurring, at a minimum, every five years. The monitoring plan is consistent with the selected methodology and provides sufficient information to estimate changes in carbon sinks in the project and baseline scenarios.

The following parameters are required to be monitored by the approved VCS methodology and are applicable to the project:

A_{sp}	Area of sample plots
N	Number of sample plots
DBH	Diameter at breast height of each tree in a sample plot
$A_{defLK,}i,t$	The total area of deforestation by the baseline agent or class of agent of the planned deforestation in stratum *i* at time *t*
Project Forest Cover Monitoring Map	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Aburn,i,t	Area burnt in stratum *i* at time *t*
$A_{DefPA,i,t}$	Area of recorded deforestation in the project area in stratum *i* at time *t*
Ai	Total area of stratum i
$U_{BSL,SS}$	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the baseline case
$U_{P,SS}$	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the project case

All other parameters used in the methodology are either used as listed in the methodology, or are estimated at validation and held constant in project carbon accounting.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports: None

New Information Requests: NIR 2011.13
NIR 2011.37

Opportunities for Improvement: None

3.4 Calculation of GHG Emissions

Greenhouse gas sources and sinks included in the project are described in Section 2.3 of the PD. The Project includes the following greenhouse gas sources, sinks, and reservoirs: above and belowground biomass, emissions of CH_4 from biomass burning, and emissions of N_2O from biomass burning and the use of fertilizer. Carbon stocks in the dead wood, litter, and soil organic carbon, as well as emissions from fossil fuel burning were conservatively excluded from the project boundary. Carbon in harvested wood products and fuel wood were analyzed by the Client and determined to collectively represent less than 5% of the cumulative estimated net GHG benefits of the project. The Client elected to exclude these pools from the project, in conformance with the VCS standard. The validation team assessed the appropriateness of these pools in the project's GHG accounting and determined that included pools and emissions sources were in conformance with the requirements of the VCS standard and the selected methodology.

Project personnel calculated baseline and Project scenario greenhouse gas emissions using the equations given in the approved VCS methodology selected by the Client. The following project-specific parameters are used in this quantification:

Parameter	Value Selected	Validation Notes
Aplanned,i	3980 ha	This represents the total area of planned deforestation over the baseline period, and is representative of the total area of land eligible within the project area. This assumes that the entire project area would be converted to a non-forest land use. Though there was no verifiable conversion plan available to substantiate this assumption, the validation team found it to be reasonable compared to other land uses observed in the project area. This area was adjusted down from the total area of forest land controlled by the project proponent to account for areas that were previously cleared, streamside buffers, and to account for differences in area between title documents and areas calculated by GIS analysis of the project area.
D%planned,i,t	10.8%	The projected annual proportion of land that will be deforested was calculated by the Client using an analysis of six proxy areas as described in section 1.3 of the BL-PL module. The proxy areas ranged in size from 554 hectares to 4046 hectares and meet the applicability criteria provided in section 1.3 of the BL-PL module. The validation team notes that, because the methodology limits analysis of proxy areas to sites that have been deforested in the last 10 years, it is impossible to arrive at a deforestation rate of less than 10% per year, regardless of the size of the project area. The technical expert hired by the audit team commented that such a rate, sustained over a decade, would be unusual in Belize. The Client showed that clearing at this rate is feasible by providing an email from a contractor in Belize and also showed one proxy area of comparable size to the project area(4046 hectares) and demonstrated, using satellite imagery, that the clearing of that area had taken place over ten years. Consequently, the validation team determined that the estimation of this parameter was in conformance with the guidance provided by the methodology.
LKCP-ME	0.4	The selection of this parameter followed the guidance in Step four of the LK-ASP module, and assumes that the project area is similar with regard to soil type, elevation, and precipitation to other areas in Belize suitable for citrus production.
PFc	0.645	The proportion of available area for production of

		commodity c that is currently forested was assessed by the client using an independently prepared land cover analysis of Belize.
MSFi,t	0.193593 tonnes/year	The mass of synthetic nitrogen fertilizer applied in the baseline scenario is based on recommendations published on the Belize Citrus Grower's Association website and conservative assumptions regarding the number of citrus trees per acre that would be planted in the baseline scenario. The validation team compared both figures to those found in relevant peer reviewed literature and found them to be conservative.
NCSFi	0.19	The fertilizer recommendations on the Belize Citrus Growers website assume the use of fertilizer with a 19-9-19 N-P-K rating. Thus, the percent nitrogen, by mass, is 19%.

Other parameters used in the quantification are either provided by the approved methodology, monitored in the project area as discussed in section 3.3, or are derived from these parameters. All calculations were implemented in an excel spreadsheet titled "BCEP Final Carbon Table 2011.xlsx." The validation team checked all calculations performed by the Client to ensure that they were conducted correctly and in accordance with the methodology. The PD reports the results of baseline and *ex-ante* project emissions in Table 2. SCS confirmed that the estimates in this table were made using the equations provided by the methodology.

Ex-ante estimates of changes in carbon stocks in above and below ground biomass are based on a study in Mexico by Hughes et al. (1999). The validation team determined that, given the limited availability of growth data in recently hurricane affected tropical forests in Belize, the Hughes study offered a reasonable proxy for the forest in the project area, but notes that these *ex-ante* estimates of project carbon benefits are subject to high uncertainty. This uncertainty does not affect *ex-post* estimates of carbon stocks in the baseline or project scenario, as, under the selected methodology, changes in biomass stocks are determined by direct monitoring. The Client has calculated the uncertainty of the baseline and project scenario in conformance with the X-UNC module, as described in sections 4.2 and 4.4 of the PD and as documented in the "BCEP Final carbon Table 2011.xlsx" spreadsheet. As of the conclusion of the spring 2011 monitoring event, the uncertainty in the baseline includes a 25.33% contribution from biomass inventory and a 7.43% contribution from proxy area analysis of the baseline deforestation rate for a total baseline uncertainty of 26.39%. The project scenario uncertainty includes a 25.33% contribution from forest inventory uncertainty. All other pools and emission sources were calculated using assumptions deemed indisputably conservative by the Client and validated as such by the validation team. The total uncertainty for the project, as of the time of issuance of this report, is 36.58%. The *ex-ante* estimates of net avoided emissions reported in Table 2 of the PD contain an uncertainty deduction calculated as described by equation 8 of the X-UNC module. All uncertainty calculations were checked by the validation team and determined to have been applied in conformance with the methodology.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports: NCR 2011.15
NCR 2011.29
NCR 2011.30

NCR 2011.32
NCR 2011.33
NCR 2011.34

New Information Requests: NIR 2011.6
NIR 2011.7
NIR 2011.8
NIR 2011.12
NIR 2011.14
NIR 2011.16
NIR 2011.28
NIR 2011.36
NIR 2011.38B
NIR 2011.39
NIR 2011.41
NIR 2011.42
NIR 2011.43
NIR 2011.44

Opportunities for Improvement: None

3.5 Environmental Impact Assessment

Requirements for an Environmental Impact Assessment are not applicable to the project activity, as the laws of Belize do not require an environmental impact assessment prior to projects designed to conserve forest land. The proposed baseline scenario would have required an environmental impact assessment, which was not conducted, as described in section 3.1 of this report.. A discussion of potential environmental impacts of the Project is provided in Section 5.0 of the PD. The validation team agrees with the Client that no negative biodiversity impacts are anticipated within the area surrounding the Project.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports: None

New Information Requests: NIR 2011.17

Opportunities for Improvement: None

3.6 Comments by stakeholders

No comments by stakeholders were received by the validation team. However, comments by stakeholders were assessed during the Project's validation against the CCBA standards in 2010. A list of comments and an assessment of those comments can be reviewed in the validation report from that audit, available at:

https://s3.amazonaws.com/CCBA/Projects/Boden_Creek_Ecological_Preserve_Project/CCB_FCO_BodenCreek_RPT_ValidationReport_071410.pdf

Conformance: Yes ☐ No ☐ N/A ☒

Non-Conformity Reports: None

New Information Requests: None

Opportunities for Improvement: None

3.7 Risk assessment

The following material is reprinted from SCS's report from the First Assessment in the Non-permanence Risk Assessment Double Approval process dated 13 April 2011:

Risk Factor and project proponent justification	**Self Assessment Risk Rating**	**Findings**
Risk of unclear land tenure and potential for disputes: Independent third-party title search has confirmed title is held by BCEP with no liens. See section 8.0 Ownership.	Low	Title documents confirm clear title to land. **Low** risk assigned.
Risk of financial failure: BLE has proven track record of repaying loans to FFI, et al. Project proponent manages eco-tourism business that is dependent on protected forest for tourism income.	Low	Review of financial documents for the project and the associated ecotourism venture show that the project is highly dependent on income from carbon finance. The associated ecotourism venture is not capable of financially sustaining the project. However, projections of VCUs to be generated from the project show that anticipated carbon revenue should be adequate to fund project activities. **Low** risk assigned.
Risk of technical failure: FCO and CMI have proven long-term track record of designing, implementing, and monitoring high quality ecosystem management projects and forest carbon projects.	Low	Past history of implementation of ecosystem management projects was discussed with project proponents. The technical complexity of project implementation is low. The combination of the project developer's past experience and the low project complexity support a **low** risk rating.
Risk of management failure FCO and CMI have proven long-term track record of designing, implementing, and	Low	Interviews with project proponents supported a **low** risk of management failure.

monitoring high quality ecosystem management projects and forest carbon projects.		
Risk of rising land opp. costs causing reversal of sequestration/protection Project proponent manages eco-tourism business that is dependent on protected forest for tourism income.	Low	Land pressures in the surrounding region were obvious upon visitation and include clearing for citrus growing and rangelands. Elsewhere in project documentation, the project proponent suggests that a deed restriction has been agreed to for the project area. Such a restriction would indeed significantly reduce this risk factor, but is not currently in place. However, given that the land is owned by a dedicated conservation organization (Boden Creek Ecological Preserve), a **low** risk level has been assigned.
Risk of political instability: Belize has low regional political instability. The project area does not include local communities. Local communities are not reliant upon the project area for essential food, fuel, fodder, medicines or building materials where such resources are not readily available elsewhere, or where the project area includes areas of cultural, ecological, economic or religious significance.	Low	**Low** risk of political instability in Belize was confirmed by reviewing the CIA World Factbook.
Risk of social instability : Belize has low regional social instability. The project area does not include local communities. Local communities are not reliant upon the project area for essential food, fuel, fodder, medicines or building materials where such resources are not readily available elsewhere, or where the project area includes areas of cultural, ecological, economic or religious significance. See Table 9: Belize Worldwide Governance Indicators.	Low	After visiting the site and consulting with a technical expert who has knowledge of the area, the validation team agrees that the risk of reversal due to social instability is **low**.
Risk of devastating fire: BCEP has no recorded history of devastating fire.	Low	The project is located in a wet tropical climate. Review of existing literature scientific literature and consultation with local technical experts confirms that the risk of a devastating forest fire is **low**.

Risk of pest and disease attacks: BCEP has no recorded history of pest and disease attacks.	Low	Consultation with a local technical expert confirmed that the forest type in the project area is not susceptible to devastating pest and disease attacks. **Low** risk assigned.
Risk of extreme weather events (e.g. floods, drought, winds) : BCEP has hurricane occurrence recorded roughly every 50 to 100 years. Also: The southern region of Belize has one of the lowest frequencies of hurricane landfall in the Caribbean with an average of one landfall every 23 years (Lugo et al. 2000). Since the forest is recovering from Hurricane Iris in 2001, and the trees are smaller and less prone to breakage, the risk of reversal as a result of hurricanes is low for the life of the project.	Low	The verification team was unable to find the hurricane frequency of one landfall every 23 years in the cited Lugo et al 2000 paper. However, data independently obtained by the audit team from the website of the NOAA hurricane research division suggests that the mean occurrence of named storms within 100 miles of the project are from 1944-1997 was approximately 0.2 storms per year (1 storm every five years on average). This same data source suggested that the hurricane return interval in the area is approximately 25-50 years, with category 4 and category 5 storms on a 100+ year return interval. This places the project in an area prone to hurricane impacts, but the risk is lower than many other parts of the Caribbean. Notably, a category 4 hurricane struck the project area in 2001, causing extensive damage to the forest. The audit team felt the project's location in a hurricane prone region did not constitute grounds for assignment of the lowest risk rating. **Medium** risk level assigned; see additional discussion below.
Geological risk (e.g. volcanoes, earthquakes, landslides): BCEP has no recorded history of geological risk.	Low	Consultation with local technical expert confirmed no known geological risk in the project area. **Low** risk level assigned.
Overall Risk Rating	**Self Assessment: Low**	**Verifier Assessment: Medium**

Risk Factor	Self Assessment Risk Rating	Findings
Land ownership / land management type Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.	Very Low	Land ownership was confirmed by review of title documents. **Very Low** risk assigned.
Technical capability of project developer BCEP, CMI, and FCO have proven capacity to design and successfully implement activities that are likely to ensure the longevity of carbon benefits (e.g., effectively managing protected areas).	Very low	Past history of implementation of ecosystem management projects was discussed with project proponents. The technical complexity of project implementation is low. The combination of the project developer's past experience and the low project complexity support a **low** risk rating.
Net revenues/financial returns from the project to all relevant stakeholders Higher to pre-project or similar to alternative land-uses. Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.	Low	The landowner is a conservation group (BCEP). For conservation groups, this risk rating is **low**, regardless of pre-project and alternative land uses.
Infrastructure and natural resources	Low	Opinion of local technical expert

Low likelihood of new road(s)/rails being built near the BCEP project boundary. BCEP is bordered on two sides with protected areas. Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.		confirmed **low** risk rating.
No high-value non-forest related natural resources (oil, minerals, etc.) known to exist within BCEP project area. Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.	Low	Opinion of local technical expert confirmed **low** risk rating.
No hydroelectric potential within BCEP project area. Land owned by private conservation organization, BCEP, with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land.	Low	Opinion of local technical expert confirmed **low** risk rating.
Population surrounding the project area Decreasing or increasing, but with low population	Low	Visitation of the project area confirmed **low** population density.

density (e.g., <50 people/km^2). BCEP project area population is estimated to be less than <50 people/km^2.		
Incidence of crop failure on surrounding lands from severe droughts, flooding and/or pests/diseases Frequent (>1 in 10 years)	Low	This risk rating is classified as **low** or very low for all APD REDD projects.
Project financial plan Credible long-term financial strategy in place (e.g., endowment, annuity-paying investments, and the like). Funding BCEP will fund investment trust with annuity payment with guaranteed income for employees of BCEP for lifetime of project. BCEP has legal easement for ongoing protection tied to land title in place.	Low	Review of financial documents for the project and the associated ecotourism venture show that the project is highly dependent on income from carbon finance. The project developer has stated plans to fund an investment trust, but at present such a trust has not yet been established, as it relies on anticipated income from carbon finance. Projections of VCUs to be generated from the project show that anticipated carbon revenue should be adequate to fund project activities. However, financial risks remain if actual revenues are less than projected revenues, perhaps because of a natural disturbance or a decrease in future demand for or price of forest carbon offsets. The legal easement discussed for protection of land title is not currently in place. At present, the validator assigns a **medium** risk level to this category, but future establishment of a legal easement or evidence that an adequate trust to fund project activities is in place may reduce the risk rating at a future assessment.
Overall Risk Rating	**Low**	**Medium**

VCS requires that projects be given the overall risk rating associated with the highest risk factor from the analysis above. The highest risk rating from the categories above is “medium”, so a medium risk rating is assigned to the Project.

The specified buffer contribution range for medium risk avoided planned deforestation projects is 10-20%. The VCS program update from 13 April 2010 specifies that the required buffer withholding percentage shall be the maximum percentage in the buffer range for the determined risk class, unless justification for a lower withholding percentage can be demonstrated. Given that the largest risk element for the project is hurricane impacts, that the relatively young age of the existing forest somewhat mitigates the extent of damage to be expected in the event of a hurricane strike, and that the project area, while hurricane prone, is of relatively low risk when compared to other portions of the Caribbean prone to hurricanes, SCS believes that less than the maximum withholding percentage for the medium risk class is appropriate. Accordingly, SCS assigns a buffer rating at the midpoint of the range specified for the medium risk category: 15%.

Conformance: Yes ☒ No ☐ N/A ☐

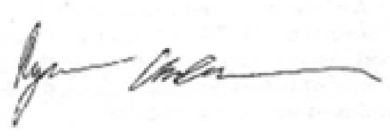
Non-Conformity Reports: None

New Information Requests: NIR 2011.19

Opportunities for Improvement: None

4 Validation Conclusion

Through a review of project documentation, supporting information also provided by the Client, a site visit, and an iterative exchange of audit findings, SCS has determined that the Project meets all relevant criteria for REDD Avoided Planned Deforestation projects under VCS. In addition, the Project is in conformance with the selected methodology and its associated modules, as listed in Section 1.2 of this document. We conclude that the Project is likely to achieve the estimated emission reductions and, as such, no qualifications or limitations should be added to the validation outcome. Thus, it is the opinion of Scientific Certification Systems that the Project is eligible for registration under the applicable VCS standard.



Name: Ryan Anderson
Title: Lead Auditor
Company: Beartooth Forest Carbon Consulting
Date: June 24, 2011

Name: Todd Frank
Title: Program Manager, GHG Verification
Company: Scientific Certification Systems
Date: June 24, 2011

SCIENTIFIC CERTIFICATION SYSTEMS

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Appendix A:

FOREST PROJECT VALIDATION
LIST OF FINDINGS

VALIDATION UNDER THE
VOLUNTARY CARBON STANDARD

Reporter/Member:
Forest Carbon Offsets

Project:
Boden Creek REDD Project

NIR Number 2011.1 of 50 dated 1/11/2011

Standard Reference: REDD-MF II I - Scope
Document Reference: NA
Finding: The methodology requires that reference to the REDD-MF framework and the modules used to construct the project-specific methodology be given in the VCS PD. Please provide a single, comprehensive list of modules used for the project.
Proponent Response: A complete list of the modules used is included in section 2.1 REDD Methodology Modules (http://www.v-c-s.org/methodology_rmm.html). In particular the following methodology modules were used for this project:

REDD-MF
M-MON
T-ADD
T-BAR
X-UNC
X-STR

Auditor Response: The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.2 of 50 dated 1/11/2011

Standard Reference: Voluntary Carbon Standard Tool for AFOLU Methodological Issues, Sec. 2, Step 1
Document Reference: BCEP Carbon PDD ver 2.doc, Sec.2.2. p13
Finding: Please provide evidence that the project boundary only includes land qualifying as forest, using an internationally accepted definition, for a minimum of ten years prior to the project start date.
Proponent Response: We used a definition based on the FAO Forest Resource Assessment of 2000:
Land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 hectares (ha). The trees should be able to reach a minimum height of 5 meters (m) at maturity in situ.
We excluded the part of the property previously converted to bananas and currently recovering. Based on satellite imagery (see below) and plot data indicating, based on tree sizes, that the forest must have been forest in 2000, we considered the project boundary to only include forest land according to this definition. The land cover study is attached.

Auditor Response: The definition applied is in conformance with the requirements of the standard. The imagery provided by the Client, as well as observations made by the audit team in the field support the claim that the project area has qualified as forest for at least ten years. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.3 of 50 dated 1/11/2011

Standard Reference: Voluntary Carbon Standard Guidance for AFOLU; REDD-MF II, step 1(a); VCS 2007.1 section 5.7, page 15

Document Reference: BCEP Carbon PDD ver 2.doc, Sec.1.5 p5
Finding: Please provide geographic coordinates of each polygon vertex defining the project area along with documentation of their accuracy.
Proponent Response: Vertices of project boundary provided at site visit.

Auditor Response: The Client provided a shapefile that contained all vertices of the project boundary during the site visit. Though no documentation of the accuracy of these points was provided, the audit team verified a sample of points along the project boundary by comparison with GPS coordinates independently collected during the site visit. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.4 of 50 dated 1/11/2011

Standard Reference: REDD-MF II step 1(b)
Document Reference: BCEP Carbon PDD ver 2.doc, Sec.1.6 p7
Finding: The starting date of the historical reference period must be between 9 and 12 years in the past and the end date must be within two years of the project start. The specified historical reference period end date is 2008. This is not within two years of the project start, as the project start date is defined as February 19, 2004.
Proponent Response: This is a revised and updated response to this NIR.

- Historical reference period January 1995 through December 2004
- Funding secured for carbon project and developer signed September 2009.
- Start of project 1/1/2005
- Crediting period 2005 to 2029.
- Baseline reset 2015 and 2025.
- Project end date is December 31, 2029.

Auditor Response: The project proponent has adjusted the project's reference period to be consistent with the requirements of the methodology. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.5 of 50 dated 1/11/2011

Standard Reference: REDD-MF II step 1(b)
Document Reference: BCEP Carbon PDD ver 2.doc, Sec 1.6 p7
Finding: The methodology requires that projections of baseline emissions be presented for ten year periods after the start of the project and that the baseline be revised every ten years after the project start. The project start date is in 2004, so the baseline must be re-evaluated in 2014. The baseline reset year of 2019 described in the PDD is not consistent with the methodology.
Proponent Response: This is a revised and updated response to this NIR.

- Historical reference period January 1995 through December 2004
- Funding secured for carbon project and developer signed September 2009.
- Start of project 1/1/2005
- Crediting period 2005 to 2029.
- Baseline reset 2015 and 2025.
- Project end date is December 31, 2029.

Auditor Response: The dates have been adjusted to be in accordance with the requirements of the methodology. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.6 of 50 dated 1/11/2011

Standard Reference: REDD-MF II step 1 (c)
Document Reference: BCEP Carbon PDD ver 2.doc, Sec 2.3 p14
Finding: The methodology requires that table 2 from REDD-MF with selection of carbon pools and appropriate justification for each be presented in the VCS PD. Please provide this information.
Proponent Response: The table on the following page is inserted in the PDD.

Auditor Response: The requested table has been provided. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.7 of 50 dated 1/11/2011

Standard Reference: REDD-MF II step 1 (d)
Document Reference: BCEP Carbon PDD ver 2.doc, Sec 2.3 p14
Finding: The methodology requires that table 3 from REDD-MF with selection of sources and appropriate justification for each be presented in the VCS PD. Please provide this information.
Proponent Response: The following table will be added to the PDD.
[Table not copied into list of findings to avoid redundant data. Table is found in the PD]

Auditor Response: The requested table has been provided. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.8 of 50 dated 1/11/2011

Standard Reference: BL-PL I. Applicability
Document Reference: BCEP Carbon PDD ver 2.doc Sec 4.2
Finding: Provide written documentation of the application of the application of the SIG

tool to verify that fuel wood collection does not significantly impact carbon pools for baseline or leakage accounting.

Proponent Response: According to Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation (BL-PL), if pre-Project, unsustainable fuelwood collection was occurring within the Project boundaries modules BL-DFW and LK-DFW shall be used to determine potential leakage. While BCEP pre-Project, limited fuelwood extraction may have been occurring on the 50 ha parcel of the property that is next to Indian Creek Village and Golden Stream Village alongside the Southern Highway that is excluded from the above-ground biomass carbon pool, the removals on this thin buffer strip along the Southern Highway across from Indian Creek Village and Golden Stream Village would have been de minimis. Population estimates pre-Project were roughly, at the very most, 750 individuals (Table 1: 1997 estimated populations).

Using annual fuelwood consumption per capita (Schulte-Bisping 1999) for Belize at 0.15 ton oil equivalent (TOE) and FAO conversion factor of 0.26 for one m3 fuelwood (solid 20–30% moisture content) / TOE yields 0.58 m3 fuelwood per capita per year.

After applying Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01) (T-SIG), the impact on this carbon pool was de minimis and substantially less than 5%. Therefore, according to the Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01) (T-SIG), the GHG emissions by sources, possible decreases in carbon pools and leakage emissions measured by this occasional fuelwood extraction on this boundary parcel is considered insignificant. Furthermore, according to village records, there has been no traditional fuelwood collection that occurred on the Project site (Toledo Maya Cultural Council 1997). Some collection of debris wood left over from agricultural operations may have occurred alongside the Project area on a parcel that is not part of the Project, yet the total carbon anthropogenic emissions from this source is de minimis and insignificant (Table 2: FGBSL, i, t Variables and Equation 1: FGBSL, i, t Equation).

Auditor Response: The validation team reviewed the assumptions of this analysis and found them reasonable. Additionally, the validation team spoke with Bonifacio Tut, a local tree identification expert who was hired by the validation team to assist with field work, regarding the volumes of fuel wood used by people who live in the area. Mr. Tut's estimates were consistent with the assumptions made in the analysis by the project proponent. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.9 of 47 1/11/dated 2011

Standard Reference: BL-PL 1.2

Document Reference: BCEP Carbon PDD ver 2.doc Sec 4.2 p19

Finding: The methodology requires documentary proof of legality of deforestation. The PD states that legal permissibility is assumed because similar deforestation occurs today and because previous deforestation was well known, but this does not constitute documentary proof. Please provide such proof.

Proponent Response: The Belize Private Forests Act (http://www.belizelaw.org/lawadmin/index2.html) requires that for conversion to take place for agriculture, no permits are required if trees under 2 feet in circumference are to be felled and burned in place. To fell trees over 2 feet in circumference requires a permit from the Forest Department. The term tree is defined as mahogany and cedar.

Provided that no such application or permission shall be necessary to fell trees under two feet girth measured at one foot above the buttresses during the clearance of land for agriculture but no tree so felled may be sold as timber without a permit from the Chief

Forest Officer

We have found no evidence to indicate that 2 foot circumference or larger mahoganies or cedars were removed by the deforesting agent therefore we presume that the deforestation for agricultural conversion was performed legally prior to acquisition by the current landowner. Regardless after the hurricane of 2003, no trees of any size were left, so clearing could have proceeded legally at that point.
No cedars or mahoganies were detected in the field data, however mahogany and cedar does occur rarely on the property. If at any time, the deforesting agent encountered mahoganies or cedars, he could have left them standing in the field or gotten a permit from the Forest Department to remove them.
Auditor Response: The validation team found that, though conversion of privately owned forest land to agriculture is legal in Belize, local laws require an environmental impact assessment prior to clearing of greater than 300 acres. See response to NIR 2011.46. After NIR 2011.46 was resolved, the Proponent's response adequately addressed the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.10 of 50 dated 1/11/2011

Standard Reference: BL-PL 1.2
Document Reference: BCEP Carbon PDD ver 2.doc Sec 4.2 p19
Finding: The methodology requires that suitability for conversion to alternative non-forest land use include documentary proof of access to relevant markets, suitability of soils, topography, and climate. Observing that the property was in the process of being converted to alternative use does not constitute documentary proof of these elements. Please provide such proof.
Proponent Response: Documentary proof:
Access to markets: see attached report "Report of damage by Hurricane Richard to the Citrus Industry of Belize By Luis G.Tzul"
Suitability of soils: See Bowen-Jones 2001 attached that is documentary proof of suitability (see section on land use history).

Auditor Response: Adequate evidence of suitability for alternative use was provided in conformance with the requirements of the methodology. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.11 of 50 dated 1/11/2011

Standard Reference: BL-PL 1.3-1.5
Document Reference: BCEP Carbon PDD ver 2.doc Sec 4.2 p20
Finding: Provide evidence that the eight proxy areas for which data is presented in table 1 meet criteria 1-6 in section 1.3 of module BL-PL (page 5). Additionally, please provide verifiable documentation of the calculation of the deforestation rate in each proxy area. Demonstrate that none of the proxy areas have been abandoned as described in section 1.5.
Proponent Response: A metadata record is attached for the new proxy area analysis.

Auditor Response: After issuance of this finding and discussions during the site visit, the proxy analysis was repeated. Evidence of the required criteria were presented with the revised proxy area analysis. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.12 of 50 dated 1/11/2011
Standard Reference: BL-PL 2.2 **Document Reference:** BCEP Carbon PDD ver 2.doc Sec 4.2 p20 **Finding**: Provide a copy of the reference used to determine the maximum carbon stock of citrus plantations. Demonstrate that this stock includes all selected and required pools, including aboveground and belowground biomass. **Proponent Response**: The reference used to determine the maximum carbon stock of citrus plantations is: Food and Agriculture Organization of the United Nations. 2003. Belize; Facing the Climate Change. *Central American series on forest and climate change*. http://www.fao.org/DOCREP/006/AD438E/AD438E00.HTM In this study the static approach is used to measure the baseline. This approach assigns static or fix rate for carbon uptake at the start of the project and uses the same rate for the lifetime of the project. **Auditor Response**: The reference was provided. A review of the reference showed that the carbon stock indicated in the FAO publication was not based on measured data, but was rather an assumption made for the purpose of making country-level estimates. The verification team determined that the reference did not meet the requirements of the methodology for estimating post deforestation carbon stocks. NIR2011.36 was issued in response. After NIR2011.36 was resolved, the Proponent's response adequately addressed the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.13 of 50 dated 1/11/2011
Standard Reference: Voluntary Carbon Standard 2007.1, Sec. 5.11; REDD-MF II step 3 **Document Reference:** BCEP Carbon PDD ver 2.doc, Appendix A **Finding**: The monitoring plan must be consistent with the methodology as described in REDD-MF step 3, including descriptions of items a-f for each monitoring task. Additionally, the VCS standard requires that the project proponent establish and maintain criteria and procedures for obtaining, recording, compiling, and analyzing data. These monitoring procedures must include: • purpose of monitoring; • types of data and information to be reported - including units of measurement; • origin of the data; • monitoring methodologies, including estimation, modeling, measurement or calculation approaches; • monitoring times and periods, considering the needs of intended users; • monitoring roles and responsibilities; • GHG information management systems, including the location and retention of stored data Please provide a monitoring plan that is consistent with the methodology and that more completely the data monitored, including units, origin, measurement methodology, monitoring times, and information systems. The monitoring plan states that measurements must be conducted according to relevant standards. To make this requirement verifiable, please list the standards that will be used for each measurement type. In order to permit replication of the sampling methodology, the monitoring plan should also include the following: - Methodology by which inventory plots are monumented - Size and type of inventory plot used - A list of variables measured

- Minimum diameter at breast height used, if any
- A list of tools used to measure trees in inventory plots
- Any applicable conditions under which diameter at breast height was measured at a point other than 1.3 vertical meters above the ground surface
- The point on the tree stem that was used to determine whether a tree was on or off the plot
- A list of any species or other categories of live trees that may have been excluded from sampling, if applicable
- Any edge correction procedures used, if applicable
- Any other useful information for this purpose

Proponent Response: See attached revised monitoring plan. The inventory was conducted according to the techniques described in the monitoring plan.

Auditor Response: A revised monitoring plan was submitted. Review of the monitoring plan showed that it provided all requested details of project monitoring protocols. After observation of plots installed in the project area, some additional details were requested in NIR 2011.44. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.14 of 50 dated 1/11/2011

Standard Reference: CP-AB Section III p12
Document Reference: Appendix A, p34
Finding: The methodology requires that allometric equations be validated. Please provide evidence of validation of allometric equations according to the procedure given on pages 12-14 of CP-AB.
Proponent Response: The allometric equations were validated for Belize by Brown et. al. 2005. A copy of the paper has been attached

Auditor Response: The document provided by the Proponent described validation of the equations in a different forest type in Belize. The methodology requires direct site specific validation of allometric equations. NIR2011.38 was issued in response. After NIR2011.38 was closed, The Proponent's response adequately addressed the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.15 of 50 dated 1/11/2011

Standard Reference: X-UNC p2
Document Reference: BCEP Carbon PDD ver 2.doc Sec 4.2 p20
Finding: The methodology allows indisputably conservative estimates to be used instead of uncertainties, provided they are based on verifiable literature sources or expert judgement. The analysis of deforestation rate based on proxy areas is based on a sample of data collected and analyszed by the project proponent, rather than a verifiable literature source or expert judgement, so uncertainty analysis is required. Please provide such analysis. The reference to r2 in X-UNC page 3 is for unplanned deforestation and is not relevant to assessing planned deforestation. No regression is prescribed by the methodology for predicting the deforestation rate for planned deforestation.
Proponent Response: This is a revised response:
The rate of conversion is set at 10.8% based on proxy area analysis. The uncertainty associated with the rate is 7.43%.
The inventory uncertainty was determined to be 24.88%. To calculate total project uncertainty we used the formula in module X-UNC on page 8. This results in a total project

uncertainty of 35.96%.
Proxy area analysis and inventory were provided as attachments for other NIRs.
The other sources of uncertainty are presumed to be 0 based on literature and expert opinion that the proposed amounts are indisputably conservative. See below for the project uncertainty calculations.

Auditor Response: The calculation of uncertainty was reviewed by the validation team. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.17 of 50 dated 1/11/2011

Standard Reference: Voluntary Carbon Standard 2007.1 Section 3.4
Document Reference: NA
Finding: The Standard requires that AFOLU projects identify potential negative environmental and socio-economic impacts and take steps to mitigate them prior to generating VCUs. Please provide documentation of any potential negative impacts and the steps taken to mitigate those impacts.
Proponent Response: The Project does not anticipate any negative biodiversity impacts within the area surrounding the Project. Offsite impacts will be positive since larger habitat and forest areas will improve the long-term viability of fauna and flora populations offsite. Avoiding conversion to agriculture also avoids release of sediment and agricultural chemicals into waterways and the Port Honduras Marine Sanctuary. If any negative impact is identified, the BCEP team and the community representative will address such problems with fast and effective solutions. The issue will be discussed and mitigation actions will be designed.
The Project is not expected to have negative social impacts on the communities surrounding the Project area. It is not expected that the Project will negatively impact any of offsite communities. In the case of any potential negative impacts, representatives of the impacted community will bring it to the attention of the conflict resolution coordinator. No unmitigated social or economic impacts are expected from the Project.
According to personal interviews and official correspondence, Indian Creek Village has never traditionally used the BCEP property for hunting, medicinal plant collecting, or other activities. All hunting has traditional occurred west and north of the village (Toledo Maya Cultural Council 1997).
According to personal interviews and official correspondence, Golden Stream Village has never used the BCEP property for hunting, medicinal plant collecting, or other activities (Toledo Maya Cultural Council 1997).
The Pine Hill Mennonite Community, a Kleine Gemeinde Mennonite community, is reclusive and interacts minimally with others from outside their community. They have no record of using the BCEP property for hunting or other activities. Currently, they receive from BCEP road access to their property through BCEP property.
Project has been awarded Gold Level certification by the Climate, Community, and Biodiversity Alliance.

Auditor Response: The supplied analysis is appropriate, and is consistent with the analysis validated against the CCB standards in 2010. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.18 of 50 dated 1/11/2011

Standard Reference: VCS 2007.1 Section 5.7 p 15
Document Reference: BCEP Carbon PDD ver 2.doc Sec 8.1
Finding: Please provide copies of the proof of title documentation described in section 8.1 of the PD.
Proponent Response: See attached copies of title documents.

Auditor Response: Adequate evidence of title was provided by the project proponent. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.19 of 50 dated 1/11/2011

Standard Reference: ACS AFOLU Program Update 8 Sep 2010
Document Reference: BCEP Carbon PDD ver 2.doc Sec 8.1
Finding: The VCS program update from 8 September 2010 requires best practice fire prevention measures to justify a low risk rating for REDD projects. Please provide a description of fire prevention measures for the project area.
Proponent Response: This ecosystem is a wet tropical system with a range of 90 mm/month in the dry season to 750 mm/month in the wet season. Fires in this system are rare events. A superb discussion of fire (Meerman and Sabido 2001) in Belize may be viewed at
http://biological-diversity.info/fire.htm
Note that the project area is in the lowest fire risk category.
The best practices for fire prevention in Belize are primarily excluding humans from the property through patrols as is proposed in the project plan.

Auditor Response: Consultation with the local technical expert hired by the audit team confirmed that, in these forest types, fires are primarily anthropogenic in origin and that few fire prevention measures are required. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.20 of 50 dated 1/11/2011

Standard Reference: REDD Methodological Module BL-PL, Sec. 1.1
Document Reference: NA
Finding: The Module requires that the agent of planned deforestation be identified. However, the identity of the agent of deforestation is not clear upon reading the proponent's PDD. Please clearly identify the agent of planned deforestation.
Proponent Response: The agent of deforestation is the previous landowner Mr. Harold O. Whitney. He was in the process of converting the property when the current landowner, Mr. Ken Karas purchased the property. See Bowen-Jones 2001 for a land use history.

Auditor Response: The project proponent has identified a specific agent of deforestation. However, no specific evidence of Mr. Whitney's intent to personally convert the area to agriculture was available. Though there was evidence that Mr. Whitney had previously converted portions of the property, interviews with the current landowner showed that Mr. Whitney was actively attempting to sell the property, and that he had received at least one other serious offer to purchase the property apart from that of the current landowner. Consequently, the audit team determined that it was not appropriate to identify Mr. Whitney as the specific agent of deforestation, as implementation of the project prevented deforestation by alternate purchasers as well as by Mr. Whitney. NIR 2011.38 was issued in response. Subsequently, an analysis of a class of deforestation agents was undertaken, as described by the methodology. After resolution of NIR 2011.38, the Proponent's response adequately addressed the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.21 of 50 dated 1/11/2011

Standard Reference: Voluntary Carbon Standard Tool VT0001, Sec. 2.2.1
Document Reference: BCEP Carbon PDD ver 2.doc, Sec. 2.4
Finding: The Tool requires that any identified alternative land uses be realistic and credible, and that for all land uses that are not currently occuring or have not occurred within the past 10 years, credibility shall be justified.
Sufficient information has not been provided for the assessor to determine whether the "Conversion of Forest Land to Settlements" land use is credible. While information has been provided about population increase in the Toledo District, this increase will not necessarily result in development pressure for the project area.
Likewise, credibility has not been demonstrated for the "Logging of Timber for Local and Domestic Use" land use, given that illegal logging was also identified as a potential land use and that the project proponent has stated that no timber of merchantable size remains after the recent hurricane. If this land use would be illegal in the baseline scenario, this should be explicitly stated and the appropriate guidance in the Tool shall be implemented. If this land use would be legal, please explain the mechanisms by which this land use would be economically feasible.
Proponent Response: PDD has been revised to remove the two offending alternatives.

Auditor Response: The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.22 of 50 dated 1/11/2011

Standard Reference: Voluntary Carbon Standard Tool VT0001, Sec. 2.2.2
Document Reference: BCEP Carbon PDD ver 2.doc, Sec. 2.4
Finding: The Tool requires that, where a land use alternative does not comply with all mandatory applicable legislation, the proponent demonstrate that "applicable mandatory legal or regulatory requirements are systematically not enforced and that non-compliance with those requirements is widespread, i.e., prevalent on at least 30% of the area of the smallest administrative unit that encompasses the project area." Demonstrate that this is the case, specifically that illegal logging occurs on at least 30% of the area of the smallest administrative unit that encompasses the project area.
Proponent Response: The illegal logging scenario has been removed from the PDD.

Auditor Response: The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.23 of 50 dated 1/11/2011

Standard Reference: Voluntary Carbon Standard Tool VT0001, Sec. 2.3.1
Document Reference: BCEP Carbon PDD ver 2.doc, Sec. 2.4
Finding: The Tool requires that, if the VCS AFOLU project generates no financial or economic benefits other than VCS related income, either investment comparison analysis or the benchmark analysis must be used. Regardless of whether or not ecotourism activities have

turned a profit, they have generated revenue. Therefore, one of the two previously mentioned analysis methods must be used to determine the most financially attractive land use.

Proponent Response: The ecotourism operation is a separate entity. No financial resources are planned for transfer from the ecotourism operation to the carbon project. At present the ecotourism operation is negative. No income is expected from the carbon project. Simple financial analysis would indicate that without the carbon income the financial situation will be negative. The baseline scenario of agriculture and particular citrus is considered positive since a. it was underway at the time of the purchase of the project (see Bowen-Jones 2001) and the citrus industry is a healthy part of the Belizean economy (Tzul 2010). Therefore at least one of the baseline scenarios is more profitable than the project scenario excluding the carbon project income.

Financial plans for both the ecotourism operation and the carbon project will be made available to the auditors.

Auditor Response: The validation team determined that, even though the ecotourism operation is not financially linked to the carbon project, protection of the forest through carbon finance generates financial benefits for the ecotourism operation, and therefore the financial analysis required by the standard was still required. NCR 2011.35 was issued in response. After resolution of NCR 2011.35, the Proponent's response adequately addressed the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.24 of 50 dated 1/11/2011

Standard Reference:NA

Document Reference: BCEP Carbon PDD ver 2.doc

Finding: Please provide more information regarding the deed restriction to be implemented as part of the project activity. Address what sort of activities will be prohibited by this restriction and how the restriction will contribute to the project's goals.

Proponent Response: The deed restriction is envisioned as a commitment by the landowner on the title to comply with the project plan over the life of the project. The purpose of this title restriction is (in the unlikely event that the land changes hands) to bind any new owners to compliance with the CCB and VCS project plans e.g. no removal of forest, regular monitoring, patrols, outreach to the local communities, etc…

Auditor Response: After discussions during the site visit, it was determined that no deed restriction currently exists on the property. No restriction is required by the standard, and the envisioned, but not yet implemented restriction was not considered in assessing the project's risk of reversal. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.25 of 50 dated 1/11/2011

Standard Reference:NA

Document Reference: BCEP Carbon PDD ver 2.doc, Sec. 9.1

Finding: Provide more information regarding the "legal easement" mentioned at the bottom of p 29.

Proponent Response: The deed restriction is envisioned as a commitment by the landowner on the title to comply with the project plan over the life of the project. The purpose of this title restriction is (in the unlikely event that the land changes hands) to bind any new owners to compliance with the CCB and VCS project plans e.g. no removal of forest, regular monitoring, patrols, outreach to the local communities, etc…

Auditor Response: After discussions during the site visit, it was determined that no legal easement currently exists on the property. No easement is required by the standard, and the envisioned, but not yet implemented easement was not considered in assessing the project's risk of reversal. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.26 of 50 dated 1/11/2011

Standard Reference: Voluntary Carbon Standard Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination
Document Reference: BCEP Carbon PDD ver 2.doc, Sec. 9.1
Finding: One risk factor required to be addressed by the Tool, for REDD projects, is: "population surrounding the project area." The proponent has provided information regarding the population inside the boundaries of the project area, which is not germane to this risk factor. Please provide information regarding the population surrounding the project area, and re-evaluate the risk factor if necessary.
Proponent Response:
The following is added to the PDD:

> ***Population Surrounding the Project Area***
> *The population density in the surrounding area is very low. It is < 50 people / km2. The Project's boundaries are defined by the 931 ha Pine Hill Mennonite Community, the 7,516 ha Seven Hills Estate, the 2,192 ha Manatee Creek Parcel, the 3,866 ha Golden Stream Parcel, and Indian Creek Village for a total of 14,505 ha. There are three communities located in the Project Zone. The communities are Indian Creek Village, Golden Stream Village, and Pine Hill Mennonite Community. The population of three communities is roughly 1,250 individual (Table 1: Population surrounding the Project area 2008 midyear population estimates). Population density is roughly 8.6 individuals per km2. Population density in the surrounding area is very low risk.*

Table 1: Population surrounding the Project area 2008 midyear population estimates
[This table was not able to be added, please see the Proponent Response.]

Auditor Response: The population densities described here are consistent with those observed by the validation team during the site visit. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.27 of 50 dated 1/11/2011

Standard Reference: VCS 2007.1 Section 5.5
Document Reference: BCEP Carbon PDD ver 2.doc, Sec. 4.2
Finding: Please provide justification for the assumed growth rate of 6.3% per year.
Proponent Response: A copy of the document is attached.

Auditor Response: The project uses an assumed growth rate from a similar forest in Mexico. No literature was available for tropical forests in Belize recovering from hurricane disturbances. The validation team found the literature reference to be appropriate, but notes that application of this study in Belize is likely to result in high uncertainty in *ex-ante* estimates of forest growth rates. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.28 of 50 dated 1/11/2011
Standard Reference: NA **Document Reference:** NA **Finding**: Please clarify the role of the existing inventory used to determine the 2009 starting point of 54.06 tons C/ha, as compared to the planned inventory for VCS validation. **Proponent Response**: The starting point of 54.06 tons C/ha is calculated from the plot data. The monitoring plan calls for re-measurement of each tagged tree on each plot at each monitoring event which will provide an opportunity to confirm the growth rate assumption as well as detecting unplanned reversals. The 2009 data is the only data proposed for validation and will be made available upon request. Re-measurement of the plots in January of 2011 will be conducted to support the verification of vintage years 2009 and 2010. **Auditor Response**: Initial communications with the Project Proponent indicated that additional inventory work was to be conducted after the beginning on the audit. This finding was issued to clarify which data should be assessed during the validation audit. The initially provided data was assessed with a check cruise during the site visit. The results of that check led to issuance of NCR 2011.48, which was resolved by re-measurement of inventory data. The data validated in this report were measured in 2011. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.29 of 50 dated 1/19/2011
Standard Reference: CP-AB, Sec. 2, Part 1 **Document Reference:** PDD Appendix A, p6 **Finding**: The Module requires that "representative random or systematic" sampling be employed in locating sample plots. Five sample plots (plots 6, 11, 15, 21, and 22) were located based on their proximity to a passable trail, rather than randomly. The resulting sample does not constitute a valid basis with which to estimate carbon stocks in the BCEP in accordance with the Module, as certain portions of the project area were systematically omitted from sampling by moving the plots that fell in those areas. **Proponent Response**: The sample size required to achieve the desired precision and confidence is 20 forest inventory plots. However, to ensure that the full range of variability was captured in the 'Forest Land' – the *Lowland Broad Leafed Wet Forest* - class on the project site, a total of 26 forest inventory plots were allocated. Plots were randomly allocated within the 'Forest Land' land-use and land cover (LULC) class using geographic information systems (GIS) and identified by specific XY coordinates (Table 10: UTM locations of forestry plots used to determine aboveground biomass (coordinates are in WGS 84 zone 16) and Figure 2: Location of forest sample plots at BCEP). However, due to high rainfall events during the field season 5 plots were inaccessible due to flooding. These plots were: 6, 11, 15 (originally allocated approximately south of current locations), 21, and 22 (originally allocated north east of the current locations). FCO allocated these inaccessible plots using a passable trail as a transect and randomly choosing 5 points along the trail, then randomly choosing an azimuth and distance (between 50 and 750 m from the trail) to locate the plot. Plot ID was randomly assigned to each location. Since 20 plots are required and 21 plots were randomly allocated, the sample is valid. The additional plots may or may not be biased. By randomly assigning distances and azimuths from the trail, the possibility of bias is lessened. The standard also allows for systematic sampling so the door is open for other procedures of assigning plot location rather than strict random assignment.

Auditor Response: The location 20 out of 26 plots in a random way does not eliminate the risk of bias introduced from locating the other 5 plots in a way that is not representative of the entire project area. The validation team notes that the use of sample size estimation equations to determine the sample size required to attain a given precision level is approximate, and depends on the accuracy of available data regarding variability within the forest prior to the sample. As reflected in the results of the uncertainty calculations required by the methodology, 20 plots were not sufficient to attain the initially desired precision. The validation team also noted that the number of initial plot locations that were excluded from sampling was high in comparison to the total number of plots sampled (5/26 = 19%). Because of the continued possibility for bias by excluding these areas from sample, NCR2011.30 was issued. After NCR2011.30 was resolved, the Proponent's response adequately addressed the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.30 of 50 dated 1/21/2011

Standard Reference: CP-AB, Sec. 2, Part 2
Document Reference: PDD Appendix A, p7; Response to NCR 2011.29
Finding: This NCR is in response to NCR 2011.29. The Module requires that "representative random or systematic" sampling be employed in locating sample plots. Regardless of the number of plots for which the original location was maintained, the method for locating sample plots was not representative of the entire project area. Even if the plots which were moved are not considered, the sample is not representative of the project area, as the areas that were flooded at the time of the previous field season had a zero percent chance of being included in the sample. The remaining plots would only be representative of the non-flooded portion of the project area. Five out of 26 plots (19%) fell in areas that were excluded from sampling, suggesting that the unsampled area represents a substantial portion of the total project area. A representative sample must be used to estimate carbon stocks in the entire project area.
Proponent Response: See revised response in NCR 29. The five plots that were moved for safety issues will be measured and added to the inventory and new statistics including the additional 5 plots will be included.

Auditor Response: The initial locations of the 5 initially excluded plots were measured by the project proponent. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.31 of 50 dated 1/21/2011

Standard Reference: BL-PL 1.2
Document Reference: Response to NIR10
Finding: The Tzul report adequately establishes access to markets. However, the Bowen-Jones report does not discuss soil suitability. Rather, it states that the land was owned from the 1980s until 1998 by a logger from north America who "extended the clearance of land near the road (for citrus and banana) whilst using it as a base for his logging operations throughout the Golden Stream watershed." This does not constitute "documentary proof" of suitability of soils for agriculture. Please provide additional information supporting the suitability of soils for agriculture.
Proponent Response: Soils in the project area are as described (in our BCEP CCB PDD):

"Soils throughout the Project Area are derived rfom mudstones, sandstones limestone deposits. Soils are moderately shallow clays that are fairly well drained (Baillie 1993). The soils are underlain by flat-bedded mudstones with some minor sandstones and limestones. Most soils are clay and well-drained while calcium and magnesium are present. The soils are moderately acidic (Ballie 1992)."

According to:

1. http://www.greenstone.org/greenstone3/nzdl;jsessionid=08426020AFACE171F7881ES4797F22BF?a=d&c=hdl&d=HASHaa250f8d90a80dea58551b&dt=hierarchy&p.a=b&p.s=ClassifierBrowse
2. http://www.agnet.org/library/bc/52004/

Citrus soils need:

1. To be moderately acidic (yes)
2. Well-drained (yes)
3. Without a deficiency of calcium and magnesium.

In other words, the soils on the Project site are sufficient according to Baillie and others for citrus growing.

Auditor Response: Adequate evidence of soil suitability was provided. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.32 of 50 dated 1/25/2011

Standard Reference: X-UNC
Document Reference: Response to NIR 16
Finding: Equation 5 of the Module X-UNC requires that the uncertainty in each carbon pool be calculated. The different pools are listed in REDD-MF, Table 1. Uncertainty for a given pool can be assigned as 0 if it can be shown that carbon estimates in that pool are indisputably conservative. The proponent has stated that "The with-project carbon stocks estimate does not include soils or litter. Again based on expert opinion, we are claiming that these estimates are indisputably conservative."
The fact that proponents have decided not to monitor carbon in the "soil organic carbon" or "litter" pools does not affect the uncertainty in the "above- and below-ground biomass in live trees" pool. The proponent's estimate of biomass in live trees is based upon sampling and therefore has its own sampling error. It is not indisputably conservative. Therefore, the uncertainty in this estimate must be computed and incorporated into all applicable equations.
Proponent Response: Uncertainty for the above ground and belowground live biomass has been calculated and found to be 23.48% Since exclusion of the other pools is considered undeniably conservative, their uncertainty is calculated at 0% leaving the uncertainty for the above and below ground biomass at 23.48%. Without project biomass uncertainty is still considered to be undeniably conservative and is considered 0%.
Appropriate changes have been made in the PDD.

Auditor Response: Appropriate calculations were made to estimate uncertainty due to sampling error. These calculations were checked by the validation team. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.33 of 50 dated 1/25/2011

Standard Reference: X-UNC Sec. 2, p3
Document Reference: Response to NCR 15
Finding: The proponents have calculated the uncertainty associated with the proxy area analysis using the width of the 95% confidence interval derived from the estimated deforestation rate in the individual proxy areas. The methodology requires this uncertainty to be expressed as a percentage of the mean deforestation rate observed across all proxy areas.
Proponent Response: A new proxy area analysis was performed to satisfy concerns that the first attempt did not capture deforested properties that were of a similar size to the project area. Jpegs and metadata summaries are attached. The results are as follows:
[This table was not able to be added, please see the Proponent Response.]

Auditor Response: The new deforestation proxy rate analysis appropriately estimated uncertainty in conformance with the methodology. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.31 of 50 dated 1/31/2011

Standard Reference: BL‑PL 1.2
Document Reference: Response to NIR10
Finding: The Tzul report adequately establishes access to markets. However, the Bowen‑Jones report does no
until 1998 by a logger from north America who "extended the clearance of land near the road (for citrus and
Stream watershed." This does not constitute "documentary proof" of suitability of soils for agriculture. Please pro
Proponent Response:
Soils in the Project area are described as (in our BCEP CCB PDD):
"Soils throughout the Project Area are derived from mudstones, sandstones limestone deposits. Soils are moder
by flat‑bedded mudstones with some minor sandstones and limestones. Most soils are clay and well‑drained
1993)."
According to:
1.http://www.greenstone.org/greenstone3/nzdl;jsessionid=08426020AFACE171F7881E54797F22BF?a=d&c=hdl&
2. http://www.agnet.org/library/bc/52004/
Citrus soils need:
1. To be moderately acidic (yes)
2. Well‑drained (yes)
3. Without a deficiency of calcium and magnesium.

In other words, the soils on the Project site are sufficient according to Baillie and others for citrus growing.

Auditor Response: equate evidence of soil suitability was provided. The Proponent's response adequately
methodology.

NCR Number 2011.34 of 50 dated 1/31/2011

Standard Reference: REDD-MF, E-BB
Document Reference: Response to NIR1, Response to NIR 7
Finding: Module E-BB is mandatory according to REDD-MF Table 1, page 4. Even if fire is unlikely in the area and no biomass burning is planned as part of project activities, emissions

from CH_4 and N_2O must be included in the project in the event that a fire occurs, and accounted for using the E-BB module as described on page 1 of E-BB.
Proponent Response: NIR language is:
The table in the PDD that displays the proposed credits by vintage will be updated to account for CH_4 and NO_2 emissions from biomass burning, and a separate column will be added to explicitly state the contribution of CH_4 and NO_2. Once the new data arrives next week we will add the new column to the new version of the spreadsheet and forward it to you to review.
A line in the PDD will be added:
In the event of ex-post fires occurring, the REDD Methodological Module: Estimation of greenhouse gas emissions from biomass burning (E-BB) Sectoral Scope 14 will be applied.

Auditor Response: The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.35 of 50 dated 1/31/2011

Standard Reference: Voluntary Carbon Standard Tool VT0001, Sec. 2.3.1
Document Reference: BCEP Carbon PDD ver 2.doc, Sec. 2.4; Response to NIR 23
Finding: The project activity (protection of the BCEP property from conversion to agriculture) generates financial benefits other than VCS related income. Regardless of whether the carbon project and the ecotourism business are interlinked financially, protection of the property as native forest allows ecotourism enterprises to operate in a manner that could not continue if the BCEP property were converted to agriculture. It is apparent that this activity will generate financial benefits, regardless of the identity of the beneficiary. Therefore, either investment comparison analysis or benchmark analysis, as defined in the Tool, must be used to conduct the investment analysis.
Proponent Response: The standard says in T-ADD 2.3 *Determine whether the proposed project activity, without the revenue from the sale of GHG credits is economically or financially less attractive than at least one of the other land use scenarios.* Our definition of project activities is anything we plan to do that has a direct or indirect impact on the carbon pools of the project. Our project activities for the VCS project are pretty clearly defined in the PDD, and they don't include the ecotourism activities. We've already said the ecotourism activities won't generate income for BCEP. The ecotourism operation is operating at a loss right now. See attached very confidential revenue and expense spreadsheet and budget for project.
The landowner has four lodges. Three are not in the project area, Indian Creek, Jungle Lodge, and Mojo Key. The other one is on the edge of the project area (Balum Na). The big attraction at Balum Na is the jaguar enclosure. Since three of the lodges are not in the project area, clearly BLE does not need the BCEP forest to run lodges. In fact, there are multiple nearby areas where BLE takes it guests to walk in much bigger jungle, as advertised on the BLE website. Furthermore, BLE does just that by taking them for hiking and cave exploration elsewhere in the Toledo District. Eco-tourism lodges in Belize do not usually have their own adjacent forested property and instead the business model in Belize is to take eco-tourism lodge guests to visit Belize's significant protected public lands.

Auditor Response: The project proponent provided confidential financial records that showed the the requirements for demonstration of financial additionality had been met. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.36 of 50 dated 1/31/2011

Standard Reference: BL-PL 2.2
Document Reference: Response to NIR12
Finding: The citrus carbon stock referenced in the FAO "Belize: facing the climate change" document is not based on measured data. Rather, the authors made generic assumptions in order to estimate the carbon sequestration potential for the country as a whole. Relevant text from the document is below:
"There is no data on carbon sequestered in the various types of agricultural operations in the country, and therefore in the analysis of the baseline values a generic rate of 10 tons of carbon per hectare of pastureland is used, while a higher figure of 20 tons of carbon per hectare is assigned to cultivated fields such as those producing annual crops like rice and corn. In higher yielding citrus plantations is assigned a value of 25 tons of carbon per hectare."
Based on this report, it is not clear whether the assumed carbon stock includes both above and belowground biomass, or only aboveground biomass. Further, the conservativeness or quantitative basis of the assumption is not discussed. The assumption that growth occurs immediately is part of the methodology(BL-PL, page 8-9, "where stocks accumulate through time the ultimate (highest) stock shall be used"), and not part of the justification for the conservativeness of the stock; this assumption is made by the methodology regardless of the source of data used to estimate the final carbon stock. A review of scientific literature by the audit team suggests that 25 tons/ha is a plausible carbon stock for a citrus plantation, but also that higher stocks are consistent with the literature as well. Insufficient evidence has been provided to demonstrate that the estimate of 25 tons/ha is indisputably conservative and thus has no associated uncertainty.
Proponent Response: Total GHG emissions from citrus include agronomic practices, transportation, storage, etc… per Spreen et.al. (2010) and Dasberg (1987). At present, we are conservatively excluding those additional emissions which can be substantial (123 tons C/ha-year according to Spreen, et al 2010). Feigenbaum (1987) reports the greatest weight for an individual tree at 319.7 kg/tree dry matter. This study only measured two trees that had been a part of a long term fertilization study and based on a more recent summary by Morgan et al (2006), this number appears to be an outlier. A far better reference in our estimation is Morgan et al 2006 that summarizes studies with much larger sample sizes. They found an average of 94 kg/tree for mature trees. Based on the best available literature, we feel an undeniably conservative estimate is 50% above the average found in Morgan et al 2006 or 141 kg/tree dry weight. Converting that weight to tons C/ha requires a presumption of tree density which is provided in Spreen et. al. (2010) as 107 trees/acre at year 20. That estimate then works out to 37 tons C/ha.
As you note, the methodology says "where stocks accumulate through time the ultimate (highest) stock shall be used". Just because this is a requirement of the methodology it does not follow that it is not conservative. Indeed it is conservative, and being a requirement doesn't make it less so. So we contend that the 37 tons C/ha figure is undeniably conservative because it is 50% higher than the best available information from the literature and it ignores the obvious growth pattern that any cultivated orchard would undergo. We also have no intention of including diesel use, pesticide use, and other baseline emissions that according to Spreen et. al. (2010) can also be substantial.
Based on our further review of the situation triggered by your question, we note a major omission in our model, the avoided emissions from nitrogen fertilizer use. The lowest rate recommended by the Belize Citrus Growers Association is 2.2 lbs of fertilizer (19-9-19)/tree-year. Running that number through the CDM tool for fertilizer impacts results in a mtCO2e figure of 46.75 mtCO2e/hectare-year avoided emissions. We will adjust our

model and provide a new version asap once the new data from the additional plots is incorporated.

Auditor Response: New estimates of citrus carbon stocks were made based on a review of additional literature. The estimates were shown to be indisputably conservative in nature. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.37 of 50 dated 1/31/2011

Standard Reference: VM0007
Document Reference: NA
Finding: Please clearly indicate the selected value and source for each of the parameters used by the methodology, but not monitored by the project (for example, in the CP-AB module, the carbon fraction, allometric equation, and root to shoot ratio selected for each species or species group).
Proponent Response: See attached list of variables.

Auditor Response: The variables selected were clearly reported and assessed by the validation team. The selected values for project-specific variables are reported in the validation report. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.38A of 50 dated 1/31/2011

Standard Reference: CP-AB p12
Document Reference: Response to NIR 14
Finding: The methodology requires "direct site-specific" validation of allometric equations. Please provide evidence of this validation from the project site.
Proponent Response: Site specific validation is complete. See attached data spreadsheet and graph below:
[please see the Proponent Response for graph]

Auditor Response: The validation exercise was conducted in conformance with the requirements of the methodology. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.38B of 50 dated 3/4/2011

Standard Reference: BLPL p 2-3
Document Reference: PDD section 1.7
Finding: It was determined through interviews during the on-site audit that the previous property owner was actively trying to sell the property prior to its purchase for conservation and carbon project development, and that other interested buyers actively tried to aquire the land. Consequently, the appropriate agent of deforestation is not limited to the previous landowner, but also includes other potential purchasers of the property. The analysis of the agent and area of baseline deforestation, consequently, must assess this "class of deforestation agents" using the criteria of BLPL section II 1.1 and 1.2. Additionally, leakage must be assessed based on this class of deforesting agents.
Proponent Response: This is a revision to this NIR response

While we can speculate as to what the previous landowner might or might not have done in the absence of an offer of purchase by the current landowner, the fact remains that the previous landowner was deforesting the property. There is no way to know if another buyer might have appeared to buy the property at a price that would have induced the previous owner to sell to another deforesting agent or if the previous owner would have continued deforesting the property to this day. Recall the one buyer that was negotiating with the previous landowner didn't follow through which left the property available for the current landowner. We should also take into account that hearsay evidence from the current owner doesn't constitute documentary evidence. The previous owner could have told the current owner quite a few things to instigate a higher sale. Getting into a guessing game as to how things might have turned out differently is beyond the scope of the standard or the audit. Regardless of what might have happened, what did happen was that the current landowner purchased the property and ended the deforestation activities by the previous owner.

The methodology requires that a class of deforestation agent be identified "if the agent is not yet defined". In this case, the agent is clearly defined as he was the guy driving the bulldozer so identifying a different "class of agent" is not appropriate or arguably even allowed within the methodology.

Despite all this, in the interests of moving the audit along, we will acquiesce to the supposition that another landowner could have appeared on the scene and could have bought the property and deforested it. Since that landowner is unknown, a class of deforestation agents will be cited in the PDD as a the agent of deforestation.

That also triggers a change in the leakage calculation component of the project and the use of module LK-ASP. The leakage calculation for the with project scenario is incorporated in the model (and reviewable in the spreadsheet model already submitted). The variables for the analysis are:

D%planned: This was generated by evaluating proxy areas (10.8%/year)
PFc: This number (64.5%) was determined utilizing available landcover data for Belize and a description of the procedure is below.
LK: The leakage factor was determined conservatively to be .4 as most of the best lands suitable and available for agriculture are already converted leaving less suitable lands for conversion.
C bsl: This variable was determined in module CP-AB

Determining PFc

CMI determined the potential using the 'Belize Ecosystems Shapefile (v.2004c)' and the 'Belize Protected Areas (Polygon) Dataset (2008)' shapefiles, downloaded from the Biodiversity & Environmental Resource Data System (BERDS) website (http://www.biodiversity.bz/mapping/warehouse/). Analysts performed all process steps in ArcGIS 9.3.
The 'Belize Ecosystems' shapefile contains landcover for the entirety of Belize (Table 1.). We removed areas of forest already under protection using the 'Erase' tool in ArcGIS to intersect the 'Ecosystems' shapefile and the 'Protected Areas' shapefile. Acreage was then recalculated for the new polygons. The next step reclassified the remaining area into 'Forest', 'Agriculture', or 'Other'. The sum of the forest and agriculture polygons gave the total potential area for agriculture. The percent of this area that is forested was calculated from this total potential area and determined to be 64.5%.

Auditor Response: The audit team and project proponent disagreed with regard to the analysis of the appropriate agent of deforestation in this case. Ultimately, there is no definitive documentation of what would have happened in the project area in the absence of the project. Evidence that the previous landowner had cleared portions of the property for conversion to agriculture was evident at the project site. However, his intentions for the property had it not been acquired by the project proponents were not documented. Interviews with the current landowner indicated that the previous landowner was actively trying to sell the property at the time of purchase by the project proponent, and that there were credible offers made by other parties. The current landowner identified a specific individual, apart from the previous landowner, who had attempted to acquire the property at the same time as the acquisition by the project proponent. If the project had not been implemented (i.e. BCEP had not purchased the land in order to conserve it), it was not clear whether the land would have been sold to this individual, someone else, or would have remained under the control of the previous landowner. The technical expert hired by the audit team indicated that the other individual known to have made a credible attempt to acquire the property is widely known in Belize to have cleared other areas of forest land for conversion to agriculture in recent years. Consequently, the audit team determined that specifically attributing baseline deforestation to the prior landowner, and thus accounting for leakage as zero, was not conservative. The project proponent disagreed with the auditors, but made changes to the project that are in conformance with the standard, including assessing potential leakage as described in the methodology . The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.39 of 50 dated 3/4/2011

Standard Reference: Tool for AFOLU Methodological Issues p5
Document Reference: PDD p20
Finding: The wood products pool and the fuelwood leakage emissions source have been excluded from the project as insignificant. It was determined that fuelwood leakage collection and would be likely to occur in the project area under the baseline scenario described. Additionally, commercially valuable timber was found within the project area, so the clearing described by the baseline scenario would be expected to generate wood products. According to the VCS Tool for AFOLU Methodolgical Issues, the sum of decreases in carbon pools and increases in GHG emissions that may be neglected must be less than 5% of the total CO2-eq benefits generated by the project. Please demonstrate that the sum of these pools and emissions sources is less than 5% of project carbon benefits or appropriately account for them in project baseline and monitoring.
Proponent Response: After analyzing the inventory and looking for commercial trees defined as trees over 25 cm dbh and either identified as a commercial species or not identified to species, we determined that the total tons biomass/ha attributable to these potentially commercial trees (see attached list) are 4.6 tons aboveground biomass/ha. Conservatively assuming that the entire amount constitutes the mean stock of extracted biomass (presuming sawn wood as no market exists for pulp and no trees are big enough to be peeled for veneer) that allows jumping to Step 3 of Option 1.
Carbon stock in wood products pool = 4.6 tons C x (1-Wood Waste Fraction at Mill) x (1-Fraction of wood products emitted in 5 years) * (1-Fraction of wood products emitted in 5-100 years). The wood waste fraction at the mill is provided in the methodology as .24. The fraction of wood products emitted in 5 years is provided in the methodology at .2. The fraction of wood products emitted in 5-100 years is provided in the methodology at .84.
Result is 4.6 x (1-0.24) x (1 - 0.2) * (1 - 0.84) = .447 tons / ha. Multiply that times 4792 hectares and times 44/12 gives a result of 7,862 mtCO2e emission avoided as a result of the wood products pool for the life of the project. Our current model for total avoided emissions over the life of the project exceeds 3 million tons so the total contribution from the wood products pool is less than 0.26%.
The other de minimis pool is fuel wood collection which was estimated (see NIR 8) at 28,736 mtCO2e which is 0.9% of the estimated total avoided carbon dioxide emissions for the life of

the project.
Both pools in sum are less than 5% and are insignificant. Note that increasing the amount of biomass attributable to commercial wood extraction by a factor of 10x still does not result in a significant pool.

Auditor Response: The latest version of project calculations includes detailed calculations of these two sources of emissions. The calculations and their underlying assumptions were assessed by the validation team. Collectively, both pools amount to less than 5% of the total anticipated carbon benefits of the project, and can thus be excluded from project accounting under VCS rules. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.40 of 50 dated 3/4/2011

Standard Reference: Tool for Demonstration and Assessment of Additionality
Document Reference: PDD section 2.4
Finding: Several other privately owned conservation reserves exist in the immediate vicinity of the project area, yet the potential for purchase of the project area for conservation purposes was not included in the potential baseline scenarios identified in section 2.4 of the PDD. This potential baseline scenario must be assessed in determining the most likely baseline scenario using the criteria provided by the methodology and applicable VCS tools.
Proponent Response: The following paragraph is added in section 2.4 as an alternative land use.
Purchase of the Land as a Conservation Area
There are privately owned protected areas in the area and throughout Belize. Most landowners, and the landowner at BCEP, that own these properties are members of the Belize Association of Private Protected Areas (BAPPA). Landowners purchase properties for conservation for a variety of reasons. Some establish non-profit companies to hold the property and some simply hold onto the property out of a desire to protect the biodiversity or other values of the site. There is no inherent financial income stream from owning a private protected area while there are several required expenses. The initial purchase price, annual taxes, maintenance, and protection from trespass are all expenses that can run into the millions of dollars. Landowners that pursue this strategy are required to be relatively wealthy or have outside sponsors or pursue a strategy of income generation that is consistent with conservation such as ecotourism.

Auditor Response: Reasonable justification that purchase of land for use as a conservation area (without carbon finance) is unlikely in the region was provided. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.41 of 50 dated 3/4/2011

Standard Reference: CP-AB p.11-12
Document Reference: NA
Finding: The CPAB module provides a prioritized list of sources for selecting allometric equations (CP-AB p12). An equation from the lowest priority equation source (Pan-tropical forest type-specific) was chosen. However, equations from sources of higher priority are available, including equations that incorporate a species specific wood density parameter and equations from neighboring countries with similar conditions. The project must apply allometric equations selected in a way that is consistent with the priorities given by the methodology.

Proponent Response: This is an updated response. After speaking with the auditors and reviewing the proposed allometric equations from Chave et. al. 2005, we assigned a new variable in the inventory for specific gravity for all known trees for which a specific gravity figure is published. For unidentified species or species that don't have published specific gravity figure available, we used a weighted average specific gravity for all known species on the project (.64).

A spreadsheet of all the specific gravity figures and their references is attached. We then used the wet forest (without Height) equation found on page 93 of Chave et. al. (2005) to predict biomass for each tree and each plot, and develop a mean and confidence interval for the project. The spreadsheet with these calculations is attached.

Auditor Response: The revised choice of allometric equations is consistent with those deemed most applicable for the project area by the technical expert hired by the audit team, and is in conformance with the priority for selecting equations given by the methodology. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.42 of 50 dated 3/4/2011

Standard Reference: CP-AB p.11-12
Document Reference: NA
Finding: CP-AB requires validation of the applicability of allometric equations using the methods provided on pages CP-AB 12-14. Please demonstrate that the equations selected for palm and cecropia species are applicable to the project area.
Proponent Response: This is a revised response to NIR 42:

The cecropia validation is presumed to be impossible since the height and dbh requirements have not been met by finding enough individual trees of adequate size in the field. We will remove the cecropia from the calculations and cite another conservative reduction in the projected biomass.
For the purposes of these calculations, cohune palm should be treated as a "non-tree woody species". This is more in line with the biology of the species. If we can acquire the original data from the Brown et. al. study in Belize
http://www.winrock.org/ecosystems/files/WI_Belize_ClosedForest_M3DADI_Report_2005.pdf

to do the equation validation we'll include the palms in a a new section entitled "Above ground non-tree biomass pool" where only the palms will be included. Otherwise we'll conservatively omit the palms as well. If that's the case, we'll need to plan on doing our own destructive sampling effort to deal with palms on this and future projects in Belize.

For the purposes of this audit, presume that the palms are conservatively removed from the analysis.

Auditor Response: Cecropia and palms were conservatively omitted from project biomass accounting. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.43 of 50 dated 3/4/2011

Standard Reference: Voluntary Carbon Standard 2007.1, Sec. 5.11; REDD-MF II step 3
Document Reference: BCEP Carbon PDD ver 2.doc, Appendix A; NIR13
Finding: Please provide a monitoring plan written with sufficient detail to ensure consistent

measurements throughout the lifetime of the project. In addition to the items described in NIR 13, this plan should include (but is not limited to):
-Measurement techniques for fallen trees with new shoots growing vertically from the fallen bole
-How the location of the diameter measurement point on each tree was determined
-measurement techniques applied for palms
-how trees were determined to be within the plot (i.e. distance to the face or center of the bole)
-consistent methods for dealing with butt swell or imperfections at the diameter measurement point
Proponent Response: See attached new copy of PDD with monitoring plan incorporated as appendix A.

Auditor Response: Additional details regarding the methods for monitoring biomass were provided and assessed by the validation team. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.44 of 50 dated 3/4/2011

Standard Reference: Voluntary Carbon Standard 2007.1, Sec. 5.11
Document Reference: Monitoring Plan
Finding: Field observations demonstrated that some biomass estimation plots were measured using a methodology that differed from that described in the monitoring plan, that these deviations were not well documented, and that tree tags on these plots appeared inconsistent with both the written plan and the verbal description provided by the project team. Please provide a detailed written account of the actual procedures used for all plot measurements, demonstrate that correct carbon stock calculations were made for these plots, and provide a plan for ensuring that consistent measurements will be made in future monitoring events.
Proponent Response: Originally the field methods were to measure all trees > 5cm occurring within a 14m radius of plot center. After the initial two plots were installed and measured 19 and 16, it was determined that a complete measurement of all trees > 5 cm would require far more time than planned and budgeted so a revised methodology was implemented that is described in this manual.
Plot 16 was remeasured during the survey using the revised methods and trees tagged outside of the plot boundary were not included in the database. Plot 19 was inventoried in the originally intended manner and the area expansion for that plot reflects the area used in the original methods. The expansion factor for that plot was 616 meters which is the area of a 14 meter radius circle making it equivalent to the other plots.

Auditor Response: After issuance of NCR 2011.48, all monitoring plots were re-measured. Those measurements were checked by a validation cruise. No evidence of methodological inconsistencies was found as a result of that validation exercise. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.45 of 50 dated 3/4/2011

Standard Reference: REDD-MF p. 5, M-MON
Document Reference: Spatial Data Provided, Field observations

Finding: Land in the project area must have qualified as forest for at least 10 years prior to the project start date. The audit team noted a line cut through the property that was not excluded from the project area. Additionally, it was not clear where all of the areas cleared for agriculture by the previous landowner were located, whether they were cleared in the ten years prior to the project start date, and whether they were included in the project boundary. Finally, the Southern Highway has been paved since the land survey provided by the project team, resulting in clearing of some forest area immediately adjacent to the road. Please provide a revised delineation of the project area that excludes all ineligible land and demonstrate that the classification accuracy meets the requirements of the MONM module.

Proponent Response:

(Describe and provide objective evidence)

The revised classification follows. Land in the project area was classified using imagery from 1993 and prior and using the BERDS boundary file:

[Table excluded to save space]

The Forest class area is the only part of the property included in the project. The BERDS boundary file results in a slightly larger land area than that recorded on the deeds, so we reduced the Forest class area to 3,980 hectares. The data used was from an analysis performed by MDA Federal for 1993. The report is attached detailing classification accuracy (95.8%).

Auditor Response: The validation team reviewed the revised project area and found it to be a conservative estimate of the area of forested land in the project area. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NIR Number 2011.46 of 50 dated 3/22/2011

Standard Reference: BLPL p 4

Document Reference: NA

Finding: The BL-PL module requires that "if government approval is required for deforestation to occur, the intention to deforest within the project area must be demonstrated by evidence:

o Recent approval from relevant government department (local to national) for conversion of forest to an alternative land use; or

o Documentation that a request for approval has be filed with the relevant government department for permission to deforest and convert to alternative land use;"

The Belize Environmental Impact Assessment (Amendment) Regulations (2007), schedule I, item (14)(d) and (g) requires an environmental impact assessment for clearing of land over 300 acres.

As a piece of the project area was acquired in 2008, the year following the year in which the EIA regulations were amended, please provide either (a) a demonstration that the project meets the requirements of the methodology as outlined above; or (b) a demonstration that the Environmental Impact Regulations cited above are not applicable to the project.

Proponent Response: Presumably all lands cleared over 300 acres in Belize are subject to this law. Belize common practice is to ignore the law in its entirety, or common practice is to provide a waiver from the law since there are no published reports of EIAs being conducted for agricultural land clearing in Belize (http://www.doe.gov.bz/EIAs.html), and there are no published reports of EIAs being declined in Belize (http://www.doe.gov.bz/EIAs.html). Regardless, this law has clearly not been a barrier to clearing land as evidenced by the extensive land clearing that has gone on in the country since 2007. Given the monumental

effort Belize is undergoing to support agriculture (http://www.agriculture.gov.bz/PDF/Policy_Document.pdf) and the national policy supporting the expansion of agriculture (http://www.embassyofbelize.org/belize-profile/economy.html) including technical, financial, and international development assistance, it is unlikely at best that any restriction would be placed on land clearing for agriculture if an EIA or study were required. If an EIA or environmental study were required it would be conducted and approved. For example, the Balam Jungle Estates EIA approved by the Government of Belize on October 26, 2007 would clear 25,784 acres *and* commercially log another 44,345 acres, for a total of 70,129 acres of cleared lowland tropical moist forest, in the same ecozone as BCEP.
Since the agent of deforestation is a "class of deforesting agents", Belize laws do not require that "classes of deforesting agents" apply for an EIA since only a single institution can apply for an EIA, as demonstrated by Balam Jungle Estates government approved EIA to clear 70,129 acres. So professional judgment would lead us to believe that since there are no substantive barriers to land clearing by a single institution, even at scales that are 7x times the scale of BCEP as evidenced by Balam Jungle Estates EIA approval granted by the Government of Belize October 26, 2007, it is clear that EIAs are routinely approved for a scale 7x that of BCEP for a single institution and would be approved for "classes of deforestation agents".

Auditor Response: The validation team asked the technical expert hired by the audit team to assess common practice with regard to environmental impact laws in Belize. He responded as follows:

> It is never common practice to not enforce environmental laws in Belize even though it may be common practice to ignore the laws. I think that the standards are clear that if government approval is required for deforestation to occur that it should be obtained. Only if it is common practice for the government to relax the requirement should it not be required under the standards, and this is clearly not the case. I would agree that most EIA's are approved but that is not surprising as the idea behind an EIA is to ensure that development occurs properly but occurs none-the-less. It is neither logical nor legally correct to say that because no EIA's are rejected that one does not need an EIA. The first and second paragraphs of FCO's response are therefore irrelevant. I am not entirely clear with where FCO was going with the third and final paragraph of their response. It is clear that the class of deforesting agents (those deforesting lands in excess of 300 acres) are required to obtain an EIA, as specified in the law.
>
> I verified whether EIAs are required for forest clearing in excess of 300 acres and whether any entities have submitted EIAs recently, and I received positive responses from the Department of the Environment. You can email them at evirodept@btl.net attn: Mr. Anthony Mai. The Department recently moved so they do not have phone lines installed as yet. The person I spoke to said that if they came across anyone clearing forest in excess of 300 acres they would be fined. I asked whether it is common practice to allow deforestation in excess of 300 acres without an EIA and the response was a clear no.

Subsequently, The validation team consulted the VCSA with regards to whether the requirement of demonstration of government approval or filing for approval applied to classes of deforestation agents. As communicated in an email from Carolyn Ching to the validation team dated 11 April 2011, the VCSA ruled that "where the agent of deforestation

is a class of agents it would not be possible to get governmental approval so it would not be necessary [to demonstrate approval].”
Consequently, though it appears that an EIA is indeed required for legal conversion of the project area to nonforest land and none was sought, based on VCS ruling, when the specific agent of deforestation cannot be identified, evidence of government approval or intent to seek government approval is not required. The Proponent’s response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.47 of 50 dated 4/11/2011

Standard Reference: A/R Methodological tool "Estimation of direct nitrous oxide emission from nitrogen fertilization"; LK-ASP Module
Document Reference: BCEP Final Carbon Table.xlsx
Finding: The following errors were identified in the BCEP Final Carbon Table spreadsheet:
-The nitrogen content of synthetic fertilizer (parameter SFiNC) was calculated from its N-P-K rating incorrectly (fertilizer tab, cell B27).
-The $\Delta_{CBSL,i}$ parameter in the leakage module equation (7) refers to the parameter calculated in equation (3) of the BL-PL module. In row 21 of the leakage tab on the excel spreadsheet provided, the parameter calculated in equation (1) of the BL-PL module is used instead of the parameter calculated in equation (3) of BL-PL.
-The PFc parameter is specified in cell B5 as 100%, but as 0.645 in row 18 of the project leakage table. Please use consistent parameter values and provide a justification for the selected parameter.
Please provide an updated version of the carbon calculation spreadsheet with these errors corrected.
Proponent Response: We stand corrected on the NPK issue. We assumed incorrectly that 19-9-19 was parts not percentages.
The leakage calculation is adjusted.
The reference to the percentage of land remaining for leakage still forested is corrected and made consistent.
A new version of the spreadsheet and PDD are attached.

Auditor Response: The required corrections were made. An additional error was discovered in the SFiNC parameter, which resulted in the issuance of NCR 2011.49. That error was subsequently corrected as well. The Proponent’s response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.48 of 50 dated 4/11/2011

Standard Reference: VCS 2007.1 7.3.1
Document Reference: Inventory Data
Finding: Based on comparison to data collected by the validations team, the project's carbon inventory did not meet the accuracy standards of the VCS. The inventory must be corrected prior to issuance of a positive validation opinion.

Proponent Response: See attached new inventory and final version of PDD.

Auditor Response: All plots in the project area were re-measured. The accuracy of the revised inventory was assessed with a validation cruise on May 23 and 24, 2011, in which seven plots were re-measured. The accuracy of the reported data was found to be within the requirements of the VCS standard. The Proponent’s response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

NCR Number 2011.49 of 50 dated 4/11/2011
Standard Reference: A/R Methodological tool "Estimation of direct nitrous oxide emission from nitrogen fertilization" **Document Reference:** BCEP Final Carbon Table.xlsx **Finding**: The parameter SFiNC is expressed as a number of grams in project calculation worksheets. Correct application of the tool requires the parameter to be expressed as a proportion. **Proponent Response**: See attached new inventory and final version of PDD. **Auditor Response**: The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

Note: Due to a numbering error by the lead validator, two findings were assigned the number 2011.38. There is no missing finding 2011.50.

VCS FINAL VALIDATION REPORT

WILDLIFE WORKS KASIGAU CORRIDOR REDD PROJECT PHASE I – RUKINGA SANCTUARY

REPORT NO. 2011-9036

REVISION NO. 01

VCS PROJECT VALIDATION REPORT

Date of first issue: 3 February, 2011	Project No.: PRJC-285203-2011-CCS-USA
Approved by: Miguel Rescalvo Regional Manager. North Americal	Organizational unit: Sustainability and Innovation Climate Change Services USA
Client: Wildlife Works Inc.	Client ref.: Jeremy Freund

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Det Norske Veritas (U.S.A.), Inc. (DNV) has performed a validation of the "The Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" (hereafter called "the project") in Kenya on the basis of Voluntary Carbon Standard 2007.1 (VCS), as well as criteria for consistent project operations, monitoring and reporting. This validation report summarizes the findings of the validation.

The validation consisted of the following three phases: i) a desk review of the project design, the baseline and the monitoring plan, ii) follow-up interviews with project stakeholders and the issuance of the finding list, and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

The total emission reductions from the project are estimated to be 4 525 767 tCO2e over the 30-year crediting period (1 January, 2005 to 31 December, 2034). This includes project emissions, the total confidence deduction, a 20% leakage deduction applied to years 2011-2034, and the VCS AFOLU buffer deductions currently assessed at 20%. This estimate assumes the baseline does not change during the baseline reevaluation.

In summary, it is DNV's opinion that the "The Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" as described in the VCS Project Document dated 31 January 2011 meets all relevant VCS 2007.1 requirements and correctly applies the VCS approved methodology element VM0009 – Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.

Report No.: 2011-9036	Date of this revision: 3 February, 2011	Rev. No. No. 1
Report title: VCS Validation Report – Wildlife Works Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary		
Work carried out by: Sam Stevenson Gordon Smith		
Work verified by: Guy Pinjuv		

Key words:
VCS
Project Validation
REDD
Kenya

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Abbreviations

AFOLU Guidelines	Agriculture, Forestry and Other Land Uses Section of Guidelines for National Greenhouse Gas Inventories 2006
CAR	Corrective Action Request
CCBA	Climate Community and Biodiversity Alliance
CDM	Clean Development Mechanism
CL	Clarification Request
CO_2	Carbon Dioxide
DNA	Designated National Authority
DNV	Det Norske Veritas
DR	Document Review
EB	Executive Board
GHG	Greenhouse Gas(es)
GPG LULUCF	Intergovernmental Panel on Climate Change's Good Practice Guidance for Land-Use Land Use Change and Forestry
GWP	Global warming potential
m	Meters
MED	Methodology Element Documentation
MoV	Means of Verification
PD	Project Document
REDD	Reduced Emissions from Deforestation and Degradation
SCS	Scientific Certification Systems
tCO_2e	Tonnes CO_2 equivalent
VCS	Voluntary Carbon Standard
VCSA	VCS Association
VCU	Voluntary Carbon Unit
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

TABLE OF CONTENTS

1 INTRODUCTION

Wildlife Works, Inc. (Wildlife Works) has commissioned Det Norske Veritas (U.S.A.), Inc. (DNV) to validate the "Kasigau Corridor REDD Phase I – Rukinga Sanctuary" in Kenya. This report provides a description of the steps involved in conducting the validation and the findings of the validation based on the Voluntary Carbon Standard 2007.1 (VCS), as well as criteria for consistent project operations, monitoring and reporting.

The validation team consisted of the following personnel:

Role/Qualification	***Last Name***	***First Name***	***Country***
Project manager	Stevenson	Samuel	USA
VCS Validator / VCS REDD AFOLU Expert	Smith	Gordon	USA
Technical reviewer	Pinjuv	Guy	USA

1.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with the VCS 2007.1 are validated. This is to ensure that the project design, as documented, is reasonable and meets the identified criteria. Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of emission reductions.

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the VCS Project Description (VCS PD). The VCS PD is reviewed against the criteria stated in the Voluntary Carbon Standard 2007.1 (VCS), and the approved VCS methodology VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests, version 1.0.

The validation is not meant to provide any consulting for the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

1.3 VCS Project Description

The "Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" has been developed by Wildlife Works Inc., a project proponent based in California, USA. The project is implemented on land known as the Rukinga Sanctuary, which is wholly owned by the Rukinga Ranching Co., Ltd. The leasehold on the title will be due for renewal in 2038, at which point it can be renewed once again for up to 99 years under Kenyan law.

The project proponent is Wildlife Works, Inc. and the project developer is Wildlife Works Carbon LLC. DNV has confirmed that Wildlife Works, Inc. has the right to all and any reductions generated by the Project during the Project Crediting Period /2/.

The project is 30 169 hectares with an average canopy cover of 39%, with mature tree heights ranging from 5-10 meters (m), and therefore conforms to the latest VCS definition of “forest” /26/ (see pg 13).

The main project activity is to prevent deforestation caused by subsistence farming activities. The objective of the project activity is to prevent the conversion of forest to cropland for annual crops, typically maize that ultimately results in net greenhouse gas (GHG) emissions into the atmosphere. The primary agents of deforestation are the growing population of the local Taita and Kamba people living in the Reference Area. Agricultural clearing in the Reference and Leakage Areas is permanent and cultivation activities do not shift.

The project start date is 1 January, 2005, which is the date Wildlife Works assumed financial responsibility for the project area and began specific GHG mitigation activities within the project area **/4/**. The selected crediting period is from 1 January, 2005 to 31 December, 2034. The total emission reductions from the project are estimated to be 4 525 767 tCO2e over the 30-year crediting period. This includes project emissions, total confidence deduction, a 20% ex-ante leakage deduction applied to years 2011-2034 as per VM0009 and the VCS AFOLU buffer deductions currently assessed at 20%. This estimate assumes the baseline does not change during the baseline re-evaluation.

1.4 Level of Assurance

DNV provides reasonable assurance that the emission reduction estimations for the “Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary Project” are conservative and meet the VCS criteria and approved methodology, VM0009.

Estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment given a lack of past project data that this is appropriate given the conditions of the project and find the assessment to conform to the requirements in the approved methodology VM0009.

To ensure complete transparency, DNV has included any clarification or corrective actions that were raised in this validation report in Appendix A.

2 METHODOLOGY

The validation consisted of the following three phases:

- A desk review of the project design and the baseline and monitoring methodology.
- Site visit and interviews with project stakeholders.
- The resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customized for the project. The protocol used shows in a transparent manner the criteria, means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organizes, details and clarifies the requirements a VCS project is expected to meet.
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of two tables. The different columns in these tables are described in Figure 1. The completed validation protocol for the “Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary”” is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective Action Requests (CAR) are issued where:

- Mistakes have been made with a direct influence on project results.
- Validation protocol requirements have not been met.
- There is a risk that the project would not be accepted as a VCS project or that emission reductions will not be certified.

The term Clarification (CL) may be used where additional information is needed to fully clarify an issue.

Validation Protocol Table 1: Requirement Checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organized in seven different sections. Each section is then further sub-divided. The lowest level constitutes a	*Gives reference to documents where the answer to the checklist question or item is found.*	*Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions*	*This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) due to non-compliance with the checklist question (See below).A request for Clarification (CL) is*

checklist question.			*reached.*	*used when the validation team has identified a need for further clarification.*

Validation Protocol Table 2: Resolution of Corrective Action Requests and Requests for Clarification			
Draft report corrective action requests and requests for clarifications	***Ref. To Table 1***	***Project participants' response***	***Final conclusion***
If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	*Reference to the checklist question number in Table 1 where the Corrective Action Request or Clarification Request is explained.*	*The responses given by the project participants during the communications with the validation team should be summarized in this section.*	*This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 1, under "Final Conclusion..*

Figure 1: Validation Protocol Tables

2.1 Review of Documents

The project document /1/, dated 31 January, 2011 and previous versions for "Kasigau Corridor REDD Phase I – Rukinga Sanctuary" was submitted by Wildlife Works, Inc., along with additional background documents related to the project design and baseline, which were assessed as part of the validation. The project documentation followed the guidance set out in VCS 2007.1.

The following table lists the documentation that was assessed during the validation:

Documents provided that relate directly to the project:

/1/ Wildlife Works Carbon LLC, *VCS PD for* Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" with VCS template and supporting document, 31 January, 2011 and previous versions.

/2/ "Carbon Rights Agreement" between Wildlife Works Inc. and Rukinga Ranching Company – 15 Febuary, 2009.

/3/ Leasehold title to Rukinga Ranch – 1 January, 1971.

/4/ Re: - Management Authority for Rukinga Ranch (1 January, 2005).

/5/ Audit Report of Wildlife Works EPZ by Kenya National Environmental Management Authority – December, 2006.

/6/ Shareholder list, Rukinga Ranching Company – Effective from AGM meeting minutes on 9 December, 2009.

/7/ Rukinga Ranch Company/ Wildlife Works Inc. / Wildlife Works EPZ financial statements and projections – As of 13 January, 2011.

/8/ CCB validation report conducted by Scientific Certifications Systems – 20

December, 2009.
/9/ Image Classification Protocol (as of 14 January, 2011).
/10/ How to Use the Classification Tool (as of 14 January, 2011).
/11/ Logistic regression model for deforestation (as of 14 January, 2011).
/12/ Field measurement protocol – Standard Operating Procedure Biomass (as of 14 January, 2011).
/13/ Field measurement protocol – Standard Operating Procedure Soils (as of 14 January, 2011).
/14/ Soil lab report of measured soil carbon concentrations (Rukinga 1m Soil Analysis, 14 January, 2011).
/15/ Forest Biomass Data (Rukinga Carbon trees Shrubs Grass v7.xlsm, 14 January, 2011).
/16/ Forest biomass sampling quality control comparisons (QC report.xlsx, 14 January,2011).
/17/ Data used to develop tree biomass allometric equations (AllometricFormulasPower.xlsx, 14 January, 2011).
/18/ Letters to shareholders of Rukinga Ranching Co. Ltd. Pertaining to an Extraordinary General Meeting of Rukinga Ranching Co Ltd. To be held at Free World Country Club, Voi at 10:00am Wednesday December 9th, 2009.
/19/ Wildlife Works Inc. Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination for the Kasigau Corridor REDD Project, Phase I – Rukinga (14 January, 2011).
/20/ Rukinga return analysis v4.xlsx (27 January, 2011)
/21/ Leakage Model Expanded (14 January, 2011).
/22/ Grid Data RefArea flaggedPointsv2.xlsx (14 January, 2011).

Background documents related to the design and/or methodologies employed in the design or other reference documents:

/23/ Approved VCS methodology: “VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests version 1.0” 11 January, 2011.

/24/ VCS Association, *Voluntary Carbon Standard 2007.1*, November 2008.

/25/ VCSA, VCS Sectoral Scopes (http://www.v-c-s.org/sectoral_scopes.html)

/26/ VCSA, *Guidance for Agriculture, Forestry and Other Land Use Projects, 18* November, 2008.

/27/ VCSA, *Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination*, 18 November, 2008

/28/ VCSA, *Update to the VCS 2007.1: Tool for Non-Permanence Risk Analysis and Buffer Determination,* 8 September, 2010.

/29/ VCS VT0001 *Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities Version 1.0, 21 May, 2010.*

/30/ CAR *Forest Project Protocol version 3.2* August 31, 2010

2.2 Follow-up Interviews

During 10-14 January, 2011, DNV performed interviews with project stakeholders at the project site in Rukinga, Kenya to confirm selected information and to resolve issues identified in the document review. Representatives of Wildlife Works, Inc. were interviewed. The main topics of the interviews are summarized in Table 1.

Table 1 Interview Topics

Interviewed Organization	Interview Topics
Wildlife Works, Inc.	✓ Project start date. ✓ Demonstration of additionality. ✓ Emission reduction estimates. ✓ Monitoring plan. ✓ Baseline determination. ✓ Buffer determination. ✓ Leakage rates. ✓ Resources, training, procedures of management structure.

Table 2. Participants at Project Site (Rukinga, Kenya)

Name	Position	Organization
Mike Korchinsky	President	Wildlife Works, Inc.
Jeremy Freund	VP, Carbon Development	Wildlife Works Carbon LLC
Rob Dodson	General Manager	Wildlife Works, Inc.
Patrick Kabatha	Biodiversity Specialist	Wildlife Works, Inc.
Hassan Sachedina	VP, Conservation Enterprise	Wildlife Works Carbon LLC
Laura Crown	Office Manager	Wildlife Works, Inc.

2.3 Resolution of Any Material Discrepancy

To guarantee the transparency of the validation process, the concerns raised by DNV and the response provided by the project proponent and the consultant are documented in Table 2 of the Validation Protocol in Appendix A.

3 VALIDATION FINDINGS

3.1 Project Design

The project avoids deforestation and forest degradation caused by clearing for subsistence agriculture. Clearing is often preceded by degradation in the form of removal of larger trees with dense wood during illegal charcoal making operations. The project encompasses a variety of activities to monitor and protect project lands, provide local people with alternative ways of sustaining themselves, and providing sustainably produced charcoal.

Quantification of deforestation was performed by human interpretation of a time series of LANDSAT images of the reference area, classifying each point of a sample as forest, non-forest, built, cloud/shadow or no image. Methods described in approved VCS Methodology VM0009, Version 1.0 were used to statistically weight each forest state observation and calculate a logistic curve representing cumulative baseline deforestation over time.

Starting vegetation and soil carbon stocks were measured within the project area. Vegetation sampling was stratified by vegetation type. Soil carbon was measured using unstratified random sampling. Destructive sampling of trees and shrubs was used to construct allometric equations to predict tree biomass as a function of diameter and shrub biomass as a function of height. Loss of soil carbon was estimated by measuring carbon stocks in farmed fields and finding the difference between stocks in fields and in undisturbed forest.

The project avoids deforestation within the project boundary by controlling project lands through ranger patrols and relationships between Wildlife Works staff and members of surrounding communities. The project provides alternatives to subsistence agriculture to avoid leakage in the form of displacing land clearing from within the project boundary to outside the project boundary. The project is developing a sustainable charcoal production program to avoid displacement of charcoal production from within the project boundary to other locations.

Baseline emissions are calculated as a function of the baseline area predicted to be deforested each year, multiplied by the carbon stock per hectare in woody biomass, soil carbon loss as a decay function since conversion to agriculture. The project avoids emissions to the extent that monitored deforestation is less than predicted baseline deforestation, adjusted for changes in biomass carbon stocks.

The project is eligible for crediting under the VCS because it meets the applicability requirements of approved VCS Methodology VM0009 as explained in section 3.2.1 below.

DNV finds that the project does conform to VCS AFOLU guidance /26/, as well as conforming to the applicability requirements of VCS Methodology VM0009. DNV also finds that the project proponent has appropriately defined a reference area, appropriately measured deforestation over time within the reference area, and appropriately monitored starting biomass and soil carbon stocks within the project boundary. DNV has also confirmed that the project is implementing leakage mitigation activities and has performed baseline measurements needed to quantify whether or not leakage occurs over time.

Project Boundary

The project area covers 100% (30,169 hectares) of the Rukinga Sanctuary. At the time of the project start date, 93% of the project area was forested for 10 years prior to the project start date. The project boundary was confirmed by DNV by reviewing the two documents provided by Wildlife Works, the leasehold title to Rukinga Ranch /2/ and the Carbon Rights Agreement between Wildlife Works Inc. and Rukinga Ranching Co. /3/.

Project Duration, Crediting Time and Project Start Date

Wildlife Works took financial responsibility for all conservation activities within the Rukinga Sanctuary (Project Area) on 1 January, 2005. As such, the project start date and project crediting period is 1 January, 2005 – 31 December, 2034. Although Wildlife Works was performing conservation activities centered around the ecofactory prior to 2005, all activities were located outside of the Project Area and thus do not affect the project start date or project crediting period of Phase I of this project. DNV confirmed that the project start date and project crediting period was determined properly through reviewing the contract signed between Wildlife Works EPZ and Rukinga Ranching Company, Ltd. /4/ and the Carbon Rights Agreement /2/. A 30-year crediting period was selected, with 1 January, 2005 as the start date. The project will therefore end on 31 December, 2034.

Project Ownership

DNV can confirm the project ownership by Wildlife Works by reviewing two documents provided by Wildlife Works /2/ and /3/. In addition, DNV can confirm that the project is not included in any emission trading program and is not subject to binding greenhouse gas (GHG) emissions limits /1/.

Project Eligibility Under the VCS

This project has not applied to nor been rejected by other GHG crediting systems.

3.2 Baseline

The project falls into sectoral scope 14 as defined by VCS /24/ . The project start date is 1 January, 2005. The project applies a new VCS methodology VM0009 “VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0” /25/, which was approved on 11 January, 2011. The project baseline is constructed according to the approved methodology. The project proponent elected to use the linear model baseline alternative provided within VM0009.

3.2.1 Applicability

DNV was able to verify that the project meets all applicability criteria of the methodology through document review and interviews **/1/**:

- DNV confirmed that in fact the primary driver of deforestation is the conversion of forest to cropland for annual crops and harvesting of wood to support the illegal charcoal trade by visiting the project site. Evidence of forest conversion to agriculture was evident both in the reference area and in the immediate surroundings of the project area. The existence of an illegal charcoal trade was very evident through makeshift roadside charcoal sellers.
- DNV confirmed that the project area has been tropical dryland forest for at least 20 years with the review of Landsat imagery dating back to 1987.
- DNV confirmed that the project area meets the FAO 2010 and residing designated national authority’s (DNA) definition of “forest” for the project country for a minimum of 10 years prior to the project start date /24/.
- DNV confirmed that the project is located in a semi-arid tropical region through its site visit to Rukinga, Kenya.

- DNV confirmed that the project is not mandated by any enforced law, statute, or other regulatory framework by reviewing the relevant laws and regulations outlined in the project document, leasehold title, management authority agreement, and the audit report performed by the Kenya National Environmental Management Authority **/1/ /3/ /4/ /5/**.
- DNV confirmed by reviewing soil maps (**/1/** section 6.5) and field observation that the project area does not contain organic or peat soils.
- DNV confirmed that the reference area meets the requirements outlined in section 6.3.1 and 6.3.2 of the approved VCS methodology, “VM0009, “Methodology for Avoided Mosaic Deforestation of Tropical Forests.”
- DNV confirmed that as of the project start date, historic imagery in the reference region exists, with sufficient coverage to meet the requirements of section 6.4.2 of VM0009.
- DNV confirmed that a wide range of project activities have been implemented to mitigate deforestation by addressing the agents and drivers of deforestation as described in section 10.1 of VM0009 (see section 6.1 in Project Document).
- DNV confirmed that the project start date and end date and crediting period are clearly defined in the Project Document (see Section 6.3) **/1/**.
- DNV confirmed that the project proponent has access to the leakage area by randomly visiting a leakage plot used to create the leakage model during the site visit.
- DNV confirmed that no activity-shifting leakage had occurred prior to the estimation of the lag period **/1/**.
- DNV confirmed that the project area does not include lands designated for legally sanctioned logging activities by reviewing the title for the Rukinga Sanctuary /3/ **/4/**.

3.2.2 Baseline Scenario

The selected baseline scenario is ongoing deforestation from subsistence agriculture. The rate of deforestation was calculated by defining a reference area that is near the project area and has similar conditions and drivers of deforestation and then observing the proportion of the reference area that is deforested at each of several points in time, ranging from 1987 to 2005.

DNV concludes that the selected baseline scenario appropriately applies to the project area because:

- There are settlements to the west and north of the project area and active deforestation is occurring on the outskirts of these settlements.

- There is a major highway near the eastern boundary of the project area and validators observed large amounts of locally produced illegal bush charcoal for sale and being transported along this highway.
- Observations of time-series land cover images show rapid deforestation continuing to occur within the reference region.
- Prior to the project start date, subsistence farmers had begun clearing land for farms within the project area, near the western boundary of the project, with the settlement apparently terminated by coordination with local village leaders and increased ranger patrolling of project lands beginning around the time of the project start.

It is DNV's opinion that the selection of the continuation of the pre-project practice of the conversion of forest to cropland as the baseline scenario is deemed to be appropriate.

3.2.2.1 The Cumulative Deforestation Model

A pilot study estimated the variance of land cover state observations. The project calculated that fewer than 1 900 observation points would be needed to meet statistical precision goals. The project elected to observe 2 000 points. Points were assigned by GIS software, in a regular grid pattern within the project boundary. LANDSAT imagery was obtained for the area, for 11 different years from 1987 to 2005. To build the Cumulative Deforestation Model, imagery was used from 1987 until the project start date (2005). For some years, images from different times within the year were tiled to create complete or relatively complete coverage of the project area. The project developed an image interpretation protocol and the protocol was used to guide classification of each point at each time for which imagery was obtained. 8 821 vegetation state observations were made.

In the region where the project is located, most deforestation occurs in a mosaic pattern. A key element of the methodology is having a consistent decision rule for distinguishing (a) areas of forest with nearby deforested fields, from (b) remnant patches of trees among fields that are classified as deforested. The image classification protocol states that if the forest fragment is surrounded by cleared area and the point is within a forest fragment but is less than one field width from the edge of the fragment, the point is classified as deforested.

Points that switched back and forth between forest and non-forest were identified. 164 points were flagged as having unlikely state transitions. Imagery for each flagged point was reviewed, and inconsistencies were removed.

Each vegetation state observation was given a weight, using the procedure described in VM0009. A commercial statistical software package was used to fit a logistic curve to the observed changes in forest state over time. The statistical uncertainty in the logistic model is 5.9% at the 95% confidence level.

Population was tested to see if it added explanatory power to the model. Population did not add power and was left out of the final deforestation model.

As allowed by the methodology, the project developer elected to be credited according to a linear deforestation rate that is cumulatively less than the logistic model at all times within the project life.

3.2.2.2 The Soil Carbon Loss Model

Soil carbon stocks were measured to a one-meter depth in undisturbed forest within the project boundary and in fields near the project that had been in agricultural use for at least 10 years. The average carbon stock was calculated for forest soil and for agricultural soil and the difference assumed to be the loss resulting from deforestation and conversion to agriculture. The observed 45% loss of forest soil carbon is within the common range of soil loss given in published studies of other locations around the world. Carbon loss was assumed to occur at a declining exponential rate, starting from the date of deforestation. The exponential rate was chosen to match the rate graphed in Figure 10 of Methodology VM0009.

During the validation process, the project proponent and validator became aware of an inconsistency in stated soil loss rates between the text of the approved methodology VM0009 Version 1.0 and the rate graphed in Figure 10 of the methodology. The validator will work with the methodology developer to write a corrected version of the methodology that eliminates this inconsistency.

3.2.2.3 Baseline Scenario for Selected Carbon Pools

The project developer has elected to count aboveground and belowground carbon in live trees and shrubs, aboveground and belowground carbon in herbaceous vegetation, and carbon in the top meter of soil.

No commercial harvesting of wood for long-lived wood products occurs within the project area. Very small amounts of wood are retained in subsistence use. Branches are used in wattle-and-daub walls of farm huts. Few trees are suitable for using as posts, and few posts are used in local construction or farming.

The cumulative deforestation model provides the baseline rate of deforestation for the project area. When a hectare is deforested, the carbon in woody biomass is assumed to be emitted to the atmosphere as CO2.

The project is expected to reduce burning of stumps during clearing, which may reduce emission of methane from the burning. However, the project does not claim avoided methane from biomass burning as an emission reduction. Not claiming the avoided emission is conservative. Relatively small amounts of biomass are burned during land clearing in this area. Tree trunks appear to be left to decompose on site, used for domestic fuel, or removed prior to deforestation during illegal charcoal production. The project counts decomposition as emission and done not claim to reduce total wood fuel and charcoal emissions. Most tree branches are moved to the edges of fields to function as fencing. Because the amount of biomass burned is small, not counting avoided methane emissions from burning does not cause material inaccuracy in emissions accounting.

Woody debris decomposition rates in the area are not well documented. When asked how long some individual pieces of woody debris on tree measurement plots had been dead, local field staff gave estimates ranging from six to eighteen months for Class Two and Class Three woody debris. Pieces that local staff identified as being dead for at least 12 months were very light—for example, a few kilograms for a 20-cm diameter, 4-meter long tree trunk. Decomposition of buried dead wood is even less well documented. Soil sampling pits in forest revealed significant amounts of tough, live roots between 0.5 and 2 cm in diameter. However, hand tilling soil within a year of deforestation did not appear to be impeded by roots. As is common, it appears that decomposition of buried dead wood is faster than decomposition of aboveground dead wood.

Especially when trees with dense wood (and presumably slower decomposing wood) are removed for charcoal before land clearing for farming, it appears that little carbon stock remains in woody debris one year after clearing. Counting woody debris pieces on a couple of sites gave densities on the order of 20 pieces per hectare greater than 15-cm in diameter. Even if the points where woody debris was counted had unusually high woody debris mass, it is unquestionable that within one year of deforestation the carbon stock in the remaining wood is substantially less than the carbon stock in the dead wood in undisturbed forest. Because the project elected not to count avoided emissions from woody debris in the forest, it is conservative not to count any carbon that may remain stored in biomass that survives more than a year after deforestation.

Soil carbon stocks in undisturbed forest and in fields that had been cleared at least 10 years previously were measured by sampling. The difference between the average soil carbon stock in forest and the average soil carbon stock in tilled fields was taken to be the soil carbon loss on clearing. Soil carbon loss dynamics are not well documented in this ecosystem. As noted above, the soil carbon loss function used to calculate soil emissions after deforestation was set to match Figure 10 in the approved methodology.

3.2.3 Project Boundary

The project area covers 100% (30,169 hectares) of the Rukinga Sanctuary. At the time of the project start date, 93% of the project area was forested for 10 years prior to the project start date. The project boundary was confirmed by DNV by reviewing the two documents provided by Wildlife Works, the leasehold title to Rukinga Ranch /2/, the Carbon Rights Agreement between Wildlife Works, Inc. and Rukinga Ranching Co. /3/.

3.2.4 Additionality Assessment

As per the approved VCS methodology, "VM0009 – Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0," the additionality of the project is demonstrated through the latest version of the VT0001 VCS Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities /24/.

Identification of Alternative Land-use Scenarios

DNV has confirmed that the alternative land use scenarios identified by Wildlife Works are appropriate. It was also determined that the identified alternative land uses are consistent with enforced mandatory laws and regulations.

DNV confirmed that the project is not mandated by any enforced law, statute, or other regulatory framework by reviewing the relevant laws and regulations outlined in the project document, leasehold title, management authority agreement, and the audit report performed by the Kenya National Environmental Management Authority **/1/ /3/ /4/ /5/**.

Investment Analysis

DNV confirmed the project proponent's simple cost analysis. DNV reviewed the financial statements for Wildlife Works and has confirmed that the project proponent has been spending approximately USD$300 000-$400 000 per year without any significant income to offset the costs to implement mitigation activities such as school building, scholarships, ranger patrols, and reforestation of deforested indigenous forests **/7/**. It is therefore DNV's conclusion that without the revenue from the sale of GHG credits, the project activities are economically unsustainable

Step 4: Common Practice Analysis

Though it is common practice to protect wilderness areas and provide sustainable development support for rural African communities in Africa, governments and donor agencies do not have a history of protecting the private lands. This project is the first AFOLU Project Activity of its type in Kenya. As such, it can be reasonably concluded that the project is not common practice.

In summary, it is demonstrated that the project activity is not a likely baseline scenario due to the need of financial revenues to offset mitigation activities, and that the emission reductions are additional to what would have happened in the absence of the project activity.

3.2.5 Leakage

Following methodology VM0009, the project developer has randomly located plots for measuring leakage. Baseline amounts of degradation and deforestation have been measured on these plots. The needed number of plots was calculated using the observed variance of forest state observations across the reference area.

Leakage model parameters were calculated from the field measurements and compared to the cumulative deforestation model. The leakage lag was calculated as the difference between the deforestation curve and the leakage curve, and was given in the Project Document.

As required by the methodology VM0009, leakage is measured empirically post project start date from the shifted leakage curve. At the time of the next verification of offsets generated by the project, the leakage plots can be re-measured and the change in degradation and deforestation calculated. These measurements and calculations are expected to support quantification of the amount of leakage, if any, that has occurred. Thus leakage will be empirically assessed during the next verification cycle.

As part of the project validation, the validator is to assess the project proponent's leakage ex-ante estimation that is likely to occur during the life of the project. Leakage is defined as displacement of deforestation from within the project area to outside the project area. This project will quantify leakage by measuring the rate of deforestation observed over time within the leakage area. The leakage area is selected as equivalently accessible to drivers of deforestation that would have deforested the project area. Any deforestation on the leakage area that is greater than the baseline rate of deforestation is counted as leakage.

The project is implementing a variety of leakage mitigation activities that are providing alternative livelihoods to local people. Leakage mitigation activities include employment in a clothing factory, work on project monitoring and Rukinga sanctuary protection, development projects through a local women's center, a sustainable charcoal program, schooling, and other activities. These activities are scheduled to be expanded in the future, using funding from the sale of the initial tranche of offsets generated by the project. DNV does not have data on the complete number of people who benefit from leakage mitigation activities, and does not know if these people would have cleared forest for subsistence agriculture in the absence of the project. Also, it is not possible to know for certain the scale at which leakage mitigation activities will be implemented in the future.

If leakage mitigation activities are less than the displaced demand for land, leakage is likely to occur. The current baseline deforestation is 955 hectares per year within the project area. If each farm were to clear 2.5 hectares (the area estimated by the project proponent), this would mean that the project should avoid the establishment of 382 new farms each year to avoid leakage. If the baseline rate of deforestation is adjusted down in the future, clearing for fewer farms would need to be avoided.

We have been unable to find historical leakage observations for any other REDD projects and have no historical data on which to make actuarial projections for this project. As a reference point, we assessed The Climate Action Reserve's default leakage risk for crop displacement activities is identified as 24 percent /30/. As noted, we do not have data on the exact number of people involved in leakage mitigation activities, and do not know the extent to which leakage mitigation activities will be implemented over the life of the project. Also, DNV is unable to determine if people involved in leakage mitigation activities would have cleared forest if they did not participate in leakage mitigation activities.

In the absence of past project data, any estimate of future leakage thus needs to rely on the conditions observed during site visitation, knowledge of other ecosystems, assessment of the agents and drivers of deforestation when judging the appropriateness of ex-ante leakage estimation of this project.

Estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment that this is appropriate given the conditions of the project and is consistent with values proposed by The Climate Action Reserve. DNV thus finds the leakage assessment to conform to the requirements in the approved methodology VM0009.

3.3 Monitoring Plan

The project applies the approved VCS "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0." The monitoring plan is in accordance with the methodology. The monitoring plan specifies how to measure and document real, achieved emission reductions over the life of the project. As required by the methodology VM0009, leakage will be measured ex post from the shifted leakage curve.

All the variables defined in VCS, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" are measured in order to determine and account for emission reductions. Each carbon pool monitored is a separate variable, with the exception that the project has elected to count large and small live trees together.

The baseline is calculated ex-ante. The current baseline is reported in the project document.

Although VCS addresses leakage separately from monitoring, it is useful to consider this project's leakage monitoring as a part of the overall monitoring program. The project document reports computation of a "lag" variable, used to find correspondence between the baseline deforestation model curve and the observed degradation and deforestation measured on leakage plots. Remeasurement of the leakage plots in the future, calculation of total degradation and deforestation on the leakage area, and adjustment by the lag factor will yield a cumulative actual deforestation number that can be compared to the baseline deforestation proportion for the date of the leakage measurement.

At future times when offsets are to be verified, the project developer will map any deforestation that may occur within the project boundary. Biomass carbon stocks will be re-measured using the same protocols as used for the original measurement. Change in carbon stocks within the project area are included in the calculation on net emission reductions as the CPE term of Equation 34 of the approved methodology. Project emissions may be positive (emissions) or negative (a sink resulting from forest growth).

Consistent with the VCS requirements for grouped projects, the data management systems used by Wildlife Works, Inc. are centralized. The general responsibility and authority for registration, monitoring, measurement and reporting activities are defined in the VCS PD. Wildlife Works Inc. has a contract with the landowner, Rukinga Ranching Co. Ltd., to measure, monitor, report, and register offsets generated by avoiding deforestation within the project area. The agreement was ratified in a general meeting of the shareholders of the landowning company. DNV has reviewed this documentation /2/.

The parameters being monitored were discussed with the project proponent. The project proponent has developed sufficient guidance for image classification and monitoring carbon in soils and biomass in order to ensure that reliable field data is collected /9//12//13/.

The frequency of the data collection depends on the specific parameter included in the monitoring plan. DNV found that these are in line with the requirements of the methodology, VM0009.

3.4 Calculation of GHG Emissions and Reductions

DNV considered the VCS Standard /24/, VCS AFOLU guidance /26/, VCS approved methodology VM0009 /23/, conditions observed during site visitation, and knowledge of other ecosystems and forest projects when judging the appropriateness of GHG emission reduction calculations of this project. DNV concludes that all significant emission sources are included in project emission calculations. Calculation equations are published in VM0009. DNV reviewed the calculations in detail and, with the corrections made in response to the CARs, calculations are correctly applied as specified by the VM0009. Factors used in calculations are stated in the project document and are derived from local measurements, VM0009, or widely-referenced public sources. Equations for specifying statistical confidence intervals are specified in VM0009. Statistical confidence intervals are calculated for the baseline deforestation function, allometric equations developed to predict tree biomass, and carbon stocks estimated from sampling. As with any sampling, unbiased measurement and classification errors are expected to increase the statistical error observed in sampling. DNV found no potential sources of bias in counting, other than the conservative exclusions described above. Statistical confidence levels meet required precision levels.

The GHG Sources Determination

GHG sources that are counted are live trees aboveground and belowground biomass, shrub aboveground and belowground biomass, herbaceous aboveground biomass, and soil carbon. Emissions that are negligible or conservatively omitted include woody debris, methane from biomass burning, and fuel consumed in land management. Any sink in long-term wood products is negligible. Credible justification of the selection of the carbon pools are included within the Project Document and DNV assessed that selection conforms to the requirements set out in VM0009.

The Correctness and Transparency of Formulas and Factors Used

The approaches to estimate emission reductions for years 2005-2010 are described in the VCS Project Document. DNV can confirm that the approaches conform to the requirements in the VCS approved methodology “VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.”

Estimated Cumulative Project Lifetime Emission Reductions

As part of the project validation, the validator is to express its estimate of a conservative amount of offsets the project is likely to generate through the life of the project. The project proponent estimates that the project will generate 4 525 767 metric tons CO_2e of offsets over the project life. This estimate is calculated using by:

- Extending the current baseline deforestation rate through the project life,
- Assuming that the carbon stock within the project boundary does not change (there is no net tree growth or loss, soil carbon stock change, and no deforestation within the project area), and
- Assuming 20% leakage in years 2011-2034.
- Applying a 20% AFOLU buffer deduction through the entire project crediting period.

There is a high likelihood that at least one of these three factors will change over the project life. The baseline deforestation rate has limited chance of increasing because approximately 95% of the project area is assumed to become deforested by the end of the project life. The baseline could be revised downward if less deforestation is observed over time in the reference area. If the baseline deforestation rate is revised down, the project would generate fewer offsets, all other things remaining unchanged. The carbon stock within the project area could rise or fall over time. A portion of the project area had been deforested in the past and is now re-growing, and is likely to have carbon stock increase. However, even if this formerly deforested area increases to the carbon density of the average stock of the forest in the project area, it would be only about a 6% increase in the total project carbon stock. It is possible that because of drought or disturbance the existing forest carbon stock could decline. Increasing carbon stock within the project area would increase the number of offsets generated by the project, and decreasing carbon stock would decrease the number of offsets generated. There is a chance that the leakage mitigation activities executed by the project will not succeed in mitigating all the demand for land displaced by the project, and leakage may occur. The project may not receive credit for positive leakage, so if there is any leakage it can only reduce the amount of offsets generated by the project.

DNV is to express its opinion as to a conservative amount of offsets the project is likely to generate over the project lifetime. To be conservative, the estimate must be a number such that it is likely that the project will not generate less than the estimated amount of offsets. We note that the factors that could result in increased generation of offsets are highly unlikely to cause an increase in offset generation greater than a few percent. At the same time, it is possible that the factors that could result in the project generating fewer offsets could result in a large reduction in benefits. We have been unable to find historical leakage observations for any other REDD projects and have no historical data on which to make actuarial projections for this project.

In the absence of project data, estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment that this is appropriate given the conditions of the project and is consistent with values proposed by the Climate Action Reserve.

DNV therefore can confirm that the calculation equations and input values are proper as described above, and hence can confirm that the emission reduction estimates are proper, which are on the average 4 525 767 tCO_2e per year over the selected 30 year crediting period.

3.5 Environmental Impact

The environmental and socio-economic impacts of the project activities have been assessed within the context of the Audit report conducted by the Kenya National Environmental Management Authority in December, 2006 /5/ and the Climate, Community, and Biodiversity Alliance (CCBA) validation that Wildlife Works, Inc. underwent in 2009 with Scientific Certifications Systems (SCS) /8/. DNV has reviewed all documentation pertaining to the environmental audit and the CCBA validation. In summary, DNV concluded that no negative environmental or socio-economic impacts are expected from project activities.

3.6 Comments by Stakeholders

The relevant stakeholders identified for this project activity include members of the Taita community, the Duruma tribe, and local employees tasked with the implementation and maintenance of the Rukinga REDD project. A local stakeholder process was carried out by soliciting public comments through the internet and postings on local area notice boards. DNV reviewed all comments and found that the process complies with VCS requirements. In addition, DNV reviewed the CCBA project validation report conducted by SCS in 2009 /8/ and stakeholder comments received during the CCBA process /8/. The project area underwent a CCBA project validation on 22 December, 2009. Feedback from such stakeholders regarding the REDD project was very positive /8/.

4 VALIDATION CONCLUSION

Det Norske Veritas (U.S.A.), Inc. (DNV) has performed a validation of the "The Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" in Kenya on the basis of Voluntary Carbon Standard 2007.1 (VCS), as well as criteria for consistent project operations, monitoring and reporting.

The project proponent is Wildlife Works, Inc. DNV has confirmed that Wildlife Works, Inc. has the right to all and any reductions generated by the Project during the Project Crediting Period 1 January, 2005 – 31 December, 2034.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfillment of stated criteria.

The project correctly applies the approved VCS methodology element VM0009 – Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.

The main project activity is to prevent deforestation caused by slash and burn and subsistence farming activities. The project results in reductions of GHG emissions that are real, measurable and give long-term benefits to the mitigation of climate change and have clear socio-economic benefits to the communities surrounding the project area. Emission reductions attributable to the project have been shown to be additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be 4 525 767 *tCO2e over the 30-year crediting period (1 January, 2005 to 31 December, 2034). This includes project emissions, total confidence deduction, a 20% leakage deduction applied to years 2011-2034 as per VM0009, and the VCS AFOLU buffer deductions currently assessed at 20%. This estimate assumes the baseline does not change during the baseline reevaluation.*

Estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment given a lack of past project data that this is appropriate given the conditions of the project and find the assessment to conform to the requirements in the approved methodology VM0009.

The approaches to estimate emission reductions are assessed to conform to the requirements in the VCS and approved methodology VM0009.

Adequate training and monitoring procedures have been implemented.

In summary, it is DNV's opinion that the "The Kasigau Corridor REDD Project Phase I – Rukinga Sanctuary" in Kenya as described in the VCS PD of 31January, 2011, meets all relevant VCS 2007.1 requirements and correctly applies the VCS approved methodology element VM0009 – Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.

APPENDIX A

Validation Protocol

Table 3 Requirements Checklist

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
A. *General Description of Project Activity* *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial and temporal boundaries clearly defined?	**/1/**	DR	Section 5.2 - The project area covers 100% (30,169 ha) of the Rukinga Sanctuary. At the time of the project start date, 93% of the project area was forested for 10 years prior to the project start date. The project boundary was confirmed by DNV by reviewing the two documents provided by Wildlife Works, the leasehold title to Rukinga Ranch **/2/**, the Carbon Rights Agreement between Wildlife Works Inc. and Rukinga Ranching Co. **/3/**.		OK
A.2. Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
A.2.1. Does the project design reflect current good practices?	**/1/**	DR, I	The project design outlines current best practices for implementing the project activities. While onsite, DNV witnessed fully operational nurseries, ranger force, a local GIS analyst, and engagement with the		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			community surrounding the project area.		
A.2.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies?	/1/	DR, I	The project proponent uses state of the art GIS and modelling techniques.		OK
A.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/	DR, I	Wildlife Works is working with the REDD Focal Point within the Government of Kenya on future REDD legislation to include sub-national nesting rules.		Ok
A.2.4. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period?	/1/	DR, I	Yes – Procedures outlined within the *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
A.2.5. Does the project make provisions for meeting training and maintenance needs?	/1/	DR, I	Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Is the baseline methodology previously approved by the VCS?	/1/	DR, I	Yes – VM0009 *Methodology for Avoided Mosaic Deforestation of Tropical Forests*		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			Version 1.0.		
B.1.2. Is the baseline methodology the one deemed most applicable for this project and is the appropriateness justified?	**/1/**	DR, I	Yes – VM0009 was developed specifically for this project.		OK
B.2. Baseline Determination *The choice of baseline will be validated with focus on whether the baseline is a likely scenario, whether the project itself is not a likely baseline scenario, and whether the baseline is complete and transparent.*					
B.2.1. Has the baseline been determined using conservative assumptions where possible?	**/1/**	I	As with any sampling, unbiased measurement and classification errors are expected to increase the statistical error observed in sampling. DNV found no potential sources of bias in counting, other than the conservative exclusions described above. Statistical confidence levels meet required precision levels. **CAR 5** The coefficients for the deforestation model given in the PD must be corrected to match the coefficients produced by the model and used in calculations of cumulative deforestation. **CAR 6** The PD should describe the method used to determine bulk density of disturbed soil samples, and document that the protocol	CAR 5, 6, 7	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			is well established. **CAR 7** The PD should specify the acceptable degree of error allowed in forest measurements, and how errors larger than acceptable amounts shall be dealt with.		
B.2.2. Has the baseline been established on a project-specific basis?	/1/	DR, I	Yes – The baseline is specific to the characteristics of the reference region that have similar drivers of deforestation.		OK
B.2.3. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	The PD identifies possible risks that could have an impact on the project baseline, including change in legislation. The government of Kenya has shown support for the project and has no recent history of expropriation of private conservation lands.		OK
B.2.4. Is the baseline determination compatible with the available data?	/1/		See section 3.2		OK
B.2.5. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario?	/1/		Encroachment of subsistence farming (the primary driver of deforestation) to the borders of the project area were evident. It was demonstrated to DNV that the project activity, conservation of forest, was not a likely baseline scenario in the project area.		OK
B.2.6. Have the major risks to the baseline been identified?	/1/	DR	Yes – The following risks have been identified: change in legislation, income, crop failure, invasion of cattle grazers due		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			to famine in adjacent communities, drought, wildlife, cash crops, and fire		
B.2.7. Are all literature and sources clearly referenced?	/1/	DR	Yes - Factors used in calculations using literature and sources are clearly widely-referenced public sources.		OK
C. Duration of the Project/ Crediting Period/project proponent *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	/1/	DR, I	The project start date is 1 January, 2005, which is the date Wildlife Work,s Inc. assumed financial responsibility for the project area and began specific GHG mitigation activities. The selected crediting period is from 1 January, 2005 to 31 December, 2034. **CAR 3** The justification of the project start date must conform to VCS requirements.	CAR 3	OK
C.1.2. Is the assumed crediting time clearly defined?	/1/	DR, I	The selected crediting period is from 1 January, 2005 to 31 December, 2034.		OK
C.1.3. Is the project proponent identified and has it been confirmed to be an individual or organization that has overall control and responsibility for a greenhouse gas project?	/1/	DR, I	Yes – Wildlife Works, Inc. is the project proponent for this project. Wildlife Works, Inc. assumed financial responsibility for the project area and began specific GHG mitigation activities on 1 January, 2005 when the company entered into an agreement with Rukinga Ranching Company, Ltd.		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
D. Monitoring Plan *The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed (blue text contains requirements to be assessed for optional review of monitoring methodology prior to submission and approval by CDM EB).*					
D.1. Monitoring Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
D.1.1. Is the monitoring methodology previously approved by the VCS?	***/1/***	DR	Yes – VM0009 *Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0.*		OK
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	***/1/***	DR	Yes – The monitoring methodology was developed specifically for this project.		OK
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	***/1/***	DR	Yes – VM0009 outlines sufficient practices for a monitoring methodology.		OK
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	***/1/***	DR	Yes – VM0009 outlines sufficient practices and is transparent.		OK
D.2. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
D.2.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	***/1/***	DR, I	Yes – Procedures outlined within the *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
D.3. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
D.3.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR, I	Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.4. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
D.4.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR, I	Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR, I	The selected baseline scenario is ongoing deforestation from subsistence agriculture. The rate of deforestation was calculated by defining a reference area that is near the project area and has similar conditions and drivers of deforestation and then observing the proportion of the reference area that is deforested at each of several points in time ranging from 1987 to 2005. The parameters of the cumulative		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			deforestation model are in line with the requirements outlined in VM0009.		
D.4.3. Will it be possible to monitor / measure the specified baseline indicators?	/1/	DR, I	All the variables defined in VCS, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" are measured in order to determine and account for emission reductions. Each carbon pool monitored is a separate variable, except that the project has elected to count large and small live trees together.		OK
D.4.4. Will the indicators give opportunity for real measurements of baseline emissions?	/1/	DR, I	At future times when offsets are to be verified, the project developer will map any deforestation that may occur within the project boundary. Biomass carbon stocks will be re-measured using the same protocols as used for the original measurement.		OK
D.5. Environmental Impacts and Stakeholders Comment *It is checked to determine if any additional environmental permits are required and if sufficient documentation of environmental impacts are provided.* *It is checked if any comments received from stakeholders are summarized properly*					
D.5.1. Are any additional environmental permits needed for the project activity? If yes, is there any approval documentation provided?	/5/	DR, I	The environmental and socio-economic impacts of the project activities have been assessed within the context of the Audit report conducted by the Kenya National		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			Environmental Management Authority in December, 2006. DNV has reviewed all documentation pertaining to the environmental audit.		
D.5.2. Any comments received from stakeholders should be summarized in the VCS PD.	/8/	DR, I	A local stakeholder process was carried out by soliciting public comments through the internet and posting on local area notice boards. DNV reviewed all comments and found that the process complies with VCS requirements.		OK
D.6. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
D.6.1. Is the authority and responsibility of project management clearly described?	/1/		Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.2. Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/		Yes – Procedures outlined within the, *How to Use the Classification Tool* (as of 14 January, 2011), Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.3. Are procedures identified for training of monitoring personnel?	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
D.6.4. Are procedures identified for maintenance of monitoring equipment and installations?	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.5. Are procedures identified for monitoring, measurements and reporting?	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.6. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
D.6.7. Are procedures identified for review of reported results/data?	/1/		Yes – Standard Operating Procedure Biomass (as of 14 January, 2011), Standard Operating Procedure Soils (as of 14 January, 2011) are sufficient.		OK
E. Calculation of GHG Emissions by Source *It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.*					
E.1. Project GHG Emissions *The validation of ex-ante estimated project GHG emissions focuses on transparency and completeness of calculations.*					
E.1.1. Are all aspects related to direct and indirect GHG emissions captured in the project design?	/1/	DR, I	GHG sources that are counted are live tree aboveground and belowground biomass, shrub aboveground and belowground biomass, herbaceous aboveground biomass, and soil carbon. Emissions that are negligible or conservatively omitted		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			include woody debris, methane from biomass burning, and fuel consumed in land management. Any sink in long-term wood products is negligible. Credible justification of the selection of the carbon pools are included within the PD and DNV assessed that it was in line with the requirements set out in VM0009.		
E.2. Leakage *It is assessed whether leakage effects i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project) have been properly assessed and estimated ex-ante.*					
E.2.1. Are potential leakage effects beyond the chosen project boundaries properly identified?	/1/		Following methodology VM0009, the project developer has randomly located plots for measuring leakage. Baseline amounts of degradation and deforestation have been measured on these plots. The needed number of plots was calculated using the observed variance of forest state observations across the reference area. **CAR 10** Please provide a justification for the estimation of the ex-ante leakage rate for the project crediting period as per the requirements of VM0009 (pg 69, pg 70).	CAR 10	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
E.3. Baseline Emissions *The validation of ex-ante estimated baseline GHG emissions focuses on transparency and completeness of calculations.*					
E.3.1. Have the most relevant and likely operational characteristics and baseline indicators been chosen as the reference for baseline emissions?	**/1/**	DR, I	DNV finds that the project proponent has appropriately defined a reference area, appropriately measured deforestation over time within the reference area, and appropriately monitored starting biomass and soil carbon stocks within the project boundary.		OK
E.3.2. Are the baseline boundaries clearly defined and do they sufficiently cover sources and sinks for baseline emissions?	**/1/**	DR, I	DNV finds that the project proponent has appropriately defined a reference area, appropriately measured deforestation over time within the reference area, and appropriately monitored starting biomass and soil carbon stocks within the project boundary.		OK
E.3.3. Are the GHG calculations documented in a complete and transparent manner?	**/1/**		The approaches to estimate emission reductions for years 2005-2010 are described in the VCS Project Document. DNV can confirm that the approaches conform to the requirements in the VCS approved methodology "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" and that a conservative approach has been taken. **CAR 4**	CAR 4	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			The factor for the root:shoot ratio for trees should be from the appropriate vegetation type for the project location. The vegetation type should be taken from an authoritative public source. **Accepted and Corrected.** The FAO Africover dataset classifies the Project Area as Tropical Dry Shrubland for which the root:shoot ratio for Trees is 0.4. We have changed our root:shoot ratio for Large and Small Trees to 0.4.		
E.3.4. Are uncertainties in the GHG emission estimates properly addressed in the documentation?	**/1/**	DR, I	The statistical uncertainty in the logistic model is 5.9% at the 95% confidence level.		OK
E.3.5. Have the project baseline(s) and the project emissions been determined using the same appropriate methodology and conservative assumptions?	**/1/**	DR, I	The approaches to estimate emission reductions for years 2005-2010 are described in the VCS Project Document. DNV can confirm that the approaches conform to the requirements in the VCS approved methodology "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests Version 1.0" and that a conservative approach has been taken		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
E.4. Emission Reductions *Validation of ex-ante estimated emission reductions.*					
E.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	**/1/**	DR, I	The total emission reductions from the project are estimated to be 4 525 767 tCO_2e over the selected 30-year crediting period (1 January, 2005 to 31 December, 2034). This includes project emissions, the total confidence deduction, 20% ex-ante leakage estimate, and the VCS AFOLU buffer determination of 20%. **CAR 8** The table of NERs and uncertainty calculations should be updated in the PD to reflect the amounts and final calculations as verified. **CAR 9** Equations for baseline emissions are not properly applied in the spreadsheet "Rukinga NER analysis v4.xlsx." The incorrectly applied equations address above and belowground biomass of trees and non-tree vegetation, and soil. The incorrectly applied equations are numbered in the methodology as equations 21, 23, 24, 26, and 26. The error is that when calculating 2006 emissions (column D in the spreadsheet), cumulative emissions as of the prior period are not subtracted from the cumulative emissions	CAR 8, 9	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			of the current monitoring period. The terms in the equations that are missing from the calculations are for monitoring period m-1 (for biomass) and i-1 (for soil). Numbers for these terms must be added to the calculations. These terms appear to be properly included and counted in subsequent years, in columns E through AG of the spreadsheet. In the spreadsheet, this error is manifested in cells D24, D25, D28, D29, and D33.		
E.5. ISO 14064-2:2006 clause 5.2: *Does the VCS PD contain the following essential elements?*	/1/				
E.5.1. Does the VCS PD contain the following essential elements as set out in ISO 14064-2:2006 clause 5.2.					
E.5.1.1. Project title, purpose(s) and objective(s)?	/1/		**CL 1** Please include a reference to the final approved VCS methodology, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests." **CL 2** Please finalize all references to documents, including the title, version, and date. **CL 3** Within the *AFOLU Non-Permanence Risk Analysis and Buffer Determination*, a reference to the project name should be	CL 1-3	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
			included within the title.		
E.5.2. Type of GHG project.	**/1/**		Yes – The project activity falls under VCS sectoral scope 14 (AFOLU) REDD Mosaic Deforestation.		OK
E.5.3. Project location, including geographic and physical information, allowing for the unique identification and delineation of the specific extent of the project.	**/1/**	DR	Project location and delination of the specific extent of the project is made clear.		OK
E.5.4. Conditions prior to the project initiation	**/1/**	DR	Section 6.1		OK
E.5.5. A description of how the project will achieve GHG emission reductions and/or removal enhancements	**/1/**	DR	Section 61		OK
E.5.6. Project technologies, products, services and the expected level of activity.	**/1/**	DR, I	Project activities include: 1) Wildlife Works Sustainable Development Initiatives 2) Organic Greenhouse 3) Dryland farming scheme 4) REDD Forest and Biodiversity monitoring 5) Ranger force team 6) Ecotourism 7) School construction and bursary scheme		OK
E.5.7. Aggregate GHG emission reductions and removal enhancements, stated in tonne of CO2e, likely to occur from the GHG project.	**/1/**	DR, I	The total emission reductions from the project are estimated to be 7,542,945 tCO_2e over the selected 30 year crediting period (1 January 2005 to 31 December 2034). This includes project emissions and the total confidence deduction but does not include the VCS AFOLU buffer determination of 20% and assumes leakage to be 0.		OK
E.5.8. Identification of risks that may substantially affect the project's GHG emission reduction or removal	**/1/**	Dr	Section 1.11 - Yes – The following risks have been identified: Change in legislation,	CAR 2	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
enhancements.			income, crop failure, invasion of cattle grazers due to famine in adjacent communities, drought, wildlife, cash crops, and fire **CAR 2** It is our assessment that the buffer determination is a medium and the final buffer withholding percentage should be should be 20% (see Section 3.7"*Buffer Risk Determination" in DNV VCS Verification Report / Verification Statement Revision 1 31 January 2011*)		
E.5.9. Roles and responsibilities, including contact information of the project proponent other project participants, relevant regulator(s) and/or administrators of any GHG Program(s) to which the GHG project subscribes.	**/1/**	DR	Section 1.15 – The project proponent is Wildlife Works Inc. Appropriate contact information is included within the project document.		OK
E.5.10. Any information relevant for the eligibility of a GHG project under a GHG Program and quantification of GHG emission reductions or removal enhancements, including legislative, technical, economic, sectoral, socio-cultural environmental, geographic, site-specific and temporal information.	**/1/**	DR, I	The project area covers 100% (30,169 ha) of the Rukinga Sanctuary. At the time of the project start date, 93% of the project area was forested for 10 years prior to the project start date. The project boundary was confirmed by DNV by reviewing the two documents provided by Wildlife Works, the leasehold title to Rukinga Ranch **/2/**, the Carbon Rights Agreement between Wildlife Works Inc. and Rukinga Ranching Co. **/3/**.		OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
E.5.11. A summary of environmental impact assessment when such an assessment is required by applicable legislation or regulation.	**/1/**		The environmental and scoio-economic impacts of the project activities have been assessed within the context of the Audit report conducted by the Kenya National Environmental Management Authority in December DNV has reviewed all documentation pertaining to the environmental audit.		OK
E.5.12. Relevant outcomes from stakeholder consultations and mechanisms for on-going communication.	**/1/**		A local stakeholder process was carried out by soliciting public comments through the internet and posting on local area notice boards. DNV reviewed all comments and found that the process complies with VCS requirements.		OK
E.5.13. Chronological plan for the date of initiating project activities, date of terminating.	**/1/**		The project start date is 1 January 2005, which is the date Wildlife Works Inc. assumed financial responsibility for the project area and began specific GHG mitigation activities. The selected crediting period is from 1 January 2005 to 31 December 2034.		OK
E.5.14. Notification of relevant local laws and regulations related to the project and demonstrate compliance with them.	**/1/**	DR, I	Section 1.10 – Wildlife Works Inc. documents the relevant local laws and regulations and was found to be in compliance with these regulations.		OK
E.5.15. Does the VCS PD contain a Proof of Title which includes either a legislative right, right under local	/1/	DR, I	Section 8.1 – Rukinga Ranching Company Ltd has legal title to the project area land.	CL 4	OK

Checklist Question	Ref	MoV*	Comments	Draft Concl	Final Concl
common law, ownership of land, or a contractual arrangement with the owner of the land			A copy of the title deed was provided to DNV. Wildlife Works Inc acquired the carbon rights from the landowner in 2009. **CL 4** It would help to communicate to the reader if the PD were to include a graphic that lists the organizations involved in the project (Rukinga Ranching, WW Inc, WW EPZ, WW Sanctuary, WW Carbon) shows the relationship between them.		

APPENDIX B

Resolution of Corrective Action and Clarification Requests

Table 4 Resolution of Corrective Action and Clarification Requests

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
CAR 1 The monitoring report must be a stand alone document from the project documentation. (VCS Program Normative Document: Double Approval Process Version 1.1 Section 6.2.1) Title page should be included with monitoring period (Jan 1 2005- December 31, 2010), client name, date, name of project, and version number on front cover.		**Accepted.** Monitoring report broken out as a standalone document. The document is entitled 'VCS Monitoring Report Version 1.0'	CAR closed.
CAR 2 It is our assessment that the buffer determination is a medium and the final buffer withholding percentage should be should be 20% (see Section 3.7"*Buffer Risk Determination" in DNV VCS Verification Report / Verification Statement Revision 1 31 January 2011*)		**Accepted and changed to 20%.**	(see Section 3.7"*Buffer Risk Determination" in DNV VCS Verification Report / Verification Statement Revision 1 31 January 2011*) CAR closed.
CAR 3 The justification of the project start date must conform to VCS requirements.		**Accepted and completed. The following text was inserted into Section 5.2 in the PD.** "Wildlife Works took financial responsibility for all conservation activities within the Project Area as of January 1st 2005, as a result of the agreement between Wildlife Works and Rukinga Ranching Company, Ltd., the	The January 1, 2005 project start date is valid because Wildlife Works Inc. took financial responsibility for the project land in 2005 and began implementing project actions within the project area only after this.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
		landowner, a copy of which was provided to the Validators. Wildlife Works began conservation activities, centered around our ecofactory, prior to 2005, but those activities were located outside the Project Area. The VCS rule for AFOLU projects starting after Jan 1 2002 is that they have no specific time requirement for validation and verification. Language exists in the MED to clarify the type of project activities that qualify a project for a historical project start date. Wildlife Works fully conforms to these MED requirements."	Prior to 2005, conservation activities implemented by Wildlife Works Inc. were implemented outside the project area. CAR closed
CAR 4 The factor for the root to shoot ratio for trees shall be from the appropriate vegetation type for the project location. The vegetation type should be taken from an authoritative public source.		**Accepted and corrected.** The FAO Africover dataset classifies the Project Area as Tropical Dry Shrubland for which the root:shoot ratio for Trees is 0.4. We have changed our root:shoot ratio for Large and Small Trees to 0.4.	The sources used for the root to shoot ratios and vegetation types are appropriate. CAR closed.
CAR 5 The coefficients for the deforestation model given in the PD must be corrected to match the coefficients produced by model and used in calculations of cumulative deforestation.		**Accepted and corrected.** The coefficients previously listed in the PD were the result of an obsolete version of the grid classification data file. The new and correct coefficients now match the CDM model.	Coefficients in the PD were changed and now match outputs of the statistical program used to calculate the coefficients of the logistic model of deforestation. The linear model coefficients also were changed, and meet the criteria that the cumulative deforestation predicted by the linear model is less that the

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
			cumulative deforestation predicted by the logistic model in each year of the project life. Further, the linear coefficients were revised to reflect the clarification of the methodology, that the accrual of offsets is at a constant rate, starting from the carbon stock within the project boundary at the time of the start of the project. This clarification avoids the assumption that, in the first year of the project, the cumulative baseline deforestation within the project rises to match the cumulative deforestation in the reference area. CAR closed.
CAR 6 The PD shall describe the method used to determine bulk density of disturbed soil samples, and document that the protocol is well established.		**Accepted and completed. Text inserted into the PD:** "The Bulk Density method used by the outside laboratory that performed the soil testing for the PD is an official FAO methodology for measuring Bulk Density of disturbed soil samples." A copy of the FAO approved protocol was provided to the Validators.	The addition of the following language on page 66 is sufficient: "The Bulk Density method used by the outside laboratory that performed the soil testing for the PD is an official FAO methodology for measuring Bulk Density of disturbed soil samples" CAR closed.
CAR 7 The PD shall specify the acceptable degree of error		Accepted and done. Text inserted into the PD: Quality Control (QC) for Biomass plots was conducting	Quality control guidance was inserted into Section 13.14 of the

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
allowed in forest measurements, and how errors larger than acceptable amounts shall be dealt with.		using the following protocol; 1. An independent QC team not involved in the original plot sampling of each plot is given coordinates for the plot centers for 5% of the original plots. The Independent QC team is also given blank plot data recording sheets, plot radius for each carbon pool, a copy of the plot sampling "Standard Operating Procedure – Biomass", dbh tape, compass and long tape, and sent out to measure the plots as though they were doing it for the first time. 2. The QC team returns to headquarters with data sheets which are given to a third party analyst, who are neither on the original nor the QC plot team, for comparison against the original plot data sheets. 3. Any discrepancies are noted, and when all sheets have been compared, the two plot teams are brought together with the VP African Field Operations or his deputy the Operations Manager to discuss and explain any significant variances (±15%) 4. The monitoring team lead is informed if more than 1 QC plot contains significant discrepancies from the original data sheets, and further QC plots may be required to establish the extent of the quality errors. 5. The Monitoring Team Lead and/or senior carbon staff makes a determination as to whether a plot needs to be revisited: For a given plot, the number of trees that fall outside the	PD. CAR closed.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
		±15% threshold for change since original measurement is counted. If greater than 10% of trees in that plot fall outside the threshold, and QC has been performed on the plot within 1 year from original measurement, the plot must be re-measured. If QC has been performed on a plot greater than 1 year after original measurement, the threshold described above shall be relaxed to 15%.	
CAR 8 The table of NERs and uncertainty calculations should be updated in the PD to reflect the amounts and final calculations as verified.		**Accepted and updated.** The table of NERs now matches the final calculations as verified.	CAR closed.
CAR 9 Equations for baseline emissions are not properly applied in the spreadsheet "Rukinga NER analysis v4.xlsx". The incorrectly applied equations address above and belowground biomass of trees and non-tree vegetation, and soil. The incorrectly applied equations are numbered in the methodology as equations 21, 23, 24, 26, and 26. The error is that when calculating 2006 emissions (column D in the spreadsheet) cumulative emissions as of the prior period are not subtracted from the cumulative emissions of the current monitoring period. The terms in the equations that are missing from the calculations are for monitoring period m-1 (for biomass) and i-1 (for soil). Numbers for these terms must be added to the calculations. These terms appear to be properly included and counted in subsequent years, in columns E through AG of the		**Alternative Changes Applied** After discussing this CAR with the validators, it was agreed that this CAR is not applicable. However, it led to some clarifying language in the PD to ensure that a conservative linear deforestation rate was used.	The project baseline is constructed according to the approved methodology. The project proponent elected to use the linear model baseline alternative provided within VM0009. As allowed by the methodology, the project developer elected to be credited according to a linear deforestation rate that is cumulatively less than the logistic model at all times within the project life. CAR Closed.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
spreadsheet. In the spreadsheet, this error is manifested in cells D24, D25, D28, D29, and D33.			
CAR 10 Please provide a justification for the estimation of the ex-ante leakage rate for the project crediting period as per the requirements of VM0009 (pg 69, pg 70).		**Accepted and competed.** The following language was added to the Section 11.3 'Estimation of Ex-ante NERs' in the PD: The project activities described in detail in Section 10 Leakage and Section 6.1 Baseline Scenario Overview, were specifically designed to mitigate deforestation and human-wildlife conflict, and therefore by default serve to mitigate leakage and uphold project permanence. Wildlife Works is of the opinion that the project will suffer little to no leakage, due to our exceptional attention to leakage mitigation. However, in the absence of precedent for estimating ex-ante leakage emissions, Wildlife Works chose to use a conservative value of 20%. Applying this factor to gross NERs yields an estimate of total net NERs over the project lifetime of: Ex-Ante NERs=7,542,945-(7,542,945*0.20) Ex-Ante NERs=**6,034,356** This analysis is available as a spreadsheet and accounts for an estimate of 20% leakage. It includes project emissions and a total confidence deduction. A chart of the projected NERs over the life of the project is presented below. Actual leakage values will be measured empirically at each monitoring period, and will vary from these conservative ex-ante estimates.	Estimating a leakage rate at the project outset is highly uncertain. Wildlife Works has determined an ex-ante leakage rate for the project crediting period at 20% and it is our assessment that this is appropriate given the conditions of the project and is consistent with values proposed by The Climate Action Reserve. DNV thus finds the leakage assessment to conform to the requirements in the approved methodology VM0009. CAR 10 Closed.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
CL 1 Please include a reference to the final approved VCS methodology, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests."		**Completed.** Included a reference to the final approved VCS methodology, "VM0009 Methodology for Avoided Mosaic Deforestation of Tropical Forests." Abbreviated to MED after the first instance.	CL closed.
CL 2 Please finalize all references to documents including the title, version, and date.		**Completed.**	CL closed.
CL 3 Within the *AFOLU Non-Permanence Risk Analysis and Buffer Determination*, a reference to the project name should be included within the title.		**Completed.**	CL closed.
CL 4 It would help to communicate to the reader if the PD were to include a graphic that lists the organizations involved in the project (Rukinga Ranching, WW Inc, WW EPZ, WW Sanctuary, WW Carbon) shows the relationship between them.		**Accepted and completed.** Graphic added in section 5.3.2	CL closed.
CL 5 Please fix the typo on page 45 bullet point 2 from "lara" to "laws".		**Done.**	CL closed.
CL 6 Page 26. "No Image" bullet: Before the last two words, insert "not"?		**Done.**	CL closed.

Draft report corrective action requests and requests for clarifications		Summary of project participants' response	Final conclusion
CL 7 Page 43. Capitalize "co" in CO2e.		**Done**	CL closed.
CL 8 Page 43. Section 6.6.4. First paragraph is truncated and incomplete.		**Done**	CL closed.
CL 9 Page 76. What are the units for the total area? Hectares?		**Accepted.** Changed table values to ha to match total. Changed unit of measure to ha.	CL closed.

Verification Report:

Name of Verification company:	Date of the issue:
Scientific Certification Systems (SCS)	July 21, 2011
Report Title:	**Approved by:**
Verification Report: Boden Creek Forest Carbon Project	Todd Frank
Client:	**Project Title:**
Forest Carbon Offsets, LLC Boden Creek Ecological Preserve	Boden Creek Ecological Preserve Forest Carbon Project

Summary:

This report documents the verification of avoided emissions for the Boden Creek Forest carbon Project for the period from the project's initiation in 2005 to 2010. The project proponent is the Boden Creek Ecological Preserve, with support from Forest Carbon Offsets, LLC. The project utilized the approved Verified Carbon Standard (VCS) methodology VM 0007 – "REDD Methodology Modules." The project was both validated and verified by SCS. This report documents verification activities. Verification of the project included an assessment of monitoring activities and data collected and evaluation of compliance to the VCS standards and to the methodology selected. The verification process also involved an in-depth assessment of the ex-post calculation of VCUs generated by the project for the reporting period of 2005 (project initiation) through 2010.

The audit conducted by Scientific Certification Systems included desk reviews of the project and supporting documentation, a site visit, and interviews with project proponents and technical service providers. It also included field work in which a sample of forest inventory plots were checked by the audit team. During the audit, an iterative exchange of requests for new information and corrections of non-conformances took place between the verifier and the project proponent. At this time, all nonconformities have been adequately resolved. The auditors conclude that the project meets all relevant requirements of the Verified Carbon Standard. SCS verified that the project generated 133,808 t CO2 equivalent net emissions reductions during the present reporting period.

Work carried out by:	Number of pages:
Ryan Anderson (Lead Verifier) Zane Haxton (Verifier) Percival Cho (Technical Expert) Robert Hrubes (Technical Reviewer)	14

1 Introduction

1.1 Objective

- Evaluate the verification scope, including the GHG project and baseline scenario; GHG sources, sinks, and reservoirs; and the physical infrastructure, activities, technologies and processes of the GHG project.
- Evaluate the monitoring plan and develop conclusions regarding the monitoring methodology and the collection and archiving of data relevant to GHG emissions estimation and baseline emissions.
- Assess conformance of the proposed Agriculture, Forestry and Other Land Use (AFOLU) Project Elements with the VCS Standard and VCS Program Guidelines;
- Evaluate the calculation of GHG emissions, including appropriateness of source, sink, and reservoirs; the correctness and transparency of formulae and factors used; assumptions related to estimating GHG emission reductions; and uncertainties.
- Determine if there have been any significant changes to the project procedures or criteria since the project validation.
- Determine if there have been any significant changes in the project and baseline emissions, removals, emission reductions and removal enhancements since the project validation.
- Develop conclusions based on verification standards, submitting any corrective action requests, as applicable.

1.2 Scope and Criteria

SCS assessed the completeness of the Project Monitoring Report to ensure that all requirements of the VCS standards and applicable methodology elements have been addressed. SCS assessed whether or not the Monitoring Report respects the principles of the VCS standards. The Project Design Document (PDD) was referenced during this assessment, but was not itself assessed, as that task was performed during the validation audit, which is documented in a validation report issued on June 24, 2011.

Assessment included but was not limited to evaluation of the project implementation, monitoring, and the calculation of GHG emissions. SCS assessed whether the project itself meets all of the requirements laid out in the VCS standards and is consistent with the PDD.

Criteria from the following standards and documents were used to assess the project:

- VCS 2007.1
- VCS Program Guidelines 2007.1
- VCS Guidance for Agriculture, Forestry and Other Land Use Projects (AFOLU)
- VCS Tool for AFOLU Methodological Issues
- VCS Program Updates: Updates to the Tool for AFOLU Methodological Issues and Guidance for AFOLU Project: Insignificant Emissions Sources and Pools, Carbon Pools, Avoided Planned Deforestation, Definition of Mosaic and Frontier Deforestation, Market Leakage
- Methodology: VM0007-REDD Methodology Modules

The assessment was performed using the client-supplied Monitoring Report, PDD, and other supporting documentation.

1.3 VCS project Description

As described in Section 1.5 of the PD, the Project consists of 3,980 ha of tropical forest located in the Toledo District of Belize. The objective of the Project is to prevent conversion of the area to agricultural use. As described in Section 1.6 of the PD, the start date of the project is January 1, 2005, and the crediting period extends from January 1, 2005 to December 31, 2029. The report describes the verification of project GHG benefits over the period from January 1, 2005 to December 31, 2010. As described in Section 1.15 of the PD, the Boden Creek Ecological Preserve (BCEP) is the project proponent. BCEP has retained Forest Carbon Offsets to "develop the strategy, implementation, and monitoring of the carbon credits generated by this project." Forest Carbon Offsets has contracted SCS to provide validation services, and therefore Forest Carbon Offsets will be referred to as "the Client" hereafter.

1.4 Level of assurance

SCS provides reasonable assurance per section 7.3.1 of the VCS standard ("VCS 2007.1") that the emission reduction estimations for the Boden Creek Forest Carbon Project are conservative and meet the VCS criteria and approved methodology, VM0007-REDD Methodology Modules.

To ensure complete transparency, SCS has included any clarification or corrective actions that were raised at the end of this validation report.

2 Methodology

2.1 Review of Documents

SCS received and reviewed the PDD and supporting documentation to assess initial conformance with the requirements of the VCS standard. Key factors that impact the reported emission reductions and removals were identified, and a Verification Plan was created to focus on the critical elements presenting potential risk for errors. These elements included inventory data collection and handling, evidence of conformance to the methodology, evidence of conformance to the monitoring plan, and implementation of calculations.

The desk review resulted in findings associated with lack of documentation of the remote sensing imagery and methods applied in project monitoring and incorrectly reported parameters. This report details the findings that led to one Non-Conformity Report (NCR) and one New Information Request (NIR) that the project proponents had to respond to in order to allow SCS to provide reasonable assurance that the emission reduction estimations meet the requirements of the VCS and the selected methodology. The client's satisfactory responses are detailed, along with the verifier's responses that lead to the closure of the identified NCR/NIRs.

Finally the document was technically reviewed for completeness by an SCS auditor for quality assurance purposes.

2.2 Site Visit

As part of a validation audit documented in a separate report, the auditors conducted an on-site audit of the project area on February 20-22, 2011. During the visit, the verification team interviewed relevant personnel, toured the project area, and re-measured six carbon inventory plots. The validation team was accompanied by local technical expert Percival Cho during the site visit, as well as local tree identification expert Bonifacio Tut. As documented in the validation report, available under separate cover, the site visit resulted in concerns regarding the accuracy of carbon stock estimates that resulted from the carbon inventory plots measured by the project proponent. These concerns led to issuance of an NCR during project validation. In response to that NCR, the Project Proponent re-measured all plots. A sample of seven of the re-measured inventory plots were checked for accuracy by Percival Cho and Bonifacio Tut on May 23 and 24. That assessment indicated that the data collected met the accuracy standards of the VCS. Although these visits were initially conducted in support of project verification activities, the same inventory data is used in this first project verification as that presented for validation. These site visits were critical to SCS's ability to arrive at reasonable assurance that the project's stated emissions removals are conservative and in compliance with the requirements of the VCS standard and applicable methodology elements.

2.3 Quantitative Analysis

The third step of the verification process focused on the quantitative analyses undertaken by the Project Proponent to estimate the net greenhouse gas benefits of the project. This entailed generating carbon stock estimates from the field data collected by the audit team and comparing it to estimates made by the project proponent. Additionally, calculations made by the project proponent were reviewed by the audit team.

2.4 Final Review and Report Drafting

The last step in the verification process included a final review of the submitted data, and drafting of the VCS Verification Deed of Representation and supporting Verification Report. A draft Verification Deed of Representation and Report was completed based on the results of the verification assessment. The draft report was presented to an internal SCS Technical Reviewer who determined the Verification Opinion to be justified given the evidence presented. The report and opinions were then presented to the project proponent for review and comment.

2.5 Follow-up Interviews

The following personnel were interviewed during the audit process:

- Jeff Waldon, Forest Carbon Offsets: Interviewed during site visit and follow-up phone discussions
- Gabriel Thoumi, Forest Carbon Offsets: Interviewed during site visit
- Verl Emrick, Conservation Management Institute: Interviewed during site visit
- Kenneth Karas, Boden Creek Ecological Preserve: Interviewed during site visit

2.6 Resolution of any material discrepancy

Throughout the validation/verification process, there was an iterative exchange between SCS and the Project Proponent to gather additional information for review and examination. This exchange includes Findings—New Information Requests (NIR), Non-Conformity Reports (NCR) and Opportunities for Improvement (OFI)—that are issued by SCS to the Project Proponent. The Project Proponent must respond to NIRs and NCRs in order for SCS to render a verification opinion. At this time, all findings have been appropriately addressed by the project proponent and subsequently closed by SCS.

The Findings from the verification of the Boden Creek Project are compiled in Appendix A- “List of Findings” to this report.

3 Verification Findings

3.1 Remaining issues, including any material discrepancy, from previous validation

This is the first project verification. The verification was performed immediately following project validation by the same audit team. All issues related to validation have been resolved and are described in a validation report available under separate cover. As described in the site visit section, above, the inventory data collected by the Project Proponent was assessed during validation. This data is fundamental to verification, and the activities described in the validation report allowed the audit team to attain reasonable assurance of the accuracy of that data for verification purposes.

3.2 Project Implementation

During the site visit and by review of project documents, SCS verified that the project had been implemented as described in the validated project design document. We note that the project has been validated under the CCBA standard as the VCS. The scope of this verification audit was limited to assessment of the project against the VCS standard, and no activities were conducted to verify whether the project has been implemented as described in the CCB PD.

The PD describes a restrictive covenant attached to the property title to mitigate non-permanence risks. This restriction, as described in the monitoring report, has not yet been put into place. However, it is not required by the methodology.

3.3 Completeness of Monitoring

As described in section 3.3 of the validation report issued by SCS for the project, the following parameters are required to be monitored by the approved VCS methodology and are applicable to the project:

A_{sp}	Area of sample plots
N	Number of sample plots
DBH	Diameter at breast height of each tree in a sample plot
$A_{defLK,}i,t$	The total area of deforestation by the baseline agent or class of agent of the planned deforestation in stratum *i* at time *t*
Project Forest Cover Monitoring Map	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Aburn,i,t	Area burnt in stratum *i* at time *t*
$A_{DefPA,i,t}$	Area of recorded deforestation in the project area in stratum *i* at time *t*
Ai	Total area of stratum i
$U_{BSL,SS}$	Percentage uncertainty (expressed as 95% confidence interval as a percentage

	of the mean where appropriate) for carbon stocks and greenhouse gas sources in the baseline case
$U_{P,SS}$	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the project case

The parameters A_{sp}, N, and *DBH* were obtained using a sample of forest inventory plots in the project area, while $A_{defLK,i,t}$, *Project Forest Cover Monitoring Map* , *Aburn,i,t* , $A_{DefPA,i,t}$, and A_i parameters resulted from remote sensing analysis. The uncertainty parameters and all other parameters used by the methodology's calculations are either given in the methodology, held constant over the life of the project (i.e. assessed at validation only), or derived from these measurements. All monitoring required by the validated project document and applicable methodology elements has been conducted.

3.4 Accuracy of Emission Reduction Calculations

SCS reviewed all *ex-post* calculations used to derive the estimate of the project's net emissions reductions. The project used the same framework for calculations that was reviewed during project validation. No additional calculation errors were discovered by the audit team during verification. Because there has been no observed deforestation in the project area, the project is being validated and verified several years after its start date, and the inventory data used in the present verification was available during validation, the verified *ex-post* net GHG benefits to date have not changed from the *ex-ante* estimates that were available at project validation.

3.5 Quality of Evidence to Determine Emission Reductions

Two main types of data were used to determine emission reductions: forest inventory data, and remote sensing based estimates of forest cover. The quality of the forest inventory was assessed during project validation with an on-site check cruise. The results of that assessment are given in the verification report for the project, available under separate cover. SCS was able to attain reasonable assurance that the inventory data upon which the emission reductions reported in the current monitoring report meet the accuracy requirements of the VCS standard.

Two issues related to the forest inventory arise because the project is back dated to 2005:

First, the current monitoring period covers six years, while the methodology requires monitoring of carbon stocks in the project area at least every five years. As back-dated projects are clearly permitted by the VCS standard, the project's start date meets the requirements of the VCS standard and the selected methodology, the methodology provides no specific guidance on back-dated projects, and it is impossible to obtain data that would allow for a five year monitoring period, SCS determined that a six year initial monitoring period was permissible.

Second, the entire project area is accumulating biomass as it recovers from the hurricane that occurred before the project start date. Under the selected methodology, ex-post changes in carbon stocks that result from forest growth are to be accounted for as the difference in measured biomass at two points in time. For the project, no reliable estimate of forest biomass at the time of the initiation of the project was available, as no inventory had yet been conducted in the project area. The selected methodology does not provide any guidance for estimating initial carbon stocks for a back-dated project. The Client has estimated the biomass for each year of the current monitoring period by subtracting an estimated growth rate of 6% per year from the carbon stock that resulted from the 2011 inventory. This rate comes from a study of a similar forest in Mexico, and, based on research conducted during project validation, appears to represent the best available published data for the forest type. However, the appropriateness of this growth rate as well as the adequacy of such a simple model is subject to high uncertainty. Nonetheless, more robust and better validated models do not appear to be available for the region and forest type applicable to the project area. The project, as validated, assumes eventual conversion of the entire project area to agriculture. The methodology does not permit crediting of more avoided emissions from loss of biomass than the biomass stocks that result from an inventory of the project area. Consequently, any inaccuracies in the estimated growth rate affect only the vintage of credits issued, and not the total number – the maximum avoided emissions credited do not exceed those actually measured in the recent inventory. Consequently, the audit team determined that the use of the estimated growth rate to back-date the inventory was a reasonably conservative approach to a situation not addressed by the methodology. The estimated growth rate should not be required in future monitoring periods, as data from multiple points in time will be available and thus should allow for estimation of carbon stock accumulation in strict conformance with the methodology.

After the issuance of NIR 2011.1, SCS received the remote sensing data used in project monitoring. The audit team reviewed the Landsat image provided and verified that appropriate methods had been applied and that the conclusions of remote sensing analysis as described in the monitoring report are consistent with the original data.

3.6 Management and Operational System

The technical capacity of the project developer is appropriate for performing the monitoring task. As described in Section 3.2 of the PD, it is intended that each permanent plot be re-measured on a yearly basis. Frequent monitoring should help to ensure that measurements are taken to a high standard of quality. Section 3.4 of the PD states that “The overall plan is that staff from BCEP will be trained by the Conservation Management Institute to measure each permanent plot each year.” The verification team observed that permanent staff employed by BCEP are very comfortable working in the forested areas of the property, and, with appropriate training, BCEP staff should be capable of performing yearly monitoring duties. However, it is unclear who will be tasked with data entry, compilation of inventory results, and remote sensing work. BCEP does not currently appear to have the technical expertise necessary to carry out these tasks. However, as otherwise documented in this report, it has been shown that the Conservation Management Institute has the capability to carry out this more technical work.

4 Verification conclusion

SCS was able to arrive at an opinion regarding the accuracy of the calculated emission reductions and removals from the Boden Creek Ecological Preserve Forest Carbon Project through a review of the Project Design Document and the supplementary documentation, additional requested information, and a site visit. SCS confirmed the soundness of the data regarding project eligibility, inventory procedures, baseline and project characterization, methodologies related to the calculation of carbon stocks and GHG reductions and removals. Through the risk based verification assessment, SCS has determined that the Boden Creek Ecological Preserve Forest Carbon Project, developed by the Boden Creek Ecological Preserve (project proponent), and Forest Carbon Offsets, LLC (project developer), is in conformance with the Voluntary Carbon Standard and meets the minimum quality standard.

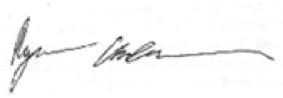
Furthermore, all issues identified during the verification were resolved and found to be in conformance with VCS standards. The monitoring report and data are considered accurate, transparent, and free of material misstatements. Therefore, SCS is able to issue a positive verification opinion for the 166,506 metric tonnes of CO2e emission reductions and removals by the project for the monitoring period from2005-2011. While all 166,506 VCUs will be issued, 15% of the project's CO_2e net carbon stock changes (32,696 metric tonnes CO2e) will be set aside in the VCS's buffer pool. As such, the project will be issued a total of 133,808 VCUs for Emission Years 2005-2010. The VCUs in this Verification Report are consistent with those claimed by the project proponent in the 2011 monitoring report.

Reporting period: From *January 1, 2005 to December 31, 2010*

Verified Emission Reductions In The Above Reporting Period:

Year	Gross Emissions Reductions (t CO2e)	Leakage Discount (t CO2e)	Uncertainty Discount (t CO2e)	Buffer Pool Contribution (t CO2e)	Net VCUs to Project (t CO2e)
2005	7,935	236	2,248	1,551	6,383
2006	14,876	485	4,227	2,915	11,961
2007	22,509	760	6,403	4,416	18,092
2008	30,894	1,062	8,793	6,067	24,827
2009	40,098	1,394	11,417	7,879	32,219
2010	50,195	1,758	14,295	9,869	40,326
TOTAL	**166,506**	**5,695**	**47,383**	**32,697**	**133,808**

Net emission reductions, after subtraction of buffer pool contribution: t CO_2 equivalents: 133,808 tonnes CO2e.



Name: Ryan Anderson
Title: SCS Contractor
Company: Contractor to Scientific Certification Systems

Date: July 21, 2011

Name: Todd Frank
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Company: Scientific Certification Systems
Date: July 21, 2011

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Forest Project Verification

Appendix A: List of Findings

Verification under the Verified Carbon Standard

Reporter/Member:
Forest Carbon Offsets

Project:
Boden Creek Ecological Preserve

New Information Requests:

NIR 2011.1
Finding: Insufficient information about the remote sensing imagery used in the current monitoring period was determined to evaluate whether it meets the requirements of the methodology. As required by page 13, Step 3, Documentation, of the M-Mon Module, please report the following information about the remote sensing imagery used in the current monitoring period: (part a): - Type, resolution, source and acquisition date of the remotely sensed data (and other data) used - geometric, radiometric and other corrections performed - spectral bands and indexes used (such as NDVI) - projection and parameters used to geo-reference the images - error estimate of the geometric correction - software and software version used to perform tasks - Definition of the classes and categories (part b): Because imagery was manually interpreted, rather than classified using an automated algorithm, many of the elements listed of part (b) of Step 3 do not apply. However, to ensure a consistent time series, the minimum mapping unit applied, definitions and descriptions of all classes used, and any keys applied in interpretation should be included. (part c): -Accuracy Assessment Technique used -coordinates and description of the ground truth data collected for classification accuracy assessment -final classification accuracy assessment Additionally, please provide a copy of the images analyzed. **Proponent Response**: The following has been added to the monitoring report: A Landsat 5 TM, 30 meter, satellite image from April 28, 2011 was downloaded from the United States Geographic Survey's (USGS) Global Visualization Viewer (GloVis) (http://glovis.usgs.gov) for path 19, row 49. As the classification was a single-image photo-interpretive process no additional preprocessing was deemed necessary for the methodology. An NDVI was created for use as an ancillary dataset to aid the photo interpreter but was not used directly in the classification. Reprojection and georeferencing was not necessary. The NDVI was created in Erdas Imagine 9.1. The landcover classification and all additional analyses were done in ESRI's ArcGIS 9.3.1. Landcover was classified as forest/nonforest. The nonforest class consolidated all landcover classes, excluding forest, from the original landcover definitions used to define the project area. Landcover was classified for the entire BCEP property through heads-up photointerpretation in a softcopy environment using ESRI's ArcGIS 9.3.1. Landcover was classified as either

forest or nonforest using a Minimum Mapping Unit of one hectare. The nonforest class combined the following classes from the original classification of the project area: cropland, grassland, riparian, settlements/clearing, and wetland. Classification was performed by experienced photo interpreters familiar with Landsat imagery and possessing a priori knowledge of Belizean landuse/landcover.
The accuracy assessment was performed using a high resolution satellite image from RapidEye (5 meter, color-infrared image from March 10, 2011). A random set of verification points was created in ArcGIS 9.3.1 using Hawth's Tools (http://www.spatialecology.com/htools/tooldesc.php). Points within 30 meters of landcover boundaries were removed. The resulting layer contained 50 nonforest and 99 forest points in the classified image.

The verification points were then compared to the high resolution image by a SME with extensive on-ground experience in the study area. The SME determined whether each point was forest or nonforest based on the imagery, knowledge of the project area, and the definition of forest under the project scope. The classified points were then compared back to the landcover map and an error matrix was developed. The overall accuracy of the classification was 96.6%.

Based on this analysis no reversals were detected.

Revised PDD, error matrix, accuracy assessment points attached. Images available if an ftp site address is provided.

Auditor Response: The requested information has been provided. The audit team reviewed the imagery itself to confirm that no material change in the forested area within the project boundary was detected. Sufficient documentation of the image analysis process was provided to allow for consistent data collection and analysis in future monitoring events. Calculations associated with error assessment were reviewed and determined to have been applied appropriately. Error assessment was performed against high resolution imagery, rather than on-the-ground observations. Though this is not in strict conformance with the methodology, it is a common remote sensing practice, and based on an independent review of the imagery provided, the simple forest/non forest classification scheme applied, and observations from a recent site visit, the audit team is reasonable confident that the analysis is materially accurate. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

Non Conformance Reports::

NCR 2011.2

Finding:

The parameter SFiNC is expressed as a number of grams in project calculation worksheets. Correct application of the tool requires the parameter to be expressed as a proportion.

Proponent Response: Spreadsheet and PDD are amended. See attached.

Auditor Response: The parameter has been corrected. The Proponent's response adequately addresses the finding in accordance with The VCS 2007.1 Protocol and selected methodology.

20150123

応用講習ｂ　実習課題

※　以下の事例を基に、グループで実習を行いましょう。

M 氏は、日本の NGO 団体の職員です。これまで、東南アジアの A 国の B 村において、住民の生活向上のための活動を行ってきました。現地は以下のような状況です。

・A 国は、熱帯地域に位置しており、雨季と乾季がある。雨季には大量の雨が降り、一日中雲に覆われる日が多い。
・B 村は、A 国の内陸側に位置しており、大部分を森林に覆われ、貴重な天然林も多く残されている。また、B 村に隣接する地域は国の保護地域に指定されており、東南アジアでも希少な動植物が生息する地域となっている。
・B 村周辺は、山岳地帯であり、主要道路以外は、車の入れる道もほとんどなく、徒歩や馬による移動が大部分である。
・B 村の森林は基本的には国有地であるが、森林の使用権が地域コミュニティーに認められており、住民は森林の伐採や薪炭材の採取などを自由に行うことができる。
・近年、B 村では人口の増加や換金作物の栽培などから、住民による森林伐採と移動耕作による天然林の減少が目立ってきた。
・A 国では過去に国レベルの森林資源調査を実施したことがない。また、これまでに国、企業、NGO も含め REDD プラス事業を実施したことがない状況である。

M 氏は、B 村で REDD プラスに係るプロジェクトを実施し、炭素クレジットを得て、森林の減少・劣化を防ぐことを考えました。プロジェクトを VCS の炭素市場に認定してもらうため、PDD の作成を目指しています。

$\boxed{\text{課題 1}}$：PDD 作成に至るまでには、どのようなアプローチ（準備）が必要でしょうか。講義テキスト、CookBook、REDD＋プロジェクト概観等の資料を参考にしつつ、意見をまとめてみましょう。
（　**キーワード：**フェーズドアプローチ、ドライバー、実施可能性調査、方法論、住民参加、人材育成、炭素クレジット、セーフガード　etc　）

※次ページに、課題 1 に対する検討例を示してあります。各グループで、皆さんの考えるアプローチ方法や、PDD 作成（プロジェクト実施）に際しての課題等を検討してください。

課題１の検討例

１．プロジェクト対象地の現状把握

・REDD プラスのプロジェクトを実施するにあたり、対象地域の範囲（B 村）を明確にするとともに、地域の森林の状況を把握する必要がある。

・特に、プロジェクト対象地となる B 村は、A 国の保護地域に隣接していることから、バッファーゾーンとしての位置づけが考えられる。希少な動植物の生息が考えられことから、単に森林面積や林相だけではなく、生物多様性の観点からも把握する必要がある。A 国では、過去に国家森林資源調査を実施したことはないが、保護地域に係り NPO 団体等の調査データがないか調べる必要がある。

・プロジェクト対象地の森林は国有林であり、地域コミュニティーに森林の使用権が認めた形となっているが、REDD プラスプロジェクトを実施するにあたり、国と地域コミュニティーの間で問題が起きないか、所有権と使用権について整理する必要がある。

・B 村では人口増加と換金作物の栽培により、森林伐採と移動耕作が増えたことが、森林減少・劣化の要因と考えられる。森林減少・劣化の要因（ドライバー）を明確にするとともに、それを防止するための対応策について検討する必要がある。

２．プロジェクトの目標

・プロジェクト対象地の状況を踏まえ、プロジェクトの目標を策定する。

・REDD プラスプロジェクトでは、単に森林の減少、劣化を防止するだけではなく、それに伴い影響を受ける地域住民の生活を考慮しなければならない。

・当該プロジェクト地域においては、以下のような目標を掲げることとする。

〇森林（天然林）の伐採、劣化の防止
〇希少野生動植物の生息環境の保全
〇地域住民の代替生計手段の創出

３．地域住民のコンセンサスとプロジェクトへの参画方法の検討

・REDD プラスプロジェクトの実施のためには、そこで生活する地域住民のコンセンサスを得ることが重要であり、地域住民がプロジェクトへ積極的に参画することがプロジェクトを成功させるために必要不可欠であると考えられる。

・地域住民に対し、対象地域の森林の減少、劣化を防止することの意義を説明し、理解を得る必要がある。そのために、地元で NGO として活動してきた実績や人脈を用いて、説明会や勉強会など地道な啓蒙活動が必要と考えられる。

・地域住民に森林伐採と移動耕作による森林減少と劣化を防ぐための活動を理解し、参画してもらうためには、地域住民の代替生計手段の創出が不可欠である。具体的な方策としては、以下のような内容が考えられる。

〇コミュニティーにおける森林の管理計画の策定
〇換金作物によるアグロフォレストリーの実施
〇薪炭材の供給を減らすための燃料効率の高いかまどの普及
〇移動耕作地の管理、農地の農業生産性の向上対策
〇エコツーリズムの実施

4．PDD 作成までのアプローチ

・VCS の PDD を作成するまでには、段階的にプロジェクトを準備、実行する必要がある（フェーズドアプローチ)。
以下のような段階を踏んで実施を検討する。

・第 1 段階（準備フェーズ）:
〇プロジェクトの行動計画の策定
〇A 国の森林に係る国家戦略や実行計画等と当該プロジェクトとの整合性の確認、調整
〇活動のための資金の調達（国際的基金、企業の協力など）
〇地域住民（コミュニティー）の啓蒙普及活動
〇プロジェクトに関与する関係者の能力開発（国・地方自治体、地域住民、コンサルタント、大学、NGO など）

・第 2 段階（実施フェーズ）:
〇プロジェクトの行動計画の実施
〇実行可能性調査（プロジェクト実施上の課題を明確化、対応策の検討）
〇VCS の方法論の検討（計測、報告、検証（MRV）が透明性のもとに実施可能か）
〇ベースライン排出量・プロジェクト排出量（炭素削減量）の算定と炭素クレジットの試算及び収益性の検討
〇プロジェクト実施に伴うセーフガードの検討（地域住民の権利、生物多様性の保全など）

・第 3 段階（完全実施）
〇VCS のプロジェクト設計書（PDD）作成。第三者検証機関によるプロジェクトの妥当性確認（Validation)。VCS 事務局にプロジェクトの登録。
〇モニタリングの実施。モニタリング報告書の作成。第三者検証機関によるモニタリングの検証（Verification)。
〇炭素クレジットの発行（PDD の Validation 後から可能)。

森林のモニタリングを行うためにリモートセンシングと森林調査を実施する必要があります。リモートセンシングと森林調査については、以下のような状況となっています。

・地域住民にリモートセンシングによる画像解析を指導することは非常に困難である。簡易な森林調査は、以前の活動で指導したことがある。
・首都にある C 大学では、LANDSAT などの中解像度衛星を用いた解析を行っている。
・首都にある D 航測会社では、空中写真の撮影のほか、高解像度衛星や SAR の解析を行っている。
・C 村の近くにある E 市には、B 村を管轄する森林事務所があり、そこの職員はリモセンには不慣れだが、GIS や GPS などの利用には慣れている。
・A 国内では、過去に材積式やアロメトリ式が作成されたことはない。隣接する E 国においては、熱帯林のアロメトリ式が作成されたことがある。

課題２：現地の状況を踏まえ、リモートセンシングの活用について、意見をまとめてみましょう。
（　**キーワード：**コスト、衛星、解像度、撮影頻度、雲量、アーカイブ、精度　etc　）

※次ページに、課題２に対する検討例を示してあります。各グループで、皆さんの考えるリモートセンシングの活用方法や、実施に際しての課題等を検討してください。

課題２の検討例

・リモートセンシングの解析のためには、パソコンや解析ソフトなどの機材、専門的な技術力が必要であり、地域住民や森林官を教育し、機材を貸与してリモセン解析を実施することは困難であると考えられる。したがって、C 大学、または D 航測会社と契約し、リモセン解析の部分を委託することが現実的と考えられる。
・A 国には過去の森林調査データがないことから、過去の衛星データ（アーカイブ）を用いて、参照レベルを開発する必要がある。過去の長期的な森林の変化を把握するためには、アーカイブが豊富であり、その中でも比較的解像度の高い LANDSAT を用いることとする。
・モニタリング調査に用いる衛星データとしては、データの継続性を考えれば LANDSAT であるが、B 村内の森林減少や劣化を正確に把握するためには、空中写真や高分解能衛星など、解像度の高いデータが必要と考えられる。
・A 国は熱帯雨林地域に位置することから、雨季には雲量が多く、光学衛星の撮影機会が少なくなることから、D 航測会社が保有する SAR の解析技術を用いて、光学衛星データを補完することを考える。
・コスト面を考えると、データコストの安い LANDSAT を中心に利用したいところである。空中写真や高分解能衛星をメインで使うと、撮影やデータコストが高額になることが懸念される。
・炭素クレジットによる収益や、求められる画像解析の精度（森林伐採 or 森林劣化の把握など）を勘案しつつ、必要なリモセンデータを選択する必要がある。

$\boxed{\text{課題３}}$：現地の状況を踏まえ、地上調査の実施について、意見をまとめてみましょう。
（**キーワード：**山岳地帯、破壊調査、アロメトリ式、サンプリング調査、層化抽出、効率性　etc　）

※次ページに、課題３に対する検討例を示してあります。各グループで、皆さんの考える地上調査の実施方法や、実施に際しての課題等を検討してください。

$\boxed{\text{課題３}}$の検討例

・A 国では、過去に国家的な森林調査を実施した事例がないことから、森林調査手法について、独自に設計する必要があるが、将来的な国家森林資源調査の動きがある場合は配慮する必要がある。
・B 村は山岳地帯であり、現地調査にかなりの労力やコストを必要とすることが想定される。森林の炭素蓄積を把握するための固定調査プロットは、適切な森林区分による層化抽出法により、効率化を図ることとする。
・国内には、熱帯林の材積式やアロメトリー式等がないことから、破壊調査により新たにアロメトリー式を作成することも考えられるが、車や重機が入れない山岳地帯でのコストや労力を考えれば、隣接国で作成されたアロメトリー式を利用することが効率的と考えられる。なお、その場合は、現地での適用可能性について確認、検証が必要となる。