THE NIHT TOPAIYO REDD+ PROJECT

Document Prepared by EP Carbon

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CONTENTS

1 PROJECT DETAILS 6

1.1 Summary Description of the Project 6
1.2 Sectoral Scope and Project Type 6
1.3 Project Eligibility 7
1.4 Project Design 8
1.5 Project Proponent 13
1.6 Other Entities Involved in the Project 14
1.7 Ownership 14
1.8 Project Start Date 15
1.9 Project Crediting Period 16
1.10 Project Scale and Estimated GHG Emission Reductions or Removals 17
1.11 Description of the Project Activity 19
1.12 Project Location 20
1.13 Conditions Prior to Project Initiation 20
1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks 21
1.15 Participation under Other GHG Programs 23
1.16 Other Forms of Credit 23
1.17 Additional Information Relevant to the Project 23

2 SAFEGUARDS 27

2.1 No Net Harm 27
2.2 Local Stakeholder Consultation 28
2.3 Environmental Impact 30
2.4 Public Comments 31
2.5 AFOLU-Specific Safeguards 32

3 APPLICATION OF METHODOLOGY 34

3.1 Title and Reference of Methodology 34
3.2 Applicability of Methodology 34
3.3 Project Boundary 35
3.4 Baseline Scenario 39

3.5 Additionality 44
3.6 Methodology Deviations 49

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS 49

4.1 Baseline Emissions 49
4.2 Project Emissions 82
4.3 Leakage 85
4.4 Net GHG Emission Reductions and Removals 87

5 MONITORING 90

5.1 Data and Parameters Available at Validation 90
5.2 Data and Parameters Monitored ..... **Error! Bookmark not defined.**
5.3 Monitoring Plan 138

ACRONYMS

AAC	Annual Allowable Cut
DBH	Diameter at Breast Height
FCA	Forest Clearing Authority
FPIC	Free, Prior, Informed Consent
ILG	Incorporated Landowner Group
LLG	Local Level Government
NER	Net Emissions Reduction
NIHT	New Ireland Hardwood Timber
PAA	Project Accounting Area
PAI	Project Activity Instance
PDR	Project Description Requirement
PNG	Papua New Guinea

1 PROJECT DETAILS

1.1 Summary Description of the Project

As of 2014, Papua New Guinea surpassed Malaysia and became the world's sole largest exporter of tropical timber wood, exporting 3.8 million cubic meters of tropical wood that year *(Mittal, 2016)*. Every year, the region loses approximately 1.4% of its forested land *(Shearman, et al., 2008)*, and with it, critical habitat to some 5% of the world's biodiversity *(Food and Agriculture Organization, 2016)* and alongside a massive global carbon sink. This makes Papua New Guinea a key area for intervention. NIHT Inc. is in the unique position to make a global stance against unsustainable timber harvesting and become a key conservation leader in Papua New Guinea.

NIHT Inc. has partnered with the traditional landowners of New Ireland and East New Britain to put an end to deforestation initiated by industrial logging in the region. The preservation of these rainforests is essential to not only the carbon and biodiversity benefits mentioned above, but also the wellbeing and prosperity of the people of New Ireland. The project is located in the forested areas of New Ireland and East New Britain in Papua New Guinea that meet the Eligibility Criteria listed in Section 1.4. The project has evolved based on the input and needs expressed by persons living in the region. What began as a traditional timber operation has been recognized as an opportunity with enormous carbon sequestering potential, and has evolved into a forest protection project.

The expansion of industrial timber is a historical trend in Papua New Guinea, and a threat specifically to the project zone as observed in previous plans to conduct industrial commercial logging throughout the area. The project plans to generate the majority of its emissions reductions through the avoidance of the initial planned industrial timber operations, and will maintain integrity of its forest through forest patrols, inventories, and sustainable management. The project aims to alleviate these pressures on the forests through financial support of clans in the area. By providing the alternative livelihood and income source of carbon finance, it will be possible to avoid conducting industrial-scale commercial timber harvesting in the area, and instead provide revenues to communities through conservation and sustainable management initiatives. This project activity, beyond protecting local forests and biodiversity, contribute to social and economic development in one of the poorest and most isolated areas of Papua New Guinea.

Commercial logging and the subsequent forest loss generate large amounts of GHG emissions. As per point 1 in the eligibility criteria in section 1.4.1, the project area would undergo large-scale commercial harvesting in the absence of the project, producing large amounts of GHG emissions. By preventing this commercial logging that would have occurred without the project and instead protecting these forests with a forest protection program, the project will generate significant GHG emission reductions. By stopping exploitative industrial commercial timber harvesting in the project area, the project expects to generate over 55 million tons of CO_2 emissions reductions across the 30 year project lifetime.

1.2 Sectoral Scope and Project Type

This project falls under VCS Sectoral Scope 14 “Agriculture, Forestry and Other Land Use” in the category of REDD (AFOLU-REDD+). As it focuses on reducing timber extraction and stopping the high-grading of forests in the project area, it is classified at Avoided Planned Deforestation and/or Planned Degradation (APDD). The baseline type is VM0009 type F-P1.b (see section 3.4).

This is a grouped project within the designated geographic area of New Ireland and East New Britain, with the first PAI representing the Kamlapar Incorporated Landowner Group (ILG) in the Konoagil Rural Local Level Government (LLG).

1.3 Project Eligibility

PDR.1 For each applicability condition, a statement of whether it applies to the project. If the applicability condition does not apply to the project, justification for this conclusion.

PDR.2 Where applicability conditions apply, credible evidence in the forms of analysis, documentation or third-party reports to satisfy the condition.

The project is eligible under the scope of the VCS program as a Reduced Emissions from Deforestation and Degradation (REDD) project. The primary project activity is to prevent legal and illegal logging within the project area and the cascading deforestation that typically follows these types of timber projects The project activities have been designed as part of the REDD+ project with the intention of reducing carbon emissions from planned degradation and unplanned deforestation compared to baseline levels. The VM0009 methodology classifies this project type as F-P1.b.

As required by VM0009, the following statements are issued to show the applicability of the methodology to the project:

1. The drivers of conversion in the baseline scenario are consistent with those described in section 6 of the methodology for F-P1.b projects. This is an avoided planned degradation by legally sanctioned commercial harvest and unplanned deforestation by secondary agents. This makes the project activities eligible for Avoided Planned Deforestation and/or Planned Degradation (APDD) under VCS Standard v4.0.

2. The eligibly criteria for project activity instances in Section 1.4 require that the project area qualify as forest as defined in Section 3.2 and that the project accounting area was in a forested status for at least 10 years prior to project start.

3. The baseline degradation is planned, and thus condition 3 is not applicable to project.

4. The baseline type is F-P1.b, and thus this condition is not applicable to the project.

5. The baseline type is F-P1.b, and thus this condition is not applicable to the project.

6. The baseline type is F-P1.b, and thus this condition is not applicable to the project.

7. The Eligibility Criteria for project activity instances in Section 1.4 require that the project area does not contain peat soil. Soils in the designated geographic region are predominantly brown forest soils and rendzinas (European Soil Data Centre, 1965).

8. For each project accounting area, a reference area has been delineated for the baseline type F-P1.b. This reference area meets the methodology requirements, including the minimum size requirement, of section 6.8.1 of this methodology (see Section 4.1.2).

9. As of the project start date, historic imagery of the reference area exists with sufficient coverage to meet the double-coverage requirements of section 6.8.4 of the methodology (see Section 4.1.2).

10. Project measures are planned to mitigate ecosystem conversion by addressing the primary driver of conversion (legal commercial timber harvest) though the development of economic opportunities (i.e., this project and carbon credits as alternative source of income for locals) that will encourage the protection and maintenance of forested lands rather than carrying out unsustainable commercial logging practices to generate revenue for the region.

11. An activity-shifting leakage area will be required if a PAI added to the project is controlled by a primary agent that is actively logging in areas not included in this project. At validation and initial verification, this is not applicable as the primary agent in the initial PAI is not actively logging elsewhere in PNG (see Section 4.3).

12. If an area within the designated geographic area that has been logged recently is added as a PAI, a market leakage deduction will be necessary and a market leakage area may be required (see Section 4.3). At validation, there is only one PAI and it has not been logged recently so no market leakage area is required.

13. SOC is not a selected carbon pool for this project. However, project is located in a tropical ecosystem.

14. No livestock are being grazed within the project area in the project scenario as per the Eligibility Criteria specified in Section 1.4.

15. All GHG emissions from project activities that are not *de minimis* will be monitored and deducted from emissions reductions. Initial project activities of preventing logging, forest patrols, and monitoring for disturbances do not result in significant GHG emissions.

1.4 Project Design

PDR.14 A list and descriptions of all enrolled project activity instances in the group at the time of validation

At the time of validation, the Kamlapar ILG PAI is the only PAI that has officially enrolled in the project. There are twelve additional ILGs that have committed to participating in the project but plan to be added as PAIs in future monitoring reports. The twelve ILGs that have committed to participating in the carbon project are also located in Konoagil and include Boi Boi Marit, Kamrai Labei, Koroi Boi Boi,

Koroir Kabiawai, Leo, Marnai, Sor, Silbat, Tokboi, Bongian, Limut, and Mongon Land Groups. Additional clans are undergoing the process of receiving official recognition as ILGs but have already committed to the project.

PDR.15 A map of the designated geographic area within which all project activity instances in the group will be located, indicating that all instances are in the same region, as shown in Figure 1.

The project is a grouped project and will include multiple PAIs within a designated geographic area. The project is beginning with only one PAI at validation, the Kamlapar ILG located in Konoagil. See Figure 1 for a map of the designated geographic area boundaries of East New Britain and New Ireland as well as the location of the initial PAI. Both non-forest areas and areas that are inaccessible due to difficult terrain have been excluded from the PAI and Project Accounting Area (PAA). The central gap in the Kamlapar PAI was excluded due to difficult terrain making it inaccessible by available means of transport. As there areas would not be suitable for either commercial logging or secondary agent deforestation activities, the baseline scenario would not be applicable to them and it is conservative to exclude them from the PAA.

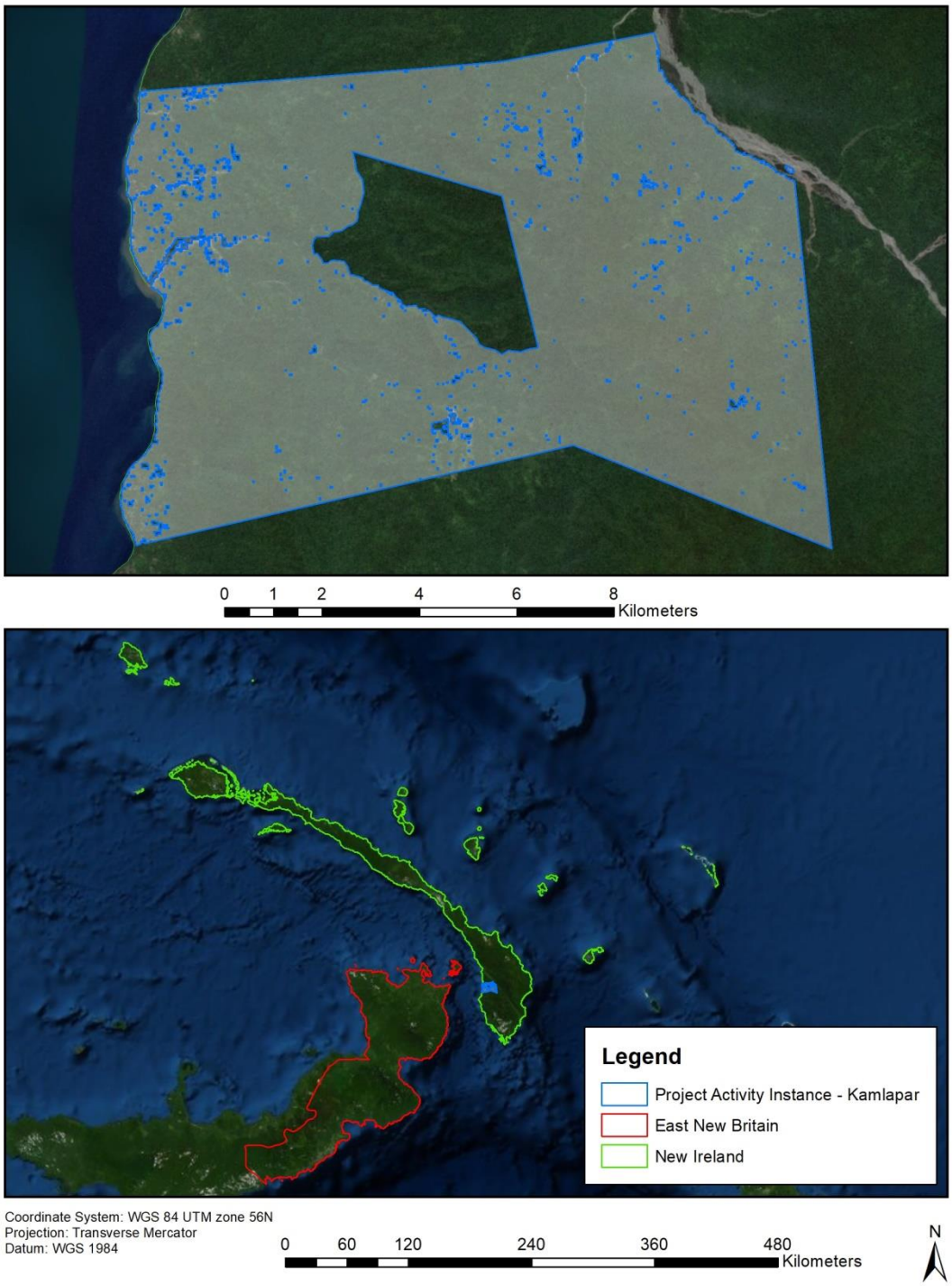


Figure 1: Map of the designated geographic area within which all PAIs will be located, including the boundaries of the Kamlapar ILG, the first PAI.

PDR.16 A map of the common reference area, proxy area, activity shifting leakage area, and market leakage area.

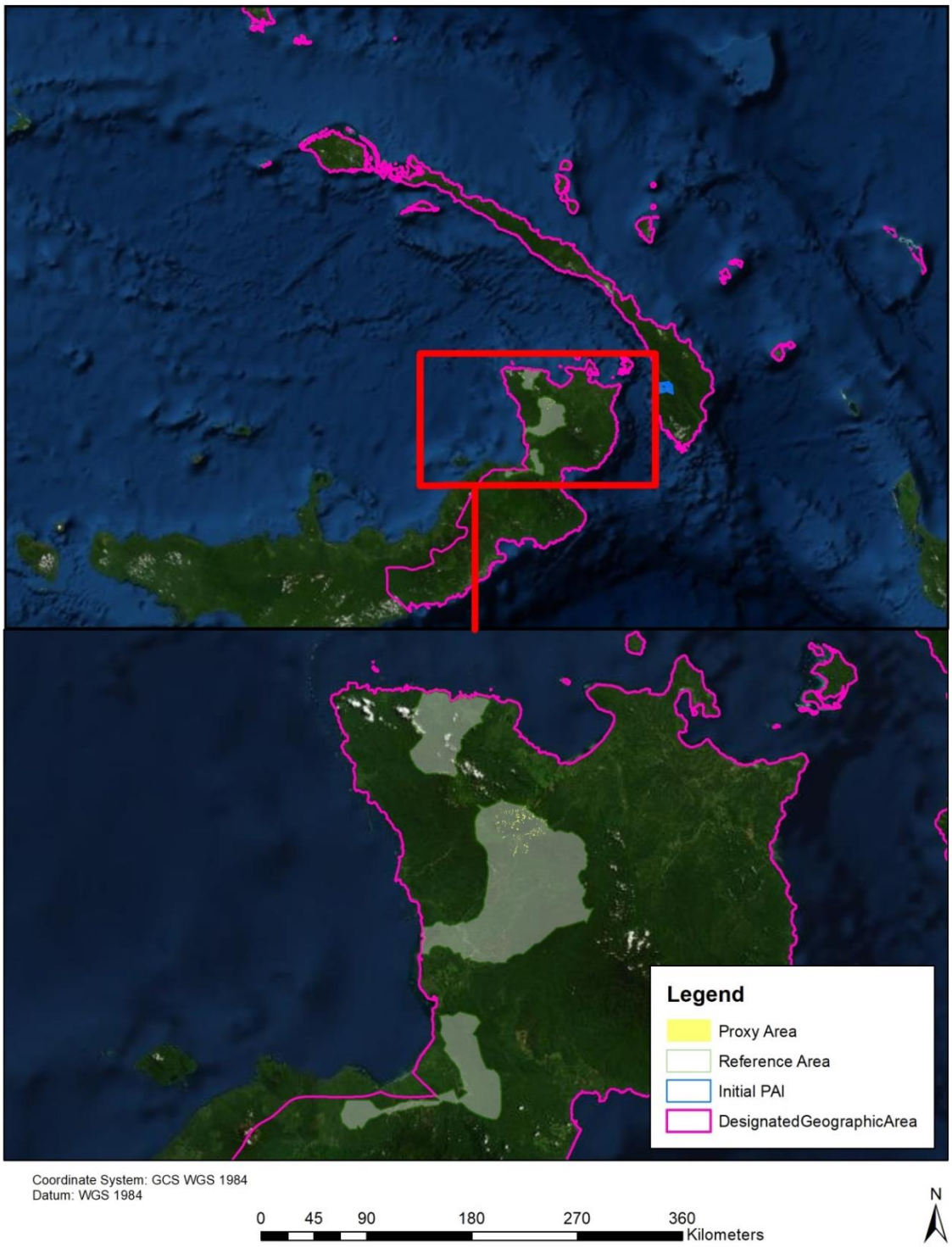


Figure 2: Map of the Proxy Area which is contained in the Reference Area in East New Britain.

1.4.1 Eligibility Criteria

As per VM0009 requirements, each individual project activity instance for this grouped project shall be treated as an individual accounting area. All PAIs will need to demonstrate they meet the following Eligibility Criteria in order to be included as part of the project within the monitoring report for the monitoring period in which they are added to the project. These Eligibility Criteria will ensure that all PAIs contain similar forest types and characteristics and that the reference area is applicable to them. All PAIs will be based off of the same common reference areas, baseline scenarios, and proxy areas.

Each project activity instance shall meet the following Eligibility Criteria:

1. The project activity instance shall be additional per the application of the VCS AFOLU Project Activities (VT0001) version 3.0 in Section 3.5 by demonstrating the following attributes:
    a. The project activity instance shall be in area that is designated for commercial logging.
    b. In the absence of the project activity instance, commercial logging would proceed as a harvest block where all legally harvestable trees of merchantable quality are eligible for removal subject to operability constraints.
    c. The PAI shall not be protected from industrial logging by a legally binding agreement prior to the project start date.
2. The PAI shall be entirely forest as defined by FAO (2010) or a more conservative definition as of ten years prior to the project start date.
3. The PAI shall not contain peat soils.
4. The PAI shall not include the grazing of livestock.
5. The baseline scenario shall be consistent with section 6 of the methodology. The baseline driver shall be type F-P1.b, or planned degradation by legally sanctioned commercial harvest followed by unplanned deforestation by secondary agents.
6. The PAI shall be in the designated geographic area of the islands of New Ireland and East New Britain within Papua New Guinea (see Figure 1). The project activity instance shall use and apply the following technologies or measures:
    a. Prohibit commercial logging.
    b. Conduct a forest protection patrol at least once during each reporting period.
7. In the absence of a Forest Reference Emissions Level (FREL) applied to the project as approved by the national or sub-national government(s), the addition of the area of the project activity instance shall not cause the size of the project area to exceed the total size of the reference areas for the project.

8. Meet the following area selection criteria as specified in Appendix D of the VM0009 methodology in both the reference area and proxy area:
    a. All PAIs must contain a village or community within its boundaries or have one located within 2 km of the boundaries of the area.
    b. Secondary agents must have legal and/or customary access rights to the area.
    c. The majority of secondary agent households within the area must practice subsistence agriculture, fishing, or a similar livelihood. As this is a characteristic of the majority of the communities and villages in the designated geographic area, this may be initially demonstrated by an area fulfilling other Eligibility Criteria.
    d. To ensure that a PAI has similar landscape configuration to the reference area:
        i. The elevation should not exceed 2,000 meters anywhere within the PAI.
        ii. The slope should not exceed 70 degrees anywhere within the PAI.
9. An enforceable and irrevocable agreement with the holder(s) of the statutory, property or contractual rights of the project activity shall vest project ownership in NIHT, Incorporated, including the technologies and measures that generate GHG emission reductions and/or removals. As part of this agreement, project participants will agree to comply with all relevant laws and statutes, as well as adhere to principles of land rights, safety and workers' rights, and anti-corruption as detailed in Section 1.14.
10. Primary agents must enroll the entirety of their lands to which they control logging rights within PNG, or sign an agreement with NIHT, Incorporated that they intend to enroll the entirety of their lands and commit to no industrial logging until this occurs.
11. Commercial timber harvesting must not have occurred within the PAI for 10 years prior to joining the project.

1.5 Project Proponent

Organization name	NIHT, Incorporated
Contact person	Stephen Strauss
Title	Managing Director
Address	202 Enterprise Drive Oxford, MS 38655 USA
Telephone	+1 (662) 222-1513 Office

Email	sstrauss@nihtinc.com

1.6 Other Entities Involved in the Project

Organization name	Ecological Carbon Offset Partners, LLC.
Role in the project	Remote sensing, land use change analysis, VCS validation and verification support services
Contact person	Paz Lozano
Title	Technical Manager, Special Projects
Address	2930 Shattuck Avenue Suite 304 Berkeley, California 94705
Telephone	+1 415 634 4650
Email	plozano@ecopartnersllc.com

Organization name	New Ireland Holdings, Ltd.
Role in the project	In-country subsidiary of NIHT that assists in monitoring and reporting activities.
Contact person	Stephen Strauss
Title	Managing Director
Address	
Telephone	+1 (662) 222-1513 Office
Email	sstrauss@nihtinc.com

1.7 Ownership

PRD.5 Credible documentation demonstrating control of the project area, or documentation that the provisos listed in the case of less than 80% project control at the time of validation delineated in this methodology are met.

Based on the VCS Standard Section 3.6.1, the project demonstrates that the proponent has ownership and or control over the emission reductions under subsection 4:

"Project ownership arising by virtue of a statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions and/or removals (where such right includes the right of use of such reductions or removals and the project proponent has not been divested of such project ownership)"

As a grouped project, the NIHT Topaiyo REDD+ Project will only include PAIs that fulfil all Eligibility Criteria as listed in Section 1.4.1. Subsection 9 of the eligibility requirements states that an enforceable and irrevocable agreement with the holder(s) of the statutory, property or contractual rights of the project activity shall vest project ownership in NIHT, Incorporated, including the technologies and measures that generate GHG emission reductions and/or removals. In order to enter into a contractual agreement with the clans, they must go through the process of becoming recognized by the PNG government as an official ILG. Once the clan has been recognized as an ILG, then the clan may choose to enter into a contractual agreement, such as a standing timber contract or carbon credit agreement with an outside company (see Section 1.14 for more detail on the laws establishing these agreements). For this project, these agreements will be with the project proponent, which transfers the carbon rights to the project proponent for the duration of the crediting period.

The project has received recognition of the Proof of Right and Ownership required to manage and operate the REDD+ project on behalf of the Kamlapar ILG. It has also signed contracts with the other clans and ILG's of the Konoagil Local Level Government of New Ireland and these areas will be added as PAIs in subsequent monitoring periods (See "Approval by New Ireland Provincial Government.doc"). The Kamlapar ILG is the first project activity instance and project ownership has been demonstrated through a standing timber agreement and carbon credit contract between NIHT and the Kamlapar ILG and is included in the recognition of Proof of Right and Ownership by the NI Provincial Government (See supporting documents: "Assignment of Contractual Rights to NI Holdings, Ltd.pdf", "Contract for Sale of Hardwood Timber", "Kamlapar Contract Final", & "Kamlapar ILG Contract for Carbon Credits and Assignment – Executed"). These documents together provide evidence for the contractual arrangement with the owners of the forests that grants all emissions reductions to the project proponent.

See Sections 1.12 and 3.3 for full explanations of the delineation of the designated geographic area, which covers the entirety of the Islands of New Ireland and East New Britain. Control of the project area for each PAI is to be demonstrated within the monitoring report for the monitoring period in which the PAI is added to the project.

1.8 Project Start Date

PDR.6 The project start date.

The project start date is 1 June 2017. This is the date of the publishing of NIHT's new business plan, a plan that marked the solidification of the proponent's commitment to conservation instead of timber harvesting within the initial PAI.

Prior to this start date, the project proponent had been on track for developing an industrial timber project, which was seen as an opportunity for economic growth in the region. On 30 August 2010, NIHT, alongside Topaiyo Holdings (THL), were registered as a forest industry participant with the government of New Ireland ("Forestry Industry Participant License.jpg"), and in November 2014 a timber viability assessment was completed ("Revised Viability Assessment Report 11-12-14.pdf"). NIHT and THL formed a Joint Venture to work on developing the project. After finding that industrial, large-scale timber operations were feasible, a contract between the Joint Venture and the region's 22 clans was signed on September 12, 2015 ("Contract for the Sale of Hardwood Timber"), solidifying the start of a timber project in the project area. In December of 2015, the Development Authority and Minister of Mining of the Papua New Guinea government approved the project ("DDA Board Endorsement for Topaiyo LA"), and the Joint Venture continued to move forward with industrial timber plans. However, the project proponent delayed implementation of logging activities to explore the feasibility of a carbon project after learning more about them.

On 15 May 2017, a meeting between NIHT directors and shareholders resulted in a Corporate Resolution ("Resolution 5.15.17") which shifted the trajectory of the project from a timber project to a carbon project. However, it was not until 1 June 2017 that NIHT published their new business plan ("Business Plan 7.17"), which detailed a change in plans from a destructive industrial timber regimen toward a carbon project which conserves the forest. The later date of 1 June 2017 has been selected as the project start date as it is later and thus more conservative. It also provides additional details on the project activities and the next steps for implementation of a carbon project. Citing biodiversity and conservation priorities, the project proponent ultimately decided that while timber was the best financial option, it would not be the best option for the area, the clans, and the climate. It is at this point that the project proponent began to take a deep dive into a carbon project in this area. During development of this project, they recognized that other agents in the region of New Ireland and East New Britain may also have similar values and decided to develop this project under a grouped project design. This way the project can extend beyond the initial PAI and the area that was originally planned to be logged by NIHT, extending benefits to the greater extent of the region in areas that fulfill the Eligibility Criteria. In October 2018 the board of the Joint Venture unanimously decided to dissolve the Joint Venture and all contracts and agreements were assigned to NI Holdings, the PNG subsidiary of NIHT (see "Kamlapar Contract Final"). THL no longer has any involvement or obligations with regards to the project.

1.9 Project Crediting Period

PDR.7 The project crediting period start date and length.

The project crediting period begins 1 June 2017 and continues until 31 May 2047 for a total 30 year crediting period.

PDR.8 The dates for mandatory baseline re-evaluation after the project start date.

Per the VCS guidelines, a mandatory baseline re-evaluation is to be executed at a minimum of every 10 years after the project start. Therefore, there will be a mandatory baseline re-evaluation on or before 1 June 2027 and on or before 1 June 2037.

PDR.9 A timeline including the first anticipated monitoring period showing when project activities will be implemented.

The first monitoring period extends from the project start date of 1 June 2017 through 31 December 2019. Project measures have already been implemented within the initial Kamlapar ILG. These measures include forest patrols and remote sensing of natural and anthropogenic disturbances within the PAI. These are discussed in more detail in section 5.

PDR.10 A timeline for anticipated subsequent monitoring periods.

The first monitoring period extends from the project start date of 1 June 2017 through 31 December 2019. Project activities have already been implemented within the Kamlapar ILG, the first PAI included in the project. These activities include forest inventories including land use patrols, remote sensing of disturbances, and community engagement focused on education and capacity building. These activities and measures are discussed in more detail in section 5. The project expects to verify every one to two years to incorporate additional project activity instances.

The timeline for subsequent monitoring periods is flexible, but will likely happen annually when an additional PAI is added to the project or every other year if no additional PAI is added in the first year of that respective monitoring period. The project proponent anticipates the addition of a PAI each year, which would result in one year monitoring periods for the entirety of the project lifetime.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Table 1 provides an ex-ante estimate of credit generation across the project lifetime. These numbers use estimates that the project will expand over time to include additional PAIs similar to the initial Kamlapar PAI. These are explained in more detail in Section 4.2.4.

Project Scale	
Project	
Large project	✔

Project Year	Estimated GHG emission reductions or removals (tCO_2e)
1	426,685
2	803,415
3	450,206

4	644,056
5	1,503,714
6	1,481,421
7	1,267,795
8	1,813,231
9	1,825,532
10	1,593,304
11	2,124,432
12	2,075,343
13	1,770,956
14	2,271,778
15	2,212,011
16	1,892,862
17	2,307,810
18	2,261,120
19	1,903,956
20	2,311,463
21	2,266,588
22	1,920,958
23	2,307,707
24	2,266,430
25	1,915,593
26	2,290,987
27	2,255,223
28	1,910,283
29	2,281,550
30	2,734,381
Total estimated ERs	55,090,789

Total number of crediting years	30
Average annual ERs	1,836,360

Table 1: Ex-ante estimate of net emissions reductions

1.11 Description of the Project Activity

The project has identified several factors responsible for deforestation:

- Industrial timber operations, including high-grading and unsustainable extraction.
- Harvest of tropical roundwood for international export.
- Access of secondary agents of deforestation to forested areas and lack of alternative livelihood options

In order to mitigate these factors and achieve solutions that will reduce deforestation, the project has planned the following series of actions:

- Preventing large-scale unsustainable industrial timber harvesting and production. This is undertaken by the project proponent and will reduce the amount of GHG emissions by preventing large amounts of forest degradation.
- Monitoring of the region to identify and prevent further illegal logging. This will reduce the amount of deforestation caused by secondary agents of deforestation, thus reducing the amount of GHG emissions from the project area. NIHT is working with the Kamlapar ILG in the first PAI to ensure the monitoring and reporting of any illegal logging on their land is carried out.
- Providing electricity in region, either through solar, water, or geothermal means directly reduce the demand for logged or harvested firewood. This may also indirectly reduce the supply of wood products by increasing incomes in these areas and providing alternative livelihood options that do not exploit forest resources. NIHT will be supporting the implementation of this project activity with clan guidance and input.
- Increasing access to co-benefits such as education, technology, clean water, and healthcare in the region will aid in expanding opportunities for alternative livelihoods, as well as increase local stakeholder capacity and support of the project which has the potential to indirectly decrease pressure on local forests. The project proponent will assist in building partnerships with relevant institutions and organizations that can support the clans in implementing these activities through sustainable development pathways.
- Supporting clan business ventures and economic opportunity through supporting sustainable business options (coconut oil) and offering gainful employment in project activities that will provide alternative livelihoods that do not result in damage to the forest. The clan committees, specifically the community development and distribution committees, will work together to

support community members in identifying and implementing clan business ventures.

- Implementing safeguards to ensure that every clan member has a say in community decisions, such as creating leadership roles for women and involving women in all decision making processes. Reducing inequalities and building more just and strong institutions in this way has the potential to decrease deforestation risk by increasing stakeholder support of the project.
- Facilitating the formation and meetings of committees within each PAI that will build capacity within the project area. This development of institutional and individual capacity will ensure project benefits are distributed fairly and that alternative livelihood options are available to communities and their members. This will reduce emissions by reducing the need for income from secondary deforestation, and thus reducing the amount of deforestation. The initial PAI has already developed five committees in each clan, consisting of Distribution, Finance, Community Development, Grievance, and Membership, providing valuable outlets for stakeholder input on the project measures and results. Topaiyo Landowners Association (TLA) is a community organization in New Ireland that is working with the clan chiefs to increase channels of communication between NIHT and the clans. TLA supported the clans through the legal process of becoming an ILG and assisted several clans in getting their National ID cards which aids in the equal distribution of funds from the carbon project.

While Papua New Guinea is in the process of developing a jurisdictional REDD+ program, there is currently no jurisdictional REDD+ established in the designated geographic area or the country as a whole. Thus, the project does not need to account for jurisdictional approaches in its design.

1.12 Project Location

PRD.4 A digital (GIS-based) map of the project area with at least the above minimum requirements for delineation of the geographic boundaries.

The project area boundaries are the administrative boundaries of the provinces of New Ireland and East New Britain within PNG. This is a grouped project and PAIs will be added to the PAA as additional areas that fulfil the Eligibility Criteria are added to the project. The first PAI, which includes 10,443 ha of tropical lowland and highland forest, is located in the Konoagil LLG within the Namatanai District of New Ireland in an area controlled by the Kamlapar clan. See Figure 1 in Section 1.4 for boundary delineations of the designated geographic area. Information on the PAI will be included in the initial monitoring report for project verification. The project proponent has agreements in place with all clans across the entirety of the Konoagil and revenue from the project will be distributed equally to all clan members within this area (see Sections 2.1 and 2.2 for more detail). The project plans to expand across the entirety of this area while simultaneously seeking other communities and clans that wish to join the project and are located within areas that would fulfil all Eligibility Criteria.

1.13 Conditions Prior to Project Initiation

The baseline scenario is the same as the existing conditions prior to the project initiation, although logging would have been much more widespread without the implementation of the project. While there has been some logging within the designated geographic area, especially within East New Britain, many areas remain intact or have largely recovered from historical logging. The majority of the designated geographic area is covered in intact tropical rainforests that have high biodiversity.

Though most of this forest remains untouched or sufficiently recovered to be classified as primary forest, the growing market for tropical roundwood timber places a large threat on the areas with the highest biomass. Since these primary forests have significant biodiversity, the benefits of protecting these forests extend beyond carbon storage and sequestration. However, without intervention, logging is a significant threat to these remaining forests. Below is a list of general environmental data on the geographic area of the project, although due to the large size of this area, it is difficult to be specific. For this reason, it will be important for all future PAIs to demonstrate fulfillment of all Eligibility Critieria upon their addition in subsequent monitoring periods. As available, more specific data will be included for PAIs in the monitoring reports.

- Climate: Tropical, with temperatures averaging 27 degrees C, and rainfall around 3000mm yearly. Humidity averages around 80% *(Food and Agriculture Organization, 2011)*
- Hydrology: High mountain ranges and heavy rainfall make water an abundant resource in the geographic project area *(Food and Agriculture Organization, 2011)*.
- Topography: High and steep mountain ranges, with some flat plains, and previous volcanic activity *(The Beck Group, 2014)*.
- Historic conditions: The geographic area has been previously untouched, with some volcanic activity *(The Beck Group, 2014)*. Tropical climate with high temperatures and abundant rainfall *(Food and Agriculture Organization, 2011)*.
- Soils: Predominantly brown forest soils and rendzinas (European Soil Data Centre, 1965)
- Vegetation: Tropical vegetation and hardwood trees, flora with a propensity for high mountain slopes and rendzinas. *(Food and Agriculture Organization, 2011)*
- Ecosystems: Tropical highland forest ecosystems *(Food and Agriculture Organization, 2011)*.

Additional information on conditions with the designated geographic area and initial PAI can be found in the document 'NIHT Timber Plan in Konoagil' and monitoring report. Section 3.4 details the significant threats to the forests within the designated geographic area in the baseline scenario.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

1.14.1 General Compliance Requirements

All PAIs will be compliant with all relevant local, regional, and national laws, and adhere to the following principles as required by Eligibility Criteria #10.

- **Land Rights:** The PAI member will recognize legal and traditional rights of landowners and will make legal contractual agreements with clans and other stakeholders regarding rights to land, timber, and/or carbon. The constitution of PNG affirms the ownership rights of land to the customary owners, i.e. the clans themselves. These rights were strengthened through the *1974 Incorporated Land Groups Act*, which established ILGs and allowed customary landowners to engage in development agreements that will provide benefits in exchange for the resources on the owned land. ILGs have typically been formed as lease programs that allow customary landowners to lease their land to the government of PNG, who in return provides a title that allows the landowners to lease their land to outside organizations *(Babon & Gowae, 2013)*. This arrangement was not initially intended to be used for logging projects, but has become the typical arrangement for between customary landowners, the government of PNG, and outside companies *(The Oakland Institute, 2016)*. The *Land Groups Incorporation Act 2009* and the *Land Registration Act 2009* expanded upon the *1974 Incorporated Land Groups Act* by providing procedures to identify all members of an area and allowing only parts of customary lands to be included in these agreements *(Babon & Gowae, 2013)*.

  The 1991 Forestry Act affirmed that these customary landowners own the forest resources, although there is no specific mention of carbon rights *(Babon & Gowae, 2013)*. The project has addressed this in initial project areas by receiving confirmation from the government that the clans have ownership rights over the project areas on which emissions reductions are occurring and that the project proponent has Proof of Right to manage and operate the project on behalf of the clans (see "Approval by New Ireland Provincial Government").

- **Safety and Workers' Rights:** The PAI member, its management, and all employees will operate under Papua New Guinea's Employment Act of 1978, and if in doubt, always refer to United States employment and workers' rights law.

- **Anti-Corruption:** The PAI member will be subject to the provisions of the US Foreign Corrupt Practices Act of 1977 or a similarly robust law if the PAI member is not subject to US law. The member will be required to adopt anti-corruption and anti-bribery policies if these policies do not already exist. The member will maintain free, prior, and informed consent (FPIC) with all relevant stakeholders and will not distribute funds in order to reach agreements with stakeholders prior to project implementation. These commitments are outlined in the document "NIHT Inc Global Anti Corruption Policy".

1.14.2 Compliance within Initial Project Activity Instance

- **Land Rights:** The clans have, of their own accord, entered themselves into Incorporated Landowners Groups (ILGs) and are in control of the rights to their timber. Please see "Topaiyo Legal Opinion Letter – Asa" for more information on contract legality, "Kamlapar Contract Final" for the New Ireland government's official approval of the clan's appeal to become an ILG, and "Approval by New Ireland Provincial Government" for government granted rights to project proponent for the management of the project.

- **Safety and Workers' Rights:** NIHT has committed to operating under Papua New Guinea's Employment Act of 1978 and is subject to US employment and workers' rights laws.
- **Anti-Corruption:** NIHT and its subsidiary (NI Holdings, LTD) are subject to the provisions of the US Foreign Corrupt Practices Act (USFCPA) of 1977 as amended, preventing and prohibiting the bribery of non-US government officials. The project proponent also lists extensive anti-corruption and anti-bribery policy in its policy documents. Bribery by US companies and their subsidiaries are also covered by USFCPA. Regarding bribery and corruption in the project proponent's relations with the clans and ILG's, NIHT has paid no funds to any of the clans either for the formation of ILGs or as an advance of any future earnings and will require any additional PAIs to sign a similar agreement. NIHT maintains the usage of free prior informed consent (FPIC). Alongside project proponent anti-corruption measures (see "NIHT Inc Global Anti Corruption Policy"), the project has formed 5 committees in each clan (see section 2.2) which decentralize decision-making and increase accountability within clan and ILG partners.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project is not currently seeking registration nor has ever been registered under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project is not involved in any other emissions trading program, and no activities that reduce GHG emissions are involved in any other emissions trading programs. VCS is the only program with which the project will be involved or trade emissions credits.

1.16.2 Other Forms of Environmental Credit

The project has neither sought nor received any other form of GHG-related environmental credit.

1.17 Additional Information Relevant to the Project

1.17.1 Leakage Management

Both activity-shifting and market leakage will be managed by delineating and monitoring leakage areas when and where necessary. The necessity of these leakage areas will depend on the primary and

secondary agents included in the project and their logging activities and mobility within PNG. Section 4.3 discusses these two types of leakage in more detail, including when these leakage areas are necessary and how their boundaries will be delineated. At validation, the initial PAI will not require either monitoring of activity-shifting or market leakage areas (see initial monitoring report).

1.17.2 Commercially Sensitive Information

The project has not excluded any commercially sensitive information from the project description.

1.17.3 Sustainable Development

In 2010, Papua New Guinea began executing the Vision 2050 plan developed by the National Executive Council (NEC) of PNG which focuses on the following seven pillars:

- Human Capital Development, Gender, Youth and People Empowerment
- Wealth Creation
- Institutional Development and Service Delivery
- Security and International Relations
- Environmental Sustainability and Climate Change
- Spiritual, Cultural, and Community Development
- Strategic Planning, Integration and Control

In 2015, Papua New Guinea adopted the 2030 Agenda for Sustainable Development at the United Nations Sustainable Development Summit to support the achievement of Vision 2050. The aims to contribute to the following SDGs and Vision 2050 initiatives:

SDG 1: End poverty in all its forms

The project will offer an alternate source of income to communities in the project area. The project plans to offer communities 56% of the profits of the project ("Kamlapar Contract Final"), which will go directly to clan members. Communities in the area live below the poverty line, and the financial resources that carbon credits will provide to them more resources for the purchasing of food, health services, and other benefits to help alleviate the impact of poverty. This contributes to the Vision 2050 goal of Wealth Creation as well as Human Capital Development by creating more sustainable sources of income, reducing poverty levels, and supporting clan member entrepreneurial ventures.

SDG 3: Ensure healthy lives and promote well-being for all at all ages

The project plans to increase opportunities for healthcare in the project region, specifically in regards to women's healthcare based on the needs expressed by community members themselves. The project plans to provide access to mammogram machines and support access to doctors with training in women's health. This project activity contributes to PNG Vision 2050 goals of Human Development,

Gender, Youth and People Empowerment by increasing access to healthcare in general and more specifically ensuring access to women's healthcare, which was a primary concern of clan members.

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

The project plans to work towards more opportunity for education in communities, specifically by allowing access to online schools, boarding schools, and WiFi access. The project proponent aims to be working towards their goal of 100% literacy for individuals 12 years old and over in the project area within the first 3 to 5 years of the project. This project activity contributes to PNG Vision 2050 goals of Human Development, Gender, Youth and People Empowerment which aims to achieve free and universal basic education for all school-age children from Elementary to Grade 12 and 100% literacy for the adult population over 15 years of age.

SDG 5: Achieve gender equality and empower all women and girls

The project plans to implement activities to improve access to women's healthcare, as well as addressing women's issues through providing access to opportunities in clan and project leadership. The project will ensure women have roles in committees and project activities and can exercise decision-making power outside of day-to-day clan activities. This project activity will help reach the PNG Vision 2050 milestone of creating a political system that actively promotes gender equality, democracy, accountability, and transparency.

SDG 6: Ensure availability and sustainable management of water and sanitation for all

The project proponent plans to explore options for improved water quality and clean water access in communities. This will be done in conjunction with communities, taking into account each clan's individual needs and their input on what systems may work best. By supporting the development of critical infrastructure required to increase access to clean water in the project area, this project activity helps achieve the PNG Vision 2050 goal of Institutional Development and Service Delivery.

SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all

The project plans to work toward increasing community access to alternative energy solutions. Currently, most clans do not have access to electricity, so the project has begun to explore opportunities in water, solar, geothermal, or even natural gas electrification. By supporting the development of critical infrastructure required to increase access to electricity in the project area, this project activity helps achieve the PNG Vision 2050 goal of Institutional Development and Service Delivery.

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Community members will be given opportunities for jobs and employment related to project monitoring and implementation. While the project only currently has one in-country employee, the project proponents plan to hire more, which opens up a significant amount of employment opportunities to

people in the project area and contributes to the goal of gainful employment and economic growth within the region. This project activity contributes to the PNG Vision 2050 goal of Human Capital Development by creating employment and skills development in the project area.

SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

The project plans to implement activities to establish regional wifi and cell service in the area. The project will develop partnerships with organizations like Google to help provide computers, cell phones, and other technologies the communities will need to promote innovation, improve infrastructure, and global connectivity. This project activity contributes to the PNG Vision 2050 goal of Human Capital Development, gender, youth and people empowerment by promoting and establishing the use of information and communications technology for sustainable education and public health.

SDG 10: Reduce inequality within and among countries

The project plans to reduce inequality in the area and amongst clans and clan members by ensuring fair distribution of benefits from carbon credit. To do this, the project has begun collecting census and birth data, which will further increase access to resources from government that require diligent record keeping. The focus on women's healthcare and women's rights in clan leadership and project activities, as well as the development of banks and increased access to resources by the marginalized will work toward the project's goal of decreasing overall regional inequalities. This project activity helps achieve the PNG Vision 2050 objective of building a peaceful and harmonious society as well as to prosper and empower the people of PNG by ensuring equal distribution of earnings from the sale of carbon credits between all people in the project area.

SDG 13: Take urgent action to combat climate change and its impacts

By eliminating industrial timber harvesting in the project area and the subsequent deforestation from secondary drivers, the project is reducing the emissions of greenhouse gases into the atmosphere by nearly 55 million tCO_2e across the 30 year project lifetime. By keeping this carbon out of the atmosphere and increasing Papua New Guinea's carbon storage, the project is an active participant in the climate action goal and the PNG Vision 2050 goal of reducing GHG emissions by 90% to 1990 levels.

SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Papua New Guinea is home to some 5% of the world's biodiversity, and its rainforests are havens to massive varieties of flora and fauna. Industrial timber operations and forest conversion destroy key habitat for many species, and further threatens already endangered species. By avoiding deforestation and timber activity, the project is conserving this key habitat and actively offering protection to the region's life on land, as well as aiding in achieving the PNG Vision 2050 goal of conserving biodiversity at the current 5 to 7 percent of the world's biodiversity.

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

In developing a benefit distribution mechanism and ensuring that benefits will be shared evenly among community members, NIHT has taken an active role in gathering census data. Census and population data is extremely limited in these communities, and access to birth registration and other services specified under SDG 16 are important goals for the project, as the project wishes to achieve fair benefit distribution and promote the growth of strong institutions in the project area. This project activity helps achieve the PNG Vision 2050 objective of building a peaceful and harmonious society as well as to prosper and empower the people of PNG by ensuring equal distribution of earnings from the sale of carbon credits between all people in the project area.

SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development

The project proponent plans to make partnerships not only with communities in the area but also with larger bodies and organizations that will aid the sustainable development within the project area. The project plans to partner with Google and other companies with important technology access in order to bring cell phones, Wi-Fi, and technology to the project area. This project activity helps achieve the PNG Vision 2050 goal of establishing public-private and community partnerships to achieve Human Development, Gender, Youth and People Empowerment.

1.17.4 Further Information

In the absence of the project activity instance, commercial logging would proceed as a harvest block where all legally harvestable trees of merchantable quality are eligible for removal subject to operability constraints.

2 SAFEGUARDS

2.1 No Net Harm

The project does not expect any negative environmental impacts. Because the project activity prevents industrial logging and immigration by secondary agents as a result of greater accessibility within the region, the project will have positive outcomes for both climate change mitigation (through carbon storage and sequestration) as well as biodiversity impacts (through the preservation of key habitats). Preservation of the forest in the project area will not only improve forest health but will also preserve many of the endemic and endangered flora and fauna of the species-rich region.

The project proponent also does not expect any negative socio-economic impacts. Community-focused project activities are aimed at increasing economic growth in the area while keeping a specific focus on improving the lives of the marginalized (as shown in project activity toward women's rights and reduction of inequalities). While published information about the economy in the project area is limited,

local stakeholders have shared that the average person in Konoagil earns less than 70 USD/year (200 kina) and employment in rural areas is nearly non-existent, with the exception of some individuals working on their farms. The logging that has historically taken place has not provided income to all clan members but rather to a select few. This project is unique because it ensures equal distribution of funds, transparency and conservation of ecosystem services, including provisioning, regulating, cultural, and supporting services. From the start, the project proponent has built a relationship with the clans based on each clan's right to self-determination. Clan leadership voted that every man, woman, and child should receive their fair share of the distribution of funds and this is written into the design of the benefit distribution mechanism. Therefore, the design of this project, as outlined in the Carbon Credit Contract, provides safeguards for every individual that participates in the distribution of funds. In addition, each clan that joins the project must have the following 5 committees to help manage the distribution and project implementation:

- Membership Committee: ensures that each person is identified and verified as a clan member.
- Distribution Committee: Manages distribution of each member's fair share and assists in identifying projects that empower all clan members.
- Finance Committee: Manages and monitors the spending of the distribution on clan-based projects.
- Community Development Committee: Works closely with the Distribution Committee to recommend projects that benefit all clan members and monitors the effect of the funding on clan members.
- Grievance Committee: Ensures that all issues and comments from clan members are shared with the project proponent and in a public forum.

The project has developed a robust grievance structure should community members have complaints or comments (see section 2.5), which will help insure community satisfaction with the project and mitigate any unforeseen negative impacts. Community input is highly valued in the project, as can be seen in community meetings and opportunities for community members to express opinions about the project and its benefits (see section 2.2).

2.2 Local Stakeholder Consultation

Since project inception, stakeholder input has been a major goal of the project proponent. Stakeholder meeting and consultation began before the official project start date and these consultations continue. The result has been overwhelming support for the project. As additional PAIs are added to the project, primary agents of deforestation are expected to work with the project proponent to ensure that similar processes that were completed in initial PAIs will be followed in all additional PAIs. These processes as applied to the initial PAI are detailed below.

Meetings with stakeholders and communities in the first PAI, the Konoagil region in which NIHT originally intended to implement a timber project, began in September 2015. These meetings have

continued sporadically, with the most recent meetings being held in September 2019. More detail on these meetings will be included in the initial monitoring report, and subsequent monitoring reports will include information on continued meetings as well as initial meetings in PAIs added to the project.

Consultation with stakeholders was in large part organized through the clan leadership, who along with clan committee members would announce dates and information on these meetings to members of their clans. Meeting types included individual clan meetings, clan meetings with clan leaders, meetings with remote villages conducted by timber cruise teams (February 2019 – April 2020), open attendance meetings, and clan committee meetings. Larger meetings are often held in venues that can hold more than 300 people; for example, the Kulau Lodge, Rabaul, the Sacred Heart Cathedral Kokopo meeting rooms, and the Kokopo Beach Bungalows. A clan meeting with clan leaders in September 2019 had an expected attendance of 80 leaders, but well over 300 leaders attended. In addition, numerous open attendance meetings were held where any clan member could come speak with NIHT management about the project. Meetings were documented with a designated note taker writing meeting minutes and taking photos of the meeting.

There are multiple mechanisms for on-going communication with local stakeholders. The project proponent has travelled to the project area at least 4 times a year since 2015 and also had a local team stationed in the project area full time from September of 2019 through April of 2020, until the local team was required to leave the project area due to the novel coronavirus COVID-19 outbreak. Open lines of communication were maintained through the sharing of email addresses and phone numbers of both the project proponent's local team and the project proponent, and conference calls have been held a minimum of 3 times a week. To ensure access to information, the PDD summary has been translated into Tok Pisin (Pidgen) and has been printed over 100 times, with copies distributed throughout the PAI with existing networks within the clan. The mechanism for disseminating important project information and updates to the clans begins by the project proponent contacting clan leadership and committees which then share the information with clan members.

Local stakeholders have had and will continue to have input on the project plan by providing them opportunities to provide input and feedback, which have been used to make adjustments to the project. The following are examples of local clan members having direct input on the design of the benefit distribution mechanism:

- Equal distribution of benefits by person instead of by amount of land owned by each clan
- Setting aside children's shares into a trust to be held until they turn 18
- Holding 10% of total distribution in a fund in case individuals are missed in the initial process
- The use of proceeds to be used for clan projects.

The feedback on these issues prompted further discussion and joint decision making with the clans.

The PDD Summary was translated into the native language and issued in combination with the comment sheets to all the various stakeholders in order to address any questions and comments they have regarding project design or implementation, and open lines of communication are being kept

through email, phone numbers, and the project proponent's offices in Kokopo. Further developments in project design, implementation, or monitoring will be communicated through meetings with the clan leadership, committee chairs, and events open to the public.

Risks, costs, and benefits that the project may bring to local stakeholders have been identified and communicated to the local stakeholders, and consultation with local stakeholders regarding these effects is on-going. The project area is in a region with an average annual salary of less than $100 USD per year and a GDP for the region in the $100,000 USD or less range. The project represents the potential initiation of an annual input of capital of over $2,000,000 USD. There is a risk that without oversight individual clan leadership may not use the funds for projects as recommended by the Distribution Committee. This risk is a concern that stakeholders brought up during stakeholder consultation meetings and mitigation efforts are discussed in section 2.5. An additional risk may be the financial loss from not participating in a timber project. The possibility of financial loss is being mitigated by the income from the carbon project, as well as the additional project benefits outlined below. The only identified cost of the project to the local clans and their members is the costs associated with receiving official recognition as Incorporated Landowner Groups (ILGs). These costs are minimal in comparison to project benefits.

The project offers numerous benefits, including empowerment, economic relief, and self-determination. The project will stop illegal logging, preserve the natural habitat, and preserve all of the endemic species. Additionally each clan member receives their equal share of 56% of the net revenue derived from the sale of the carbon credits, plus each clan is considered a partner and is treated as an equal in the process of developing the carbon credits. Many of these details have been determined from consultation with local stakeholders, and this communication will continue as discussed above in this section.

In terms of protections to stakeholders through workers' rights, Papua New Guinea maintains very little legislation or regulations. Due to a lack of laws, the project proponent has reverted to United States' labor law to ensure fair pay and treatment of all workers involved in the project, though currently only one individual works in-country. Other employees have worked as consultants for the project proponent rather than as employees. The project proponent plans to hire more in-country employees as the project progresses, in which case Papua New Guinea's Employment Act of 1978 will be referenced *(Independent State of Papua New Guinea, 1978)*. These rights will be clearly communicated to all hires. Future PAIs will be required to have similar commitments, as required by Eligibility Criteria #10 in section 1.4.1.

All updates regarding the validation and verification of the project, including the verifier's site visit, will be communicated to local stakeholders using the methods discussed above in this section.

2.3 Environmental Impact

The project does not expect any negative environmental impacts, as the main project activity is the avoidance of conversion due to industrial timber and immigration of secondary agents as a result of increased accessibility (see sections 2.1 and 3.4).

2.4 Public Comments

The project will distribute copies of the project description and other main project documents (including a local language project summary) to communities in the initial PAI for public comment. All public comments will be addressed by the project proponent after the public comment period to ensure community satisfaction. Presently, the project has taken a clan-based approach to public comments for the first instances. All complaints, ideas, and requests have been presented to the chief of each clan, who makes the ultimate decision and manages results regarding comments. Alongside chief support, public meetings have all been opened to a question and answer period, where clan members are able to voice questions and concerns to be answered directly by the project proponent. The project proponent will continue to assist clans with comments about the project, and will work towards helping clans establish their own individual grievance committees to handle project complaints. Additional PAIs will implement similar processes that will be adaptive to the governance and institutions of the relevant communities and stakeholders.

Public comments from each of the clans that have entered the Carbon Credit Agreement went through the public comment process described above from May 1, 2020 to May 31, 2020 and have been provided to Verra. The comments were overwhelmingly positive and forward looking, as many clan members are looking forward to seeing the project come to fruition. One comment noted a discrepancy in the project lifetime crediting figures in the Tok Pisin and English versions of the PD and MR summaries. The reason for the discrepancy has been identified and corrected versions will be distributed once all documentation is updated. There were no comments suggesting changes to the project design. However, any future clan comments and concerns regarding the project design will be addressed through the grievance process outlined in section 2.5. The grievance process is designed to ensure clan influence in project design and enable adaptive management throughout the project lifetime.

The project proponent has resolved many of the received comments and questions through PD updates made as part of the validation process. However, various stakeholders raised questions about the project boundaries and one commenter asked about resolving land disputes between clans, as disputes over clan boundaries are possible due to lack of legal recognition from the government. Section 1.12 has been updated to clarify the agreements in place with all clans within Konoagil as well as plans to expand in other areas of the designated geographic area that fulfil all Eligibility Criteria. This design mitigates the risk of land disputes that are due to the project by not distributing benefits based on the total area controlled or owned by each clan, but instead distributing benefits evenly between members of participating clans, which will have to first receive official recognition as an ILG. Additionally, the Climate Change Development Authority (CCDA) of PNG has continually supported the work of the project proponent and has endorsed the project in meetings with the projects proponent and with auditors as part of the validation process.

As described in Sections 2.2 and 2.5, the process reaching these agreements between the project proponent and clans within Konoagil followed FPIC principles. All these clans selected members to participate in meetings with the project proponent and have all signed agreements agreeing to

participate in the project. As census data in the area is limited, it is indeed challenging to identify every clan member to ensure they are able to participate in the project and share in the benefits. However, Section 2.5 already addresses this problem and identifies this as a primary responsibility of Membership Committees formed by each clan. The project proponent has recognized the importance of allowing clans to maintain ownership of their land and the challenge of ensuring that all project participants are properly informed of project activities. The project design and implementation activities have addressed these issues.

2.5 AFOLU-Specific Safeguards

The project proponent is working with the membership committees of all the clans to create a process whereby every child, woman, and man in the project area is counted and registered. Each membership list must be approved, validated, and signed by both the clan chief and the ILG chairperson. To date, this process has identified over 42,000 stakeholders.

Recent and accurate census data in the designated geographic area is limited to population numbers at the provincial level, so the project proponent has been working to quantify realistic numbers of community members impacted. The project proponent has gathered as much birth and population data as possible during clan meetings in the initial PAI as well as areas the project is likely to expand. NIHT continues to gather information that will be used both to assess number of people impacted and fair benefit distribution.

The biggest concern expressed by communities in initial meetings has been mitigating the risk of the misappropriation of funds allocated to a community account. The following safeguards have been implemented to ensure transparency of use of funds and deter misappropriation of funds. The project proponent is working with the distribution and finance committees and the clan's accountants to track use of funds, as well as working with the community committees to assist clan members with budgeting and use of proceeds plans to ensure all funding is properly managed and applied. The project proponent has set up a monitoring and auditing process for every clan whereby a NIHT team can monitor the project accounts in real time using the planned community centers. The community centers, once implemented, will provide free access to internet and reserve computers for the finance committees of each clan. Each clan will maintain QuickBooks accounts that the NIHT accounting team will be able to audit daily. In addition, the project proponent has worked extensively to mitigate this issue through numerous meetings and training sessions in the initial project area, and future PAIs will implement similar processes. These processes should ensure transparency through monitoring and auditing completed by the project proponent or a trained project partner. This will ensure accountability within all communities so that they trust the project proponent.

All project partners and participating communities will be required to set up safeguards against the misappropriation of funds. Representatives of the primary agent or project proponent will have to demonstrate in the initial monitoring report how they are engaging with all communities and following FPIC principles in these meetings. Distribution of payments will be maintained in a database the project proponent can audit daily.

Property rights are one of the basic cornerstones of the project plan. The Incorporated Landowner Groups (ILGs) maintain their ownership of the land and the land will never be hypothecated or assigned. If an ILG is not the governing structure of a PAI, similar agreements must be made maintaining local community ownership. The standing timber, the asset being utilized for this program, is protected in this way and owned by the ILGs or communities themselves. NIHT's contracts only address the timber/carbon rights necessary for a carbon credit project, and NIHT has no right to the land or any other asset that the ILGs or the clans own. To ensure the autonomy of ILGs and communities, the project proponent will ensure clear communication of project updates and information through clan leadership and local committees. For more information on the communication and meeting process, please see section 2.2.

Each clan working with the project proponent has a grievance committee, which has been developing a Standard Operating Procedure (SOP) for resolving any conflicts or grievances that may arise between the project proponent and local stakeholders. Each grievance process SOP must be in place prior to the first distribution. The plan must be in writing and cover all aspects of the business: carbon credits, distribution of funds, and clan membership. The following are the minimum requirements:

1. Develop a written Standard Operating Procedure (SOP) for the committee based on this basic outline.
2. Present the SOP in writing to the clan and have them approved by the head of the clan, and the chiefs, and the clan members.
3. Establish days and hours of operation to present disputes. There must be designated individuals that handle disputes on behalf of the clans.
4. Publish the process of the rules and procedures for submitting a grievance, with a reasonable time for response by the clan.
5. Individuals would submit their grievance to the clan. If necessary, then the clan will submit the grievance to TLA. If necessary, TLA will submit the grievances to NIHT, although NIHT will maintain an open-door policy for grievances and will assist individuals with submitting grievances in accordance with the established clan grievance policies.
6. All grievances must be addressed within 2 weeks with a written response to the individual/entity regarding the grievance and the resolution. The individual who submitted the signed grievance must be given the results.
7. If the individual is still dissatisfied, then the grievance will continue to the next level of the clan grievance procedure until it is before NIHT.
8. If the individual is still dissatisfied, then a grievance committee will be formed with 1 person from the clan, 2 people from TLA, 1 person from NIHT and 8 other individuals from the community to determine a resolution. If the grieved individual is still unhappy after the vote of this grievance committee, then they will have to seek satisfaction in the courts. This grievance committee will schedule meetings with at least 2 weeks-notice.
9. Establish how are the committee's general rules are approved, when they can be changed and who can change them. Establish how a rule change is accepted by the clan. Establish who has the right to challenge rules and how the challenge process takes place.

10. Work with various other clans' committees to ensure that there is a general consistency in procedures and policies as much as is practical.
11. All proposed changes to the rules and procedures must have a public comment process of a minimum of 30 days.
12. All changes must have the signed approval at a minimum of: the head of the clan and the chief of the clan if no other approval procedure is established.
13. NIHT must be notified in writing of all changes to the procedures or the rules; and all changes must have a 15-day window after notification before implementation to provide an opportunity for comments and suggestions.
14. The rules/procedures of the committee, along with any subsequent changes or amendments, must be available for audit by all clan members, and also maintained on the cloud-based app so that NIHT can view and monitor transparently.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The project is using methodology VM0009, the Methodology for Avoided Ecosystem Conversion v3.0. Additionally, the project has used the VCS Tool for the Demonstration of Additionality in VCS AFOLU Project Activities (VT0001) version 3.0 to assess the additionality of the project and to select the most likely baseline scenario.

3.2 Applicability of Methodology

The applicability of the methodology is demonstrated in Section 1.3, where each applicability condition is discussed in relation to the project.

PDR.3 Definition of forest used by the project proponent and its source.

The project proponent has selected a conservative definition of forest as an area that met the threshold of canopy cover for at least 10 years prior to the project start date. The canopy cover threshold for forest remains a contentious issue globally, and values as low as 10% are cited by the Forestry Department and Government of PNG in their submission for PNG's National REDD+ Forest Reference Level *(Forestry Department, 2000; Government of Papua New Guinea, 2017)*. However, a more conservative value of 30% has been selected using the upper threshold of guidelines from the UNFCCC, which defined forest as "an area of land 0.05–1 hectare in size, of which more than 10–30% is covered by tree canopy" *(UNFCCC, 2002)*. This is conservative, as it reduces the forest area that may be deforested in the baseline scenario, reducing baseline emissions. This definition of forest is used in all analyses that only include forested areas.

3.3 Project Boundary

PDR.11 A list of the greenhouse gases considered.

Gas	Sources	Inclusion	Justification
CO_2	Flux in carbon pools	Yes	Major pool considered in the project scenario
CH_4 (methane)	Burning of biomass	No	Conservatively excluded as burning will not be a part of project activities
CH_4	Livestock	No	Emissions from grazing are not included because livestock are not a credited technology or measure
N_2O	Burning of biomass	No	Conservatively excluded as burning will not be a part of project activities
N_2O	Livestock	No	Excluded on the basis of applicability condition 14
N_2O	Synthetic fertilizer	No	Excluded as synthetic fertilizer will not be a part of project activities

Table 2: Included GHG sources (adapted from Table 2a in the VM0009 Methodology v3)

PDR.12 A list of the selected carbon pools and evidence for the conservative exclusion of any optional pools.

Included and excluded pools as well at their justification are listed in Table 3. More information on how carbon stocks in included pools were calculated can be found in section 3.4.

Pool	Required	Inclusion	Justification
Above-ground Merchantable Tree (AGMT)	Yes, if baseline scenario or project activity include the harvest of long-lived wood products.	Yes	Major pool considered when accounting for emissions from long-lived wood products. Timber harvesting is a primary driver of deforestation in the baseline scenario and may be included as a project activity at a later date.

Above-ground Other Tree (AGOT)	Yes	Yes	Major pool considered.
Above-ground Non-Tree (AGNT)	Yes, if the baseline scenario includes perennial tree crops. Otherwise, accounting for this carbon pool is optional.	No	As perennial tree crops are not part of the baseline scenario, this pool has been conservatively excluded.
Below-ground Merchantable Tree (BGMT)	Optional	Yes	This pool is included as it is a major carbon pool in merchantable trees.
Below-ground Other Tree (BGOT)	Optional	Yes	This pool is included as it is a major carbon pool in non-merchantable trees.
Below-ground Non-Tree (BGNT)	Optional	No	This pool is conservatively excluded.
Litter (LTR)	No	No	This pool is always conservatively excluded per methodology requirements.
Deadwood (DW)	Yes, if AGMT is selected.	Yes	The proportion slash is calculated from the AGMT pool.
Standing Deadwood (SD)	Optional	No	This pool is conservatively excluded.
Lying Deadwood (LD)	Optional	No	This pool is conservatively excluded.
Soil Organic Carbon (SOC)	Optional	Maybe	This pool is conservatively excluded from the intial PAI and ex-ante crediting estimates, but may be added in future monitoring periods.
Long-lived Wood Products (WP)	Yes, if AGMT is selected.	Yes	This pool is calculated from the AGMT pool.

Table 3: Required and optional carbon pools for forest project accounting areas and justifications (adapted from Table 2b in the VM0009 Methodology v3)

PDR.13 The definition and evidence to support the definition of a merchantable tree if the baseline or project activities include logging.

Trees are categorized as merchantable or non-merchantable based on the guidelines provided in the 'PNG Logging Code of Practice 2014' *(PNG Forest Authority, 2014)*. These guidelines prescribe a simple definition of merchantability and state, "Harvesting will be restricted to the selective logging of

merchantable trees greater than 50 cm in diameter at breast height, or directly above fluting, excluding trees in Exclusion Zones." The inventory workbook 'NIHT Treelist' follows these guidelines by classifying all trees with a DBH greater than 50 cm as merchantable and all trees with a DBH fewer than 50 cm as non-merchantable. Exclusion Zones are accounted for geospatially by stratifying PAAs based on whether or not the area is within an Exclusion Zone. As new PAIs are added to the project they will be similarly stratified.

PDR.22 A digital (GIS-based) map of the project accounting areas, including aerial or satellite imagery showing that they are comprised of forest or native grassland as of the project start date and 10 years prior to the project start date.

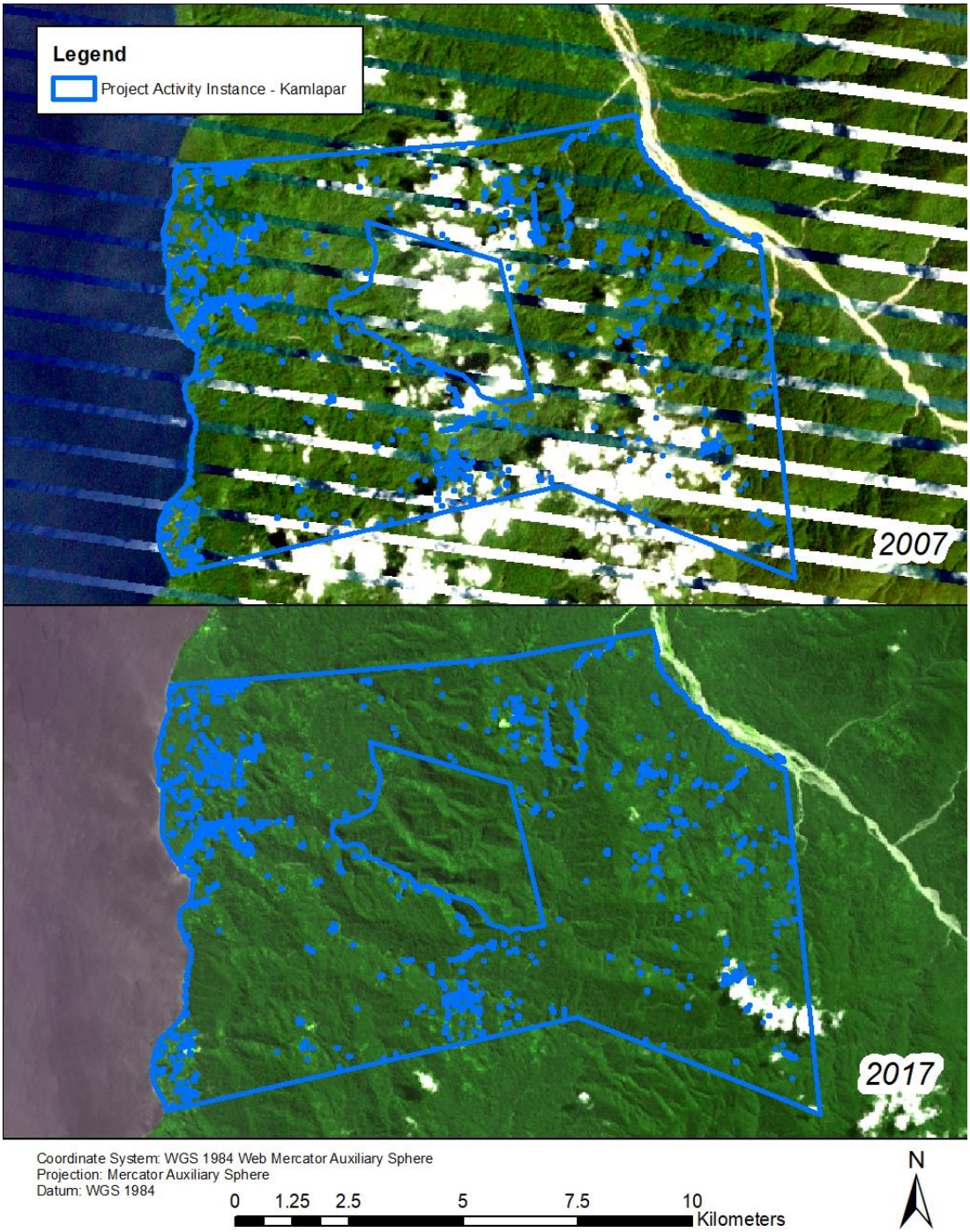


Figure 3. Landsat imagery of the current project accounting area at project start and 10 years prior. The bottom image was taken in May 5th, 2017 and the top image is a composite of images taken on October 24th, 2007 and December 11th, 2007 (artifacts are due to issues with the Landsat 7 sensor).

PDR.35 A map of the delineated boundaries.

The designated geographic area for this project is the administrative boundaries of the islands of New Ireland and East New Britain (Figure 1 in Section 1.12).

3.4 Baseline Scenario

As an F-P1.b project, the baseline scenario is commercial logging of the project area by the primary agent of deforestation followed by a cascade of deforestation driven by the secondary agent of deforestation.

PDR.17 Show that the identified baseline type is the most plausible baseline scenario.

Per Eligibility Criteria #1, all PAIs will be required to demonstrate they were designated for industrial logging prior to joining the project, making this the most plausible baseline scenario. Section 3.4 provides justification for the baseline type being the most plausible and that the project is additional.

PDR.18 A list of agents and drivers of deforestation, including quantitative descriptions of agent mobilities.

PDR.19 A narrative describing the agents and drivers of conversion.

PDR. 20 Descriptions of agents and drivers including any useful statistics and their resources.

Conversion Type	Conversion Agent	Conversion Driver
Primary	Commercial logging operator: NIHT, Incorporated	Commercial logging that harvests and exports all merchantable timber within project area resulting in significant degradation of the project area.
Secondary	Communities and local villages within or neighboring project area	Conversion to non-forest land uses of areas now accessible by the secondary agent due to the activities of the primary agent. Many of these areas would likely be converted for agricultural purposes.

Table 4. Types of agents and drivers of deforestation within the project area in the baseline scenario.

There are two types of agents and drivers of deforestation within the project area in the baseline scenario (Table 4). The first is the primary agent of deforestation, which is the company that owns the rights to implement commercial logging within the project area. In this case, the primary agent of deforestation in the baseline scenario is any industrial logger that has the rights to implement an industrial timber project within the designated geographic area. Primary agents have the mobility to reach any accessible point within an area due to their construction of roads, allowing access to previously inaccessible areas.

In the case of the initial PAI, this primary agent is the project proponent NIHT, Incorporated, which owns the rights to legally harvest within this PAI but has decided to instead implement project activities as part of this carbon project. Following the legal requirements of timber harvesting within PNG, they would harvest every merchantable tree within harvest blocks that within the designated geographic area. This timber would then be exported as roundwood. The NIHT Timber Plan in Konoagil and initial monitoring report provide further detail on how this logging would have been completed in the initial PAI and other areas they are legally allowed to harvest.

The activities of the primary agent, such as the removal of the large merchantable trees and the construction of logging roads, would provide access to areas that were previously inaccessible to the secondary agents. This access would occur after the primary agent had completed operating within a harvest block and was no longer patrolling an area to protect from encroachment. This would result in cascading deforestation as these secondary agents would immigrate to and convert previously forested areas to non-forest, typically for agriculture. A study completed within PNG found that following the departure of primary agents, deforestation is common due to activities by secondary agents *(Shearman, et al., 2008)*. Much of this conversion would likely be subsistence agriculture, the most prevalent agriculture within PNG. However, some cash crops would also be likely developed within the region, taking advantage of the newly accessible markets both domestically and internationally as a result of the infrastructure constructed as part of the timber operation. Oil palm and coconut are some of the more likely cash crops in this region as both cash crops have been grown on the islands of New Ireland and East New Britain, with extensive agriculture continuing to expand on East New Britain. Finally, some secondary illegal logging would likely occur. The rate of this conversion will be determined by the historical analysis of conversion within the reference area (Section 4.1). Mobility of secondary agents is typically limited to distances that can either be travelled by foot (approximately 5 km) or other simple transportation such as pack animals (approximately 25 km).

PDR.21 A list of external drivers (covariates) of conversion used in the model, if any, that may be identified as part of the PRA, expert knowledge or literature (eg. Median household income, road density, rainfall).

External drivers and covariates were conservatively excluded from the baseline model.

PDR. 23 Justify the project accounting areas using the identified agents and drivers of conversion, constraints to conversion, and attributes listed above in section 6.2.

Additional PAIs will be limited to areas within the designated geographic area that fulfil the Eligibility Criteria. Inaccessible areas due to steep slopes will be excluded from the PAA and will be identified using a combination of local knowledge and digital elevation models analysed within a GIS and in alignment with Eligibility Criteria #8. As new PAIs are added to the project, all of their inaccessible areas will be identified and removed from the PAA. The PAA will then be further stratified into harvestable and non-harvestable areas using Exclusion Zone criteria in the PNG Logging Code of Practice 2014. These include slope, stream management zones, and areas located near communities.

The primary agent of conversion is constrained to only the harvestable areas of the PAA. This conservatively assumes that commercial logging agents will only work within legally harvestable areas, extracting all merchantable trees within a harvest block.

The secondary agent is not confined to only harvestable areas since the activities of the primary agent provide access to the entire PAA. While it is possible that the secondary agents would prioritize conversion activities in non-harvestable areas, there is nothing to legally prevent them from converting these areas following the departure of the primary agent.

PDR.26 If Types F-P1.a, F-P1.b or F-P2 are selected, justification for meeting the definition of APD in the current VCS-approved AFOLU requirements.

The VCS Standard v4.0 has been updated and now includes the category 'Avoided Planned Deforestation and/or Degradation (APDD). These projects involve 'activities that reduce net GHG emissions by stopping or reducing deforestation or degradation on forest lands that are legally authorized and documented for conversion'. As per the Eligibility Criteria, all PAIs will be constrained to forested areas on which logging is planned and legally authorized, i.e. planned degradation. The cascading deforestation as a result of actions by the secondary agents will result in unplanned deforestation.

PDR.27 If Type F-P1.a or F-P1.b is selected, evidence of legally sanctioned commercial harvest in the baseline scenario.

As PAIs are added to the project, it will be necessary to provide evidence that in the baseline scenario the primary agent would have developed infrastructure within the PAA that would have led to access that could result in deforestation. Per Section 6.3.1 of the VM0009 Methodology v3.0, this evidence can include demonstrating that the primary agent has intent to construct the roads or that this infrastructure is common practice in the region and the primary agent has sufficient access to construct this infrastructure.

Evidence supporting legally sanctioned commercial harvesting for the initial PAI is provided in sections 1.7 and 1.8. The Kamlapar ILG is officially recognized by the government of NIHT and they are allowed to legally harvest within the harvestable areas of their ILG boundaries. The ILG has made an agreement transferring these timber extraction rights to the project proponent. If it were not for project activities and carbon finance, the project proponent would have legally extracted timber from the harvestable areas of this PAI in the baseline scenario.

PDR.29 If Type F-P1.b is selected, evidence of frontier configuration: a. Projects must demonstrate that the agent of degradation had access to the project area AND that comparable agents create roads for extraction of timber AND/OR b. Projects may produce permits, construction plans, contracts or tenders, budgets, or other evidence of the intent to construct roads.

The PAA for each PAI will be the forested area on which it can be demonstrated that timber harvesting is planned and would have happened without project activities. Timber extraction at the scale of the baseline scenario would require significant infrastructure projects, especially the construction of new roads in areas that are currently difficult to access within the designated geographic area due to this lack of infrastructure. The practice of building forest roads, skidtrails, and landings is common in PNG timber projects across all terrain types. A forest harvesting case-study conducted by the Food and Agriculture Organization of the UN (FAO), found that on average, planned road density for selective harvesting operations in natural forests in PNG is 7-8 m/ha *(Food and Agriculture Organization, 2011)*. Each PAI will have to meet the Eligibility Criteria by demonstrating a commercial timber operator has access to the PAA and that current infrastructure and agreements are preventing secondary agents from converting the PAA (Eligibility Criteria #1).

The Kamplapar ILG obtained the rights to commercially harvest within its boundaries and transferred these rights to the project proponent. Even though these timber extraction rights have been transferred to the project proponent, the local clans and communities still maintain traditional use rights to the area within the PAI. Timber operators typically protect their harvestable areas with forest patrols and other monitoring. However, once timber operations are complete in an area the primary agent would no longer divert resources to forest patrols and the secondary agents would be free to convert this land, aided by expanded access provided by the new infrastructure. This is an observable pattern within the reference area and this same pattern would be followed within PAIs in which it is demonstrated that the reference area is applicable in a similarity analysis.

PDR.39 A qualitative description of the baseline scenario for each selected carbon pool.

The following sections describe how the baseline emissions models from the methodology are applied to each pool as well as the additional assumptions used in identifying the baseline scenario for the project. All values come from a biomass inventory completed within the first PAA. As additional PAIs are added to the project, the sampling frame will need to be expanded to include these PAAs. Additional information on the initial inventory can be found in the document “NIHT Field Measurement Protocol”.

Baseline for AGMT

For a project type F-P1.b (commercial logging), the following assumptions are made as to what will become of aboveground merchantable biomass:

a. All commercial portions of commercially viable trees are assumed to be removed and converted to long-lived wood products

b. Non-merchantable portion of merchantable trees (the slash) will be decayed linearly over 10 years (as this is conservative, even if some would be used for burning or fuels)

These assumptions and steps are applied in baseline accounting, as the without-project scenario would have included legal commercial logging. The aboveground merchantable trees would have been cut and

sold as wood products, treated as commercial products, and otherwise followed standard industrial commercial logging practices of the region.

In the baseline scenario, every tree meeting the merchantability criteria (see PDR.13 in section 3.3) is harvested and the merchantable timber is converted to long-lived wood products. However, the proxy area analysis found residual biomass in AGMT of 45.5 tCO2e ha-1, so baseline emissions conservatively estimate this residual biomass remains following harvesting. Greater than 90% of timber from PNG is exported as roundwood *(International Tropical Timber Organization, 2018)*, so all merchantable timber (i.e. the AGMT that is not slash) in the baseline scenario would be converted to roundwood.

The proportion of slash was estimated by calculating the merchantable volume of AGMT using equation B.17 of the methodology, a standard equation for calculating the volume of a truncated cone. This merchantable volume was converted to biomass by multiplying by the species specific gravity. The biomass of slash was estimated by subtracting the merchantable biomass for each tree from the total AGMT. The proportion slash was calculated for each plot in the harvestable strata of the PAI by dividing the total biomass of slash in AGMT by the total biomass of AGMT for each plot. Even though much of this slash would likely be burned and emitted immediately, it is conservatively accounted for as decaying over a period of 10 years.

Baseline for AGOT and AGNT

The AGOT pool is not harvested by the primary agent of deforestation and is conservatively assumed to remain undamaged as a result of harvesting activities. In areas where the secondary agents of deforestation are active, they clear remaining trees until the residual AGOT biomass remains as determined by the proxy area analysis. The proxy area analysis indicates that 49.2 tCO2e ha-1 remains in AGOT following a deforestation event by the secondary agents and drivers. AGNT is an excluded pool.

Baseline for BGMT, BGOT, and BGNT

The only below-ground portion of trees and other below-ground biomass affected during the commercial baseline logging is conservatively assumed to be that of merchantable trees harvested during logging. The BGMT and BGOT pools are respectively calculated from AGMT and AGOT pools using the IPCC default root-to-shoot ratio for wet tropical forests of 0.37 *(IPCC, 2006)*. This below-ground biomass will be decayed over 10 years in trees removed by the primary and secondary agents. These assumptions are in line with the baseline scenario as logging in PNG does not usually involve using or removing below-ground biomass. It is conservative for the AGOT pool since it assumes the BGOT pool is allowed to decay over time, even though it is likely that some of this pool would be removed and the emissions would happen immediately due to burning.

Baseline for SD

Standing deadwood in the baseline scenario would be removed, burned, or converted to fuel wood. For baseline type F-P1.b, the SD pool is assumed to be insignificant in affecting baseline scenario emissions and it has been conservatively excluded from accounting.

Baseline for LD

Similar to SD, in baseline type F-P1.b, lying dead wood would be removed, burned, or converted to fuel wood during the harvest process. However, like the SD pool, it has been conservatively excluded.

Baseline for SOC

The baseline scenario does not account for any changes in the SOC pool. Since it is likely that the disturbances of the primary and secondary agents of deforestation would likely result in an increase in emissions from this pool, this is conservative.

Baseline for WP

Since logging is the main driver of deforestation in the project's baseline scenario, carbon biomass stored in long-lived wood products will be accounted for as explained for AGMT above. All of the AGMT not considered slash is converted to roundwood, the primary timber export of PNG.

3.5 Additionality

The project has used the VCS Tool for the Demonstration of Additionality in VCS AFOLU Project Activities (VT0001) version 3.0 to assess the additionality of the project and to select the most likely baseline scenario. Project additionality and baseline scenario are assessed for the first project activity instance to conclude that all additional PAIs that fulfil all Eligibility Criteria are also additional. The initial monitoring report will demonstrate that the initial PAI fulfils the additionality criteria.

PDR.99 A list of alternative land use scenarios to the project.

Sub-step 1a is a list of alternative land use scenarios to the project

Step 1: Identification of alternative land use scenarios to the proposed VCS AFOLU project activity

Sub-step 1a(a): Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity

i. Continuation of pre-project land use. The following land uses occurred in the project area prior to project initiation:

- Per Eligibility Criteria #1, all PAIs will be required to demonstrate they were designated for industrial logging prior to joining the project, making this the most plausible baseline scenario.

ii. Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project:

- It is possible, though highly unlikely, that the project proponent could fundraise to pay for the implementation of technologies and measures to protect the first project activity instance.

iii. Activities similar to proposed project activity on at least part of the land within the project boundary resulting from legal requirements or observed similar activities:

- It is possible, though highly unlikely, that laws could be instated by either local governments or by the government of Papua New Guinea that ban industrial logging or instate sustainability quotas and conservation targets, preventing the commercial logging of the first project activity instance.

Sub-step 1a(b): Credibility of identified land use scenarios

Scenario 1 is applicable to all PAIs that fulfil the Eligibility Criteria as all PAIs will be required to demonstrate that the area was designated for commercial logging. Scenario 2, however, is not credible, as there is a lack of conservation funding in the area, and commercial logging is exceedingly more profitable than philanthropic conservation. This is especially the case due to the lack of regulation around tax evasion as well as high mark-up of tropical Roundwood prices when sold overseas *(Mittal, 2016)*.It would be extremely challenging for the project proponent to secure conservation donations to overcome the opportunity cost of commercial logging. Scenario 3 is also not credible, as the government of Papua New Guinea collects tax from commercial logging exports and concession fees, and is not likely to change any laws as it may reduce their tax basis *(Mittal, 2016)*.

Sub-step 1a(c): List of credible alternative land use scenarios

- Project proponent carrying out commercial logging as a harvest block in the first project activity instance.

Sub-step 1b(a): Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

- In order to demonstrate that PAIs fulfil the Eligibility Criteria, it will be necessary to demonstrate that the primary agent is able to legally implement an industrial logging operation. Thus, by fulfilling the Eligibility Criteria, the baseline land use scenario will be credible.

Sub-step 1b(b): Outcome of Sub-step 1b

- Project proponent carrying out commercial logging in the first project activity instance.

PDR.100 Justification for the selected baseline scenario. This justification can include expert knowledge, results from the participatory rural appraisal and ex-ante estimates of avoided emissions.

Sub-step 1c: Selection of baseline scenario

- All PAIs that fulfil the Eligibility Criteria will have the selected baseline scenario of industrial logging of the PAI following the PNG Logging Code of Practice followed by conversion by secondary agents (project type F-p1.b).

PDR.101 An investment or barriers analysis proving that the project is not the most economical option.

A barriers analysis demonstrates that the project is not the most economical option as identified in Step 3.

Step 2: Investment Analysis

The VCS Additionality Tool requires that either step 2 (investment analysis) or step 3 (barrier analysis) be undertaken (or both). The barrier analysis was selected and is completed below.

Step 3: Barrier analysis

This section shows how project activities would not take place without the revenues arising from the sale of GHG credits.

Step 3a: Identify barriers that would prevent the implementation of the type of proposed project activity

Investment barriers. Similar project activities have only occurred with outside funding like grants and non-commercial finance terms. Financing for conservation projects does not exist in Papua New Guinea, and it is highly unlikely that the project would be able to support itself and its activities without some sort of financing.

Institutional barriers. As shown in *The Great Timber Heist: The Logging Industry in Papua New Guinea*, a report produced by the Oakland Institute in 2016, there is a lack of law enforcement when it comes to the timber industry. Even if laws began to regulate timber and were aimed to create a more sustainable industry, it is highly unlikely that these would actually be enforced, and over-exploitation would continue to occur due to rampant corruption and lack of governmental capacity.

Barriers related to local tradition. The communities in the region have limited access to education, especially environmental education opportunities. Because of this, conservation practice would be limited at best, as community members would not have the education background to practice sustainable timber and would not be knowledgeable of how to complete the forest inventories necessary for conservation practice.

Barriers due to social conditions and land-use practices. The project would not have a workforce skilled in conservation technique and practice, and thus needs outside consulting in order to properly maintain a forest to its full capacity.

Step 3b: Show that the identified barriers would not prevent the implementation of at least one the alternative land use scenarios (except the proposed project activity):

All barriers identified above will not prevent the land use scenarios identified in Step 1, as private corporations will be able to finance timber operations because of the high market value and profits of tropical roundwood. Lack of regulation eases logging and corporations will be

able to bring in the skilled workforce that is necessary to operate a timber concession and harvest blocks.

PDR.102 A common practice analysis including a list of project activities and the drivers of conversion that they address.

Step 4: Common practice analysis

Due to lack of governmental and community resources, there are no operational projects or initiatives to reduce deforestation on this scale in the region. Although the PNG Government has proposed plans to reduce illegal logging and eliminate the export of illegally harvested Roundwood, logging and timber exports within PNG continue to be executed at a high level *(The Oakland Institute, 2016)*. There are no other initiatives in the region to reduce deforestation and promote sustainable land management. Because of this, the proposed project activity is considered additional.

PDR.103 Evident compliance with the minimum requirements of the aforementioned VCS tool. This evidence may be the same as the evidence provided to meet reporting requirements.

Evidence for each additional PAI will be provided in the monitoring reports and supporting documents for the monitoring period in which the PAI is added to the project. All PAIs that fulfill the Eligibility Criteria are additional since the most plausible baseline scenario for them aligns with the VM0009 Methodology's F-P1.b project type.

Section 1.4.1 lists 11 Eligibility Criteria that each PAI will need to fulfil in order to be eligible to join the project. Evidence that the initial PAI, Kamlapar ILG, meets the eligibility criteria is provided below:

1. The PAI is additional per the application of the VCS AFOLU Project Activities (VT0001) version 3.0 in Section 3.5:
    a. The PAI boundaries were delineated using the area of the Kamlapar ILG, which was formed so that commercial logging could commence.
    b. If not for the implementation of the REDD project, the Kamlapar PAI would have been logged over a period of two years (see 'Konoagil Logging Plan').
    c. The PAI was not protected from logging until the project proponent decided to protect the area instead of initiating timber harvesting (see Business Plan).
2. The project accounting area (PAA) of the initial PAI was reduced to only areas that had been classified as forest for at least 10 years prior to the project start date using a conservative definition of forest.
3. The soil in the PAI is primarily brown forest soils and rendzinas. There are no peat soils in the PAI boundaries.
4. There is no evidence of livestock grazing within the PAI. Subsistence agriculture and fishing is the primary livelihood for most communities, along with a few cash crop plantations.

5. The baseline scenario for the PAI is consistent with baseline type F-P1.b projects. The Kamlapar ILG transferred the legal rights to commercial logging to the project proponent, which intended on harvesting the entirety of the harvestable areas of the PAI as established in the 'Konoagil Logging Plan'.

6. The project activity instance is located in the designated geographic area. It is located in the Konoagil LLG within the Namatanai District of New Ireland (see Figure 1). The following technologies and measures have been implemented within the Kamlapar PAI:

    a. Prohibition of all commercial logging.

    b. Conducted forest patrols as part of project measures.

7. The addition of the PAI to the PAA does not exceed the reference area size of 110,000 hectares. The PAA of this initial PAI is 10,443 hectares.

8. The Kamlapar PAI and the reference area meet the similarity criteria established by the methodology to fulfil these eligibility criteria.

    a. There are a number of very small villages along the coast within the PAI, including the village of Watpi.

    b. The Kamlapar clan maintains customary and legal use rights to the areas within the boundaries of the Kamlapar PAI.

    c. The majority of secondary agent households within the area must practice subsistence agriculture, fishing, or a similar livelihood.

    d. The Kamlapar PAI meets the landscape configuration requirements:

        i. The maximum elevation within the Kamlapar PAI is 1,553 meters, which does not exceed the maximum elevation threshold established in the PD.

        ii. The maximum slope within the Kamlapar PAI is 69.9 degrees and does not exceed the maximum slope threshold as established in the PD.

9. The contractual rights to timber for the Kamlapar PAI are controlled by NIHT, Incorporated, so no additional agreement is necessary. The contract between the project proponent and the ILGs (see KamlaparContract Final) confers project management capacity and rights to GHG emissions reductions to NIHT, Incorporated (see "Topaiyo Legal Opinion Letter.pdf"). The contract stands for 30 years.

10. The primary agent, which for this PAI is the project proponent NIHT, is committed to enrolling the entirety of areas in which clans have signed agreements with them. NIHT is not only committed to no industrial logging until these areas are enrolled, but is actively working with clans outside the PAI boundaries to prevent illegal logging until this happens (see MR.64 in Section 5.3.2 for more information).

11. There has been no industrial logging within the Kamlapar PAI within the past 10 years. There have been no active concessions and there are no logging export records from within this area.

3.6 Methodology Deviations

There are no methodology deviations at this time.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

4.1.1 Proxy Area

The VM0009 Methodology requires an inventory of a proxy area to estimate post-conversion carbon stocks in the baseline scenario. The following section demonstrates that the selected proxy area is sufficiently similar to the initial PAA and explains how the proxy area was delineated.

PDR.36 Maps or other evidence that the proxy area's site characteristics and landscape configuration is similar to its respective project accounting area, including: Vegetation; Climatic conditions (eg, mean temperature, rainfall, etc.); Topographic constraints to conversion (slope, aspect, elevation); Land use and/or land cover; Soil map (if available) or other soil information; Applicable infrastructure (eg, water ways, roads, railroad, airports, provision of electricity, and other access points); and Ownership/tenure boundaries that influence conversion (eg, government holdings, private holdings and reserves).

The following maps are included as required by the VM0009 Methodology. Eligibility Criteria #8.c requires that all PAIs meet certain requirements for slope and elevation. Thus, fulfillment of the Eligibility Criteria in monitoring reports will fulfill this requirement as PAIs are added to the project.

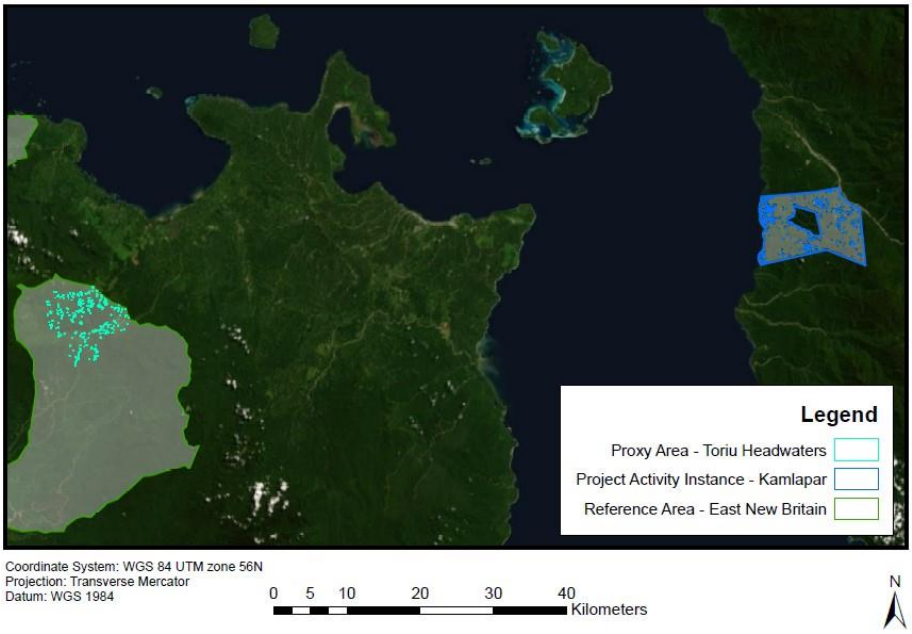
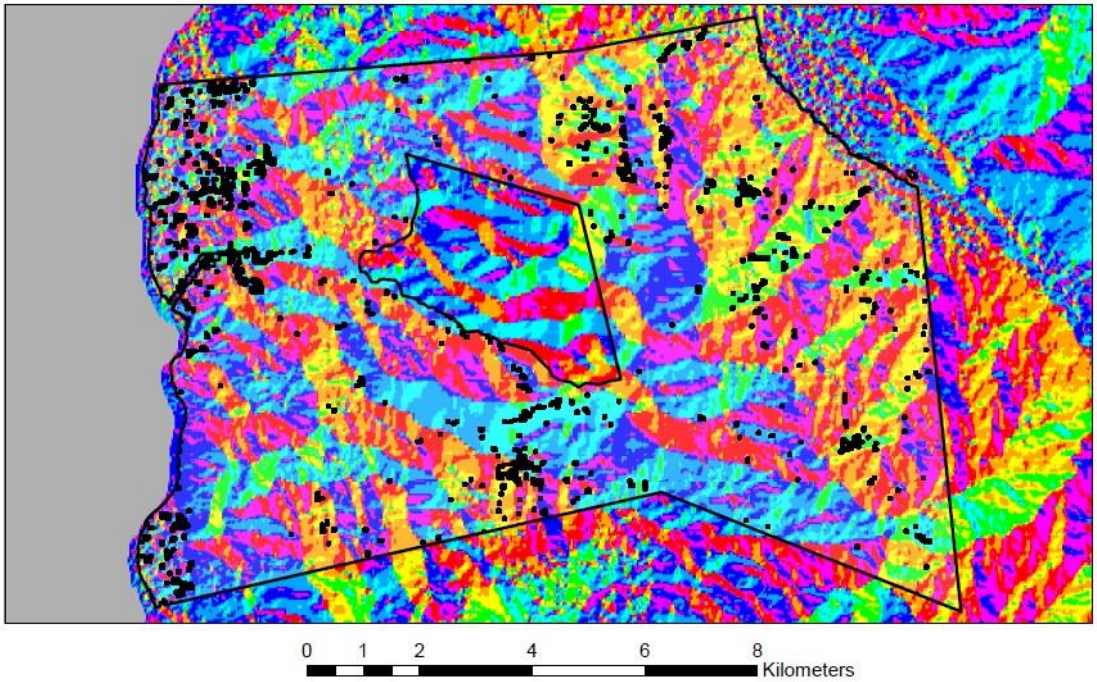


Figure 4. The map above demonstrates the boundaries of the Proxy Area and Kamlapar PAI.



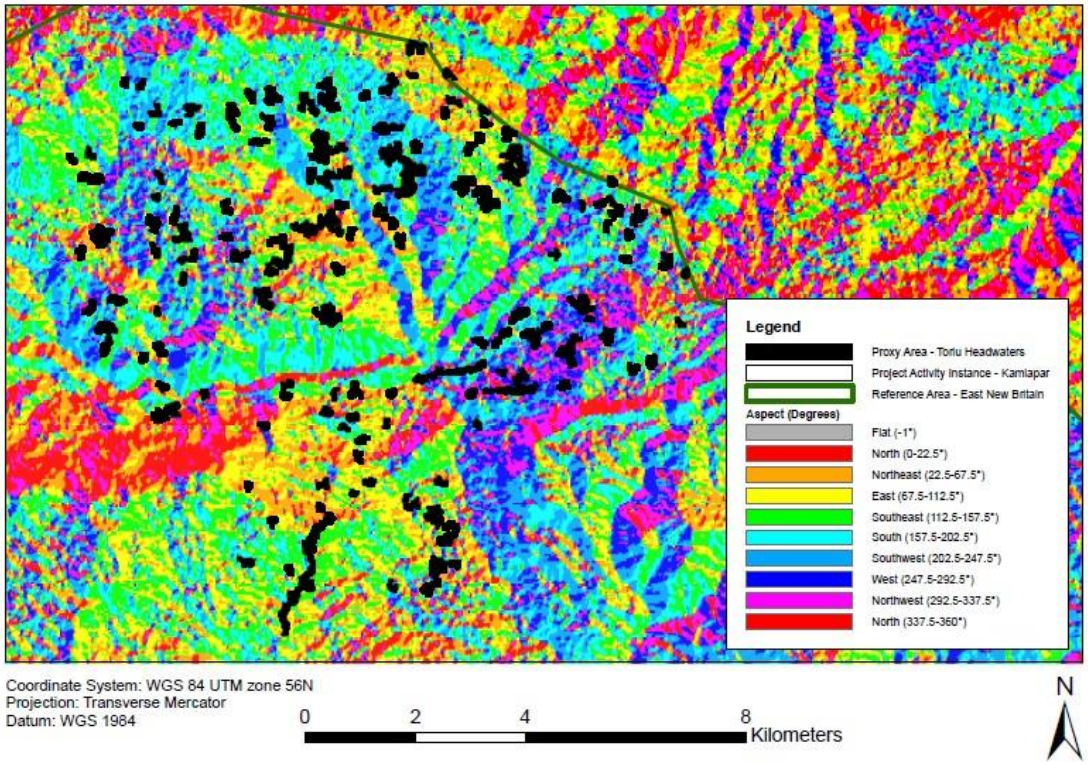


Figure 5. The maps above compare the aspects found in the Toriu Headwaters Proxy Area (bottom) and Kamlapar PAI (top). This analysis indicates that both regions contain all aspects.

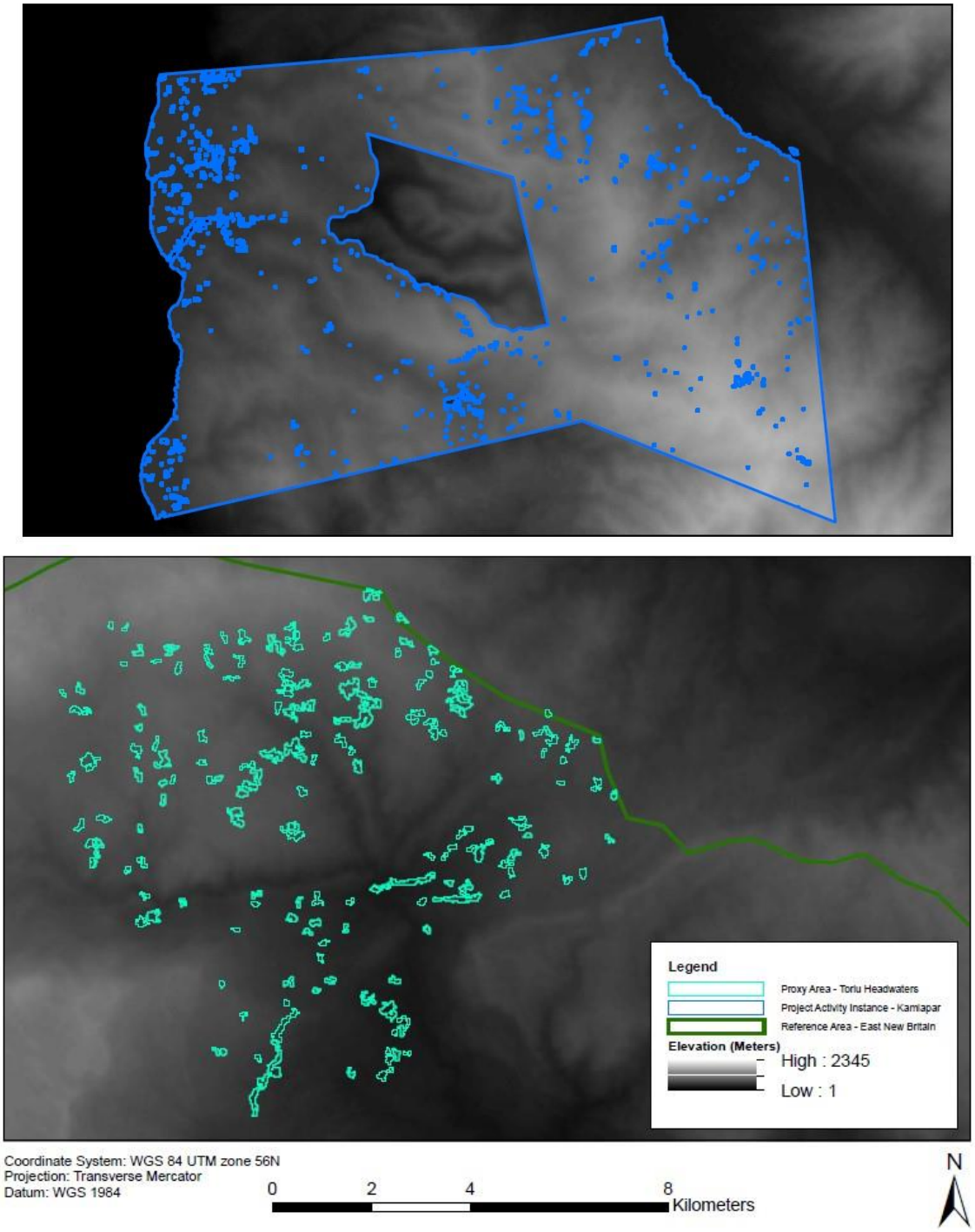


Figure 6. The maps above compare the elevations found in the Toriu Headwaters Proxy Area (bottom) and Kamlapar PAI (top). An analysis of the range of elevation existing in both the Proxy Area and the Kamlapar PAI demonstrates that both regions have a minimum elevation of 0 m and a maximum of 1594 m and 1553 m for the Proxy area and Kamlapar PAI, respectively.

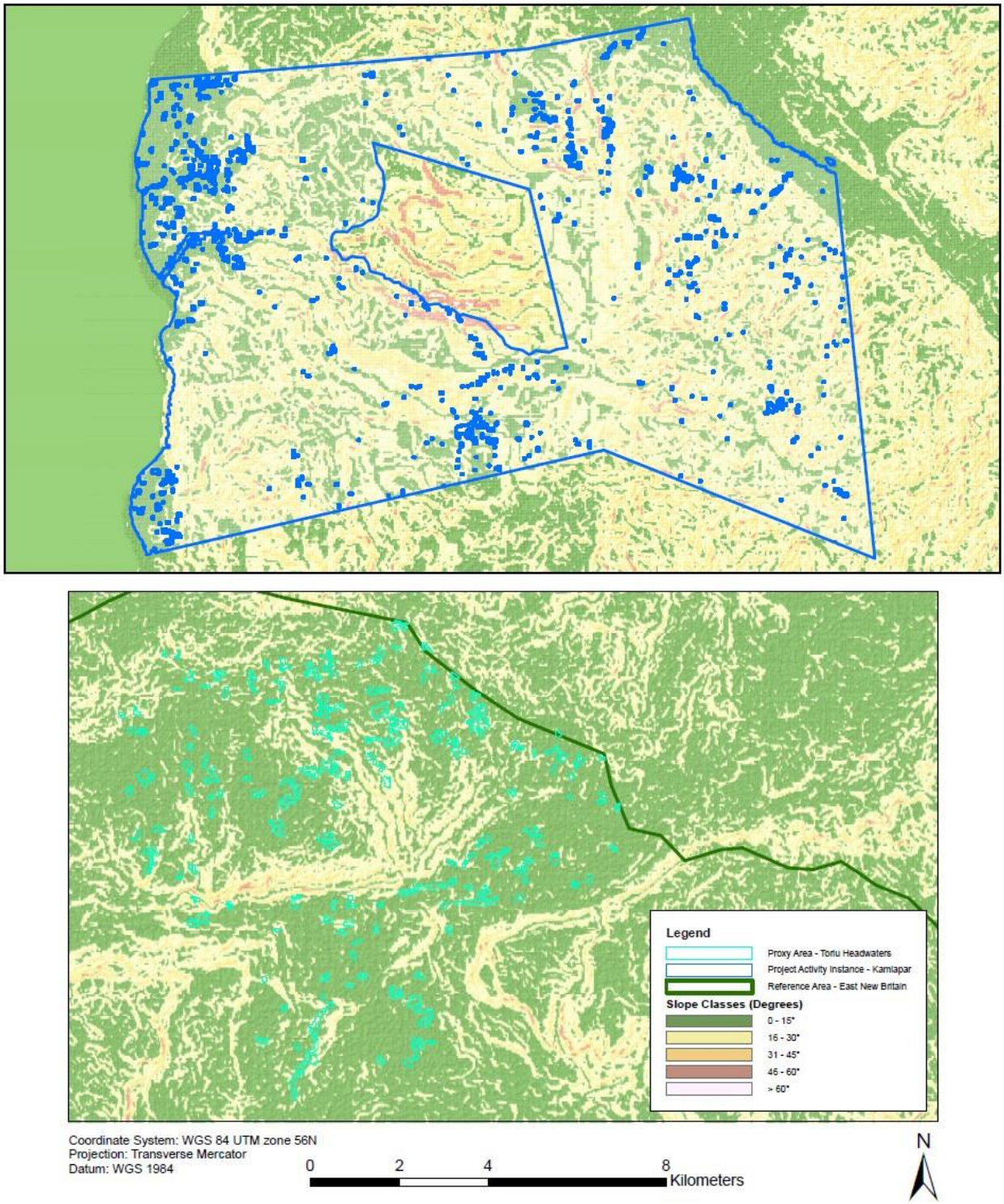


Figure 7. The maps above compare the slope classes found in the Toriu Headwaters Proxy Area (bottom) and Kamlapar PAI (top). An analysis of the slopes existing in both the Proxy Area and the

Kamlapar PAI demonstrates that these regions have average slopes on 10 and 21 degrees, respectively.

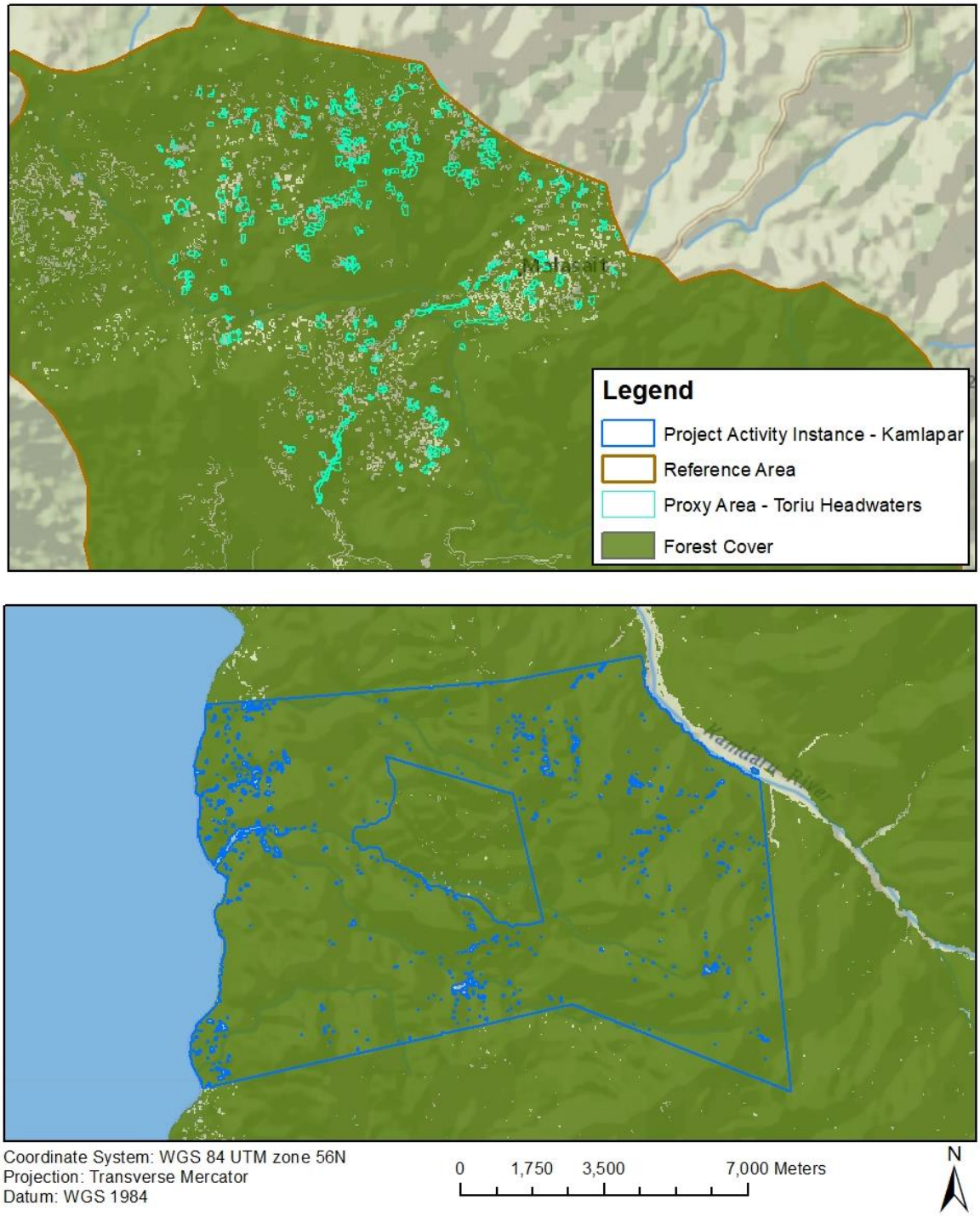


Figure 8. The maps above show the forest cover for the Proxy Area (Top) and the Kamlapar PAI (Bottom). The forest cover map was generated using the University of Maryland's Hansen Tree Cover data for both

2008 for the Proxy Area which was prior to harvest activities and 2018 for the PAI. These maps indicate a land cover of forest throughout the Proxy and PAI areas.

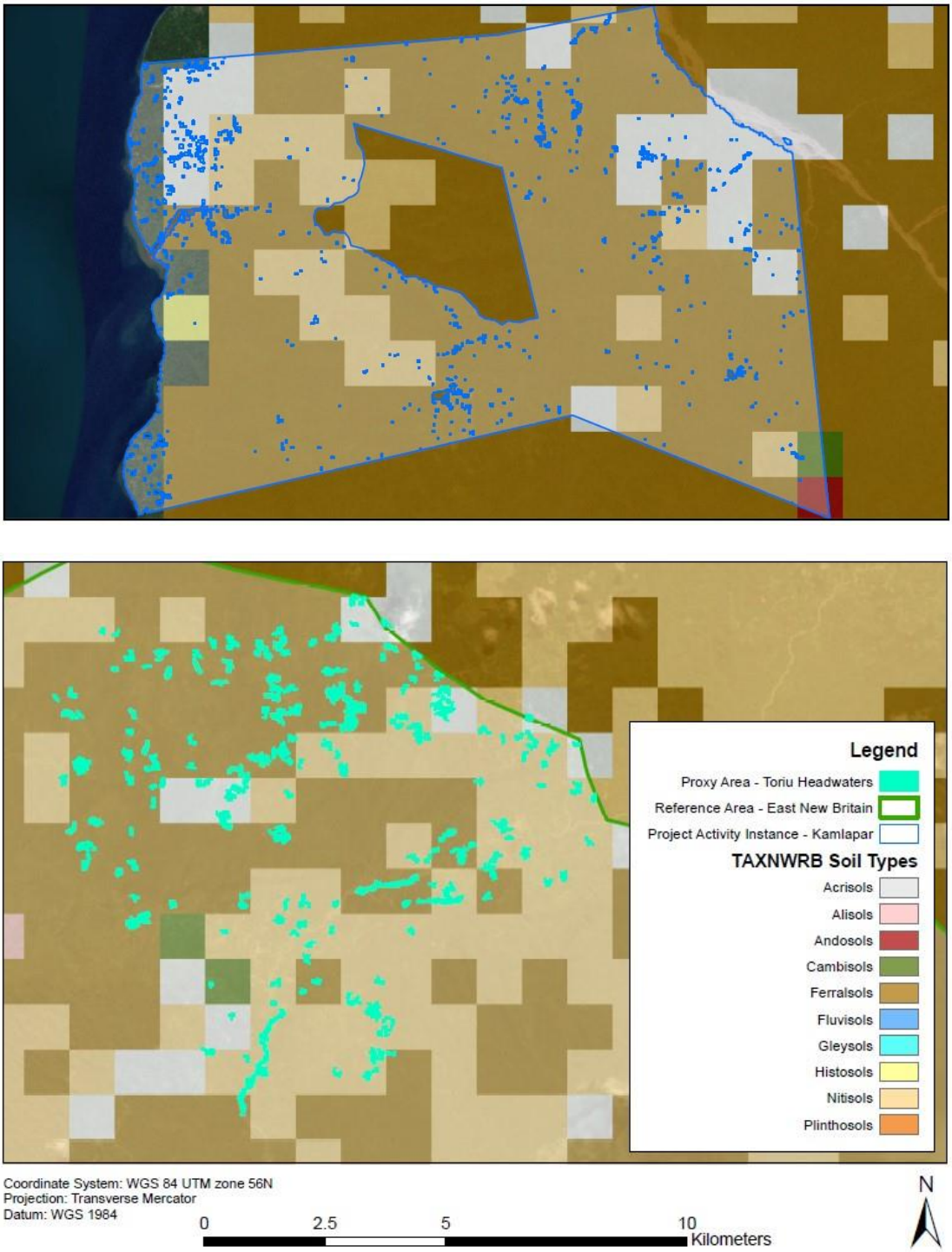


Figure 9. The maps above compare the soil types found in the Toriu Headwaters Proxy Area (bottom) and Kamlapar PAI (top). A comparison analysis of soil types in the Proxy and Reference area was

conducted and results suggest that both areas are characterized by majority Ferralsols and Nitosols. Both sites also have smaller instances of Acrisols and Cambisols.

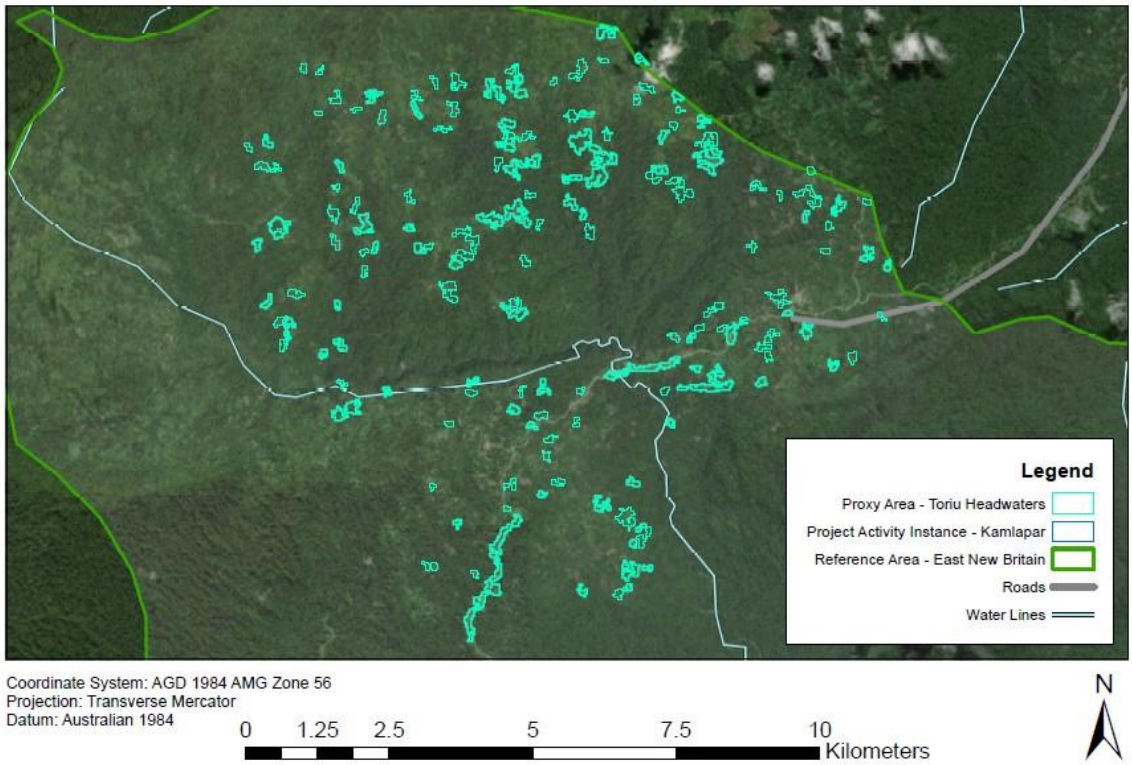


Figure 10. The maps above compare the roads and water ways found in the Toriu Headwaters Proxy Area (bottom) and Kamlapar PAI (top). While updated roads data is difficult to attain, these maps show that both areas exhibit access pathways via waterways and roads.

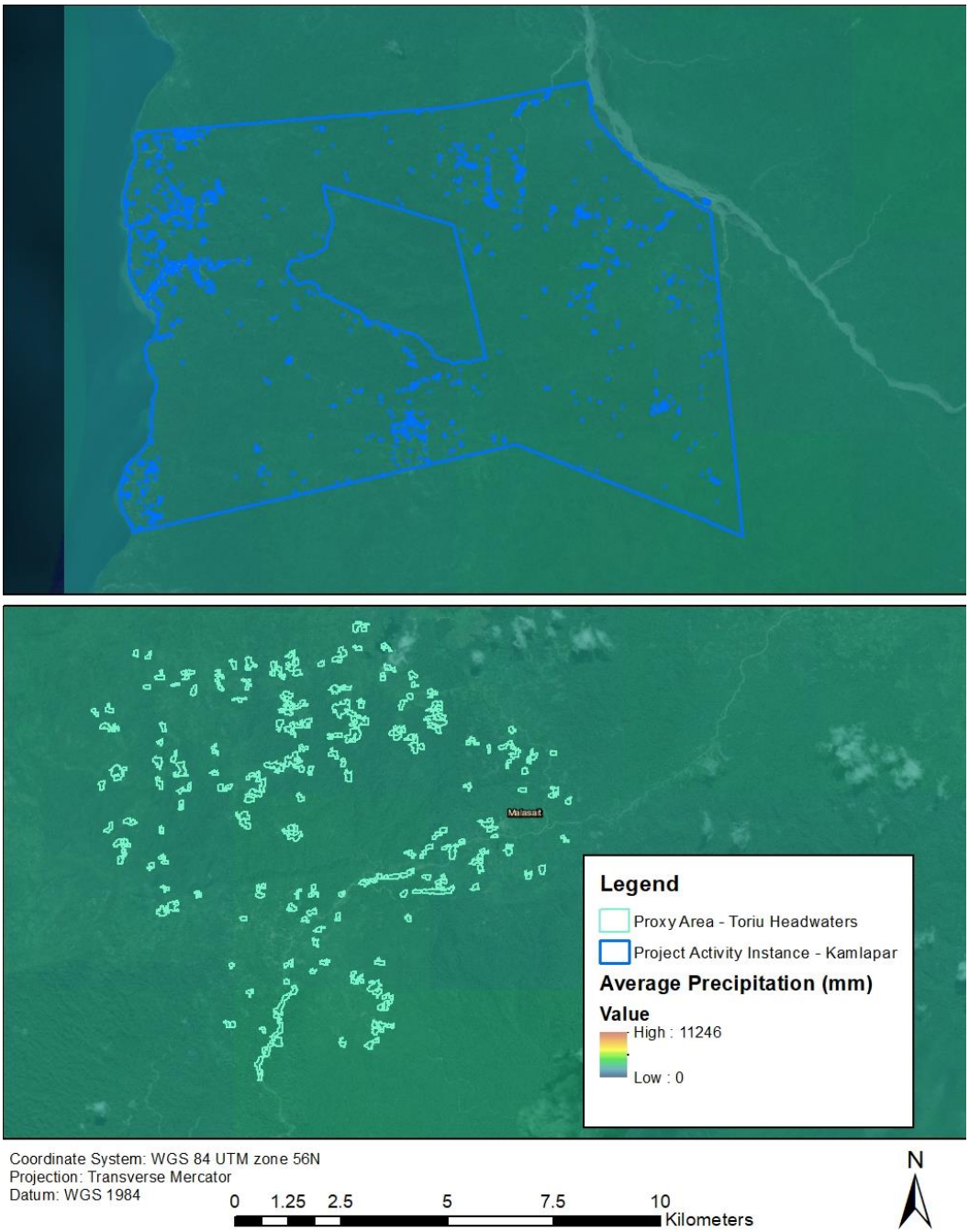


Figure 11. The maps above compare the average yearly precipitation in the Proxy Area and Kamlapar PAI. A geospatial analysis comparing the average precipitation in the Proxy area and PAI was conducted

using the WorldClim bioclimatic variables data set. This analysis suggests that both regions have similar average yearly precipitation at 2,404 and 2,374 mm/year, respectively.

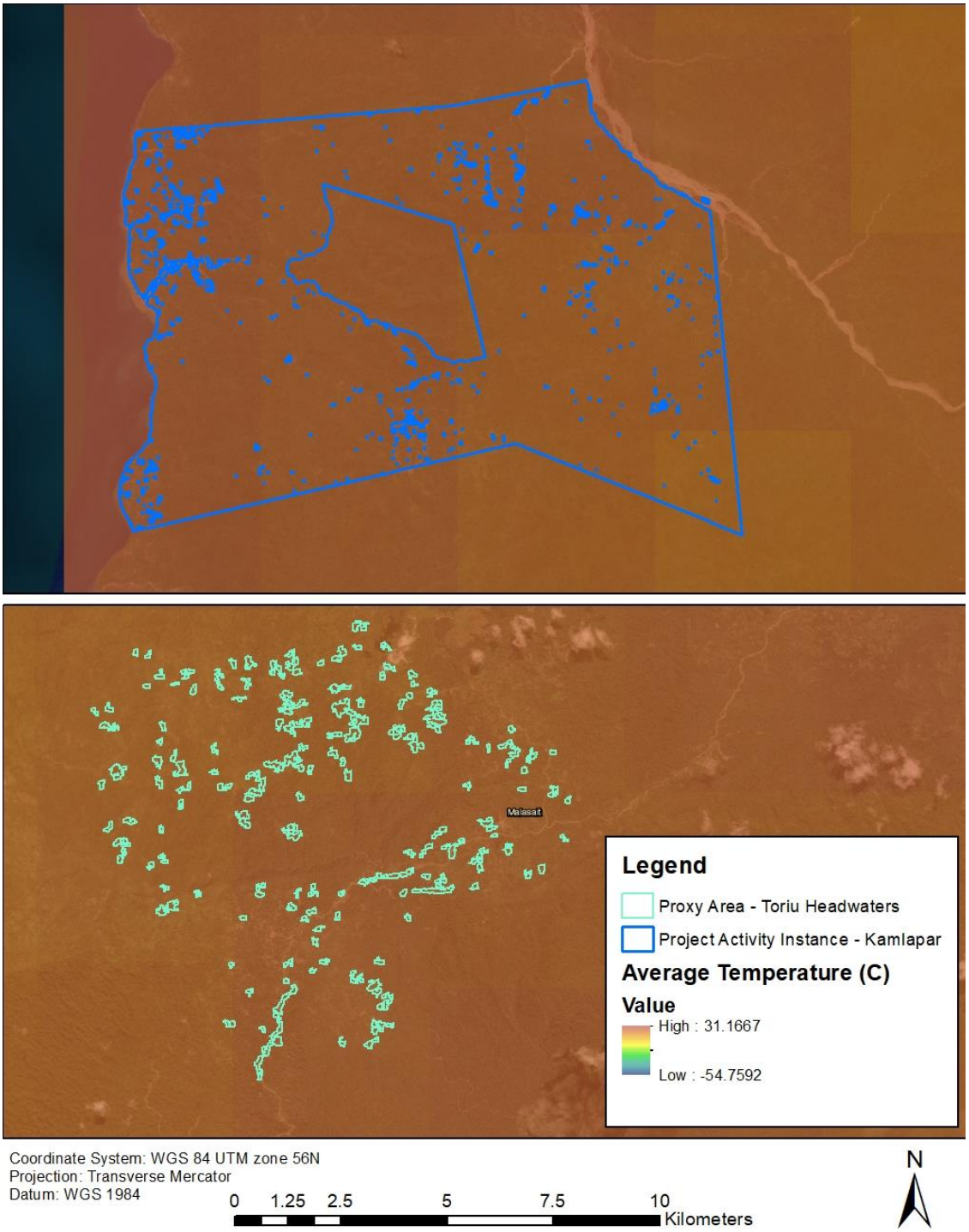


Figure 12. The maps above compare the average temperature in the Proxy Area and Kamlapar PAI. A geospatial analysis comparing the average temperatures in the Proxy area and PAI was conducted using

the WorldClim bioclimatic variables data set. This analysis suggests that both regions have similar average yearly temperature at 22.3 and 24.3 degrees Celsius, respectively.

PDR.37 A narrative describing the rationale for selection of proxy area boundaries, including the proxy area's similarity to the corresponding project accounting area with respect to vegetation, soil and climatic conditions.

The proxy area boundaries were selected by identifying a concession in the reference area that has been degraded due to commercial logging and accessible by secondary agents. The Toriu Headwaters concession is controlled by KK Connections Ltd and has export records dating back to 16 July 2008. The project proponent was provided permission to access the area to complete an inventory, making it a suitable location for proxy area sampling. A sub-section of this concession that has been converted to non-forest was identified using remote sensing imagery and local knowledge. This area was further restricted to non-forest using Hansen data through the end of 2017 and the definition of forest from section 3.2. Finally, to reduce the impact of classification errors within this dataset, any features with an area less than 1 ha were removed using a GIS to ensure the proxy area is primarily non-forest. These are the boundaries of the proxy area as well as the sampling frame for the proxy area inventory.

As the proxy area falls within the designated geographic area in addition the reference area, it shares many similarities with the initial PAA. The maps in Figures 5-12 demonstrate some of these key similarities. Additionally, the area was analyzed within a GIS to ensure that it meets the landcover requirements of Eligibility Criteria #8.c. The results of this analysis are found in Table 5 below.

Eligibility Criteria	Value	Units
Maximum Elevation	1,594	meters
Maximum Slope (degrees)	41.9	degrees

Table 5. Proxy area fulfilment of Eligibility Criteria 8.d.

PDR.38 Results of a spatial analysis to demonstrate the proxy area is converted, on average, as of the project start date.

The proxy area boundaries are the areas within the Toriu Headwaters concession that have been converted to non-forest as of the project start date. These converted areas were identified using Hansen data and the definition of forest from section 3.2. Thus, all areas within the proxy area have been classified as non-forest. If parts of the proxy area were misclassified and remain forest it is conservative to include them in the proxy area sampling frame as this will increase the post-conversion carbon stocks.

PDR.122 Summary of sampling procedures for the project accounting areas, with a copy of a sampling protocol used to carry out measurements.

PDR.123 Summary of sampling procedures for the proxy areas, with a copy of a sampling protocol used to carry out measurements.

Carbon stocks for post-conversion landcover classes were estimated from a biomass inventory within a sampling frame of the proxy area. The procedures for this inventory are the same as those within the initial PAA and can be found in the document "NIHT Field Measurement Protocol v1.9".

4.1.2 Reference Area

The VM0009 Methodology similarly requires the delineation of a reference area in order to estimate conversion rates for the baseline scenario.

PDR.40 A map of the delineated boundaries, demonstrating that the reference area was held by the identified baseline agent or agents and does not include the project area.

The selected reference area is within the designated geographic area in the province of East New Britain, where logging has significantly expanded since 2000.

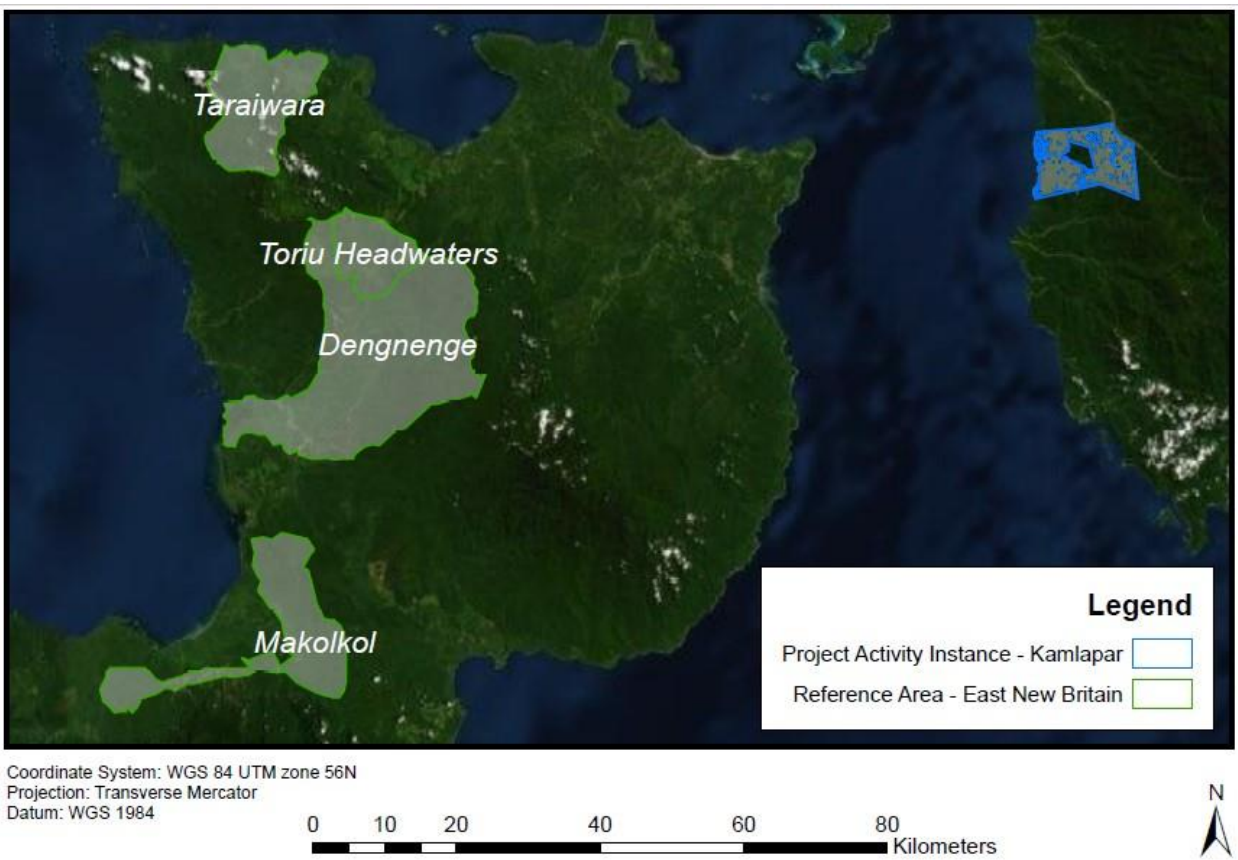


Figure 13. A map of the Reference Area boundaries in relation to the first Project Activity Instance.

Concession Name	Identification Number	First Export Date	Villages or Towns within 2 km of FCA Boundaries

Taraiwara	FCA 15-14	29/06/2019	Lassul
Toriu Head Waters	FCA 15-04	16/07/2008	Malasit
Dengnenge	FCA 15-10	13/11/2016	Name of village unknown, visible in imagery
Makolkol	FCA 15-09	25/07/2016	Open Bay

Table 6. Initial logging export dates for each of the reference area concessions, as well as their Forest Clearing Authority (FCA) identification numbers.

PDR. 41 Results of a spatial analysis to demonstrate the reference area had as much forest or native grassland as the project accounting area at some point in time during the historic reference period.

Instead of utilizing a landcover classification for the reference area, global tree cover data produced as a part of the University of Maryland's research (i.e. Hansen data) on global forest cover and loss rates was used to estimate the amount of forest in the reference area as near to the start of the reference period as possible. Since Hansen treecover data provides an estimate of the percentage of canopy cover for each pixel in the year 2000, forest areas for this year were delineated using the conservative definition of forest established in Section 3.2. Since the reference period begins in January 2008, the project proponent used Hansen deforestation data through the year 2007 to estimate the amount of forest in the reference area at the beginning of the reference period. Any areas that had been marked as deforested within the concession boundaries were removed from the reference area to provide this estimate. The four concessions that make up the reference area have a combined area of 110,000 hectares, the size threshold for the total PAA per Eligibility Criteria #8. In 2008, these concessions had a forest area of 108,598 hectares. The PAAs of each PAI will be similarly reduced to only forest areas in order to meet Eligibility Criteria #2.

PDR. 42 Evidence that the management practices of the baseline agent in the reference area are similar to those that would have been applied to the project accounting area or areas in the baseline.

Timber export data for the four concessions within the reference area during the reference period are available to auditors for review. All of these FCAs have been actively logged since their first export date found in Table 6.

PDR.43 A description of the rationale for selection of reference area boundaries.

The VM0009 Methodology requires the delineation of a reference area that is applicable to the PAA. The methodology has multiple criteria that must be met in order to ensure that the agents and drivers of deforestation within both areas are similar. Since this is an F-P1.b project, the primary agent is a commercial timber operator. Thus, the reference area is constrained to areas logged by commercial

timber operators during the historic reference period. The island of New Ireland has had limited commercial harvests in the past 20 years, so active concessions were identified on East New Britain (see Table 6).

Since the project will add PAIs in future monitoring periods, the reference area boundaries must fulfill the land cover requirements of Eligibility Criteria #8. Thus, the project proponent searched for several concessions that meet the methodology requirements and cover an expansive area that will be applicable to much of the designated geographic area. Four concessions were identified within the northeastern region of East New Britain, the area closest geographically to New Ireland and the initial PAI. These four concessions were selected as the reference area boundaries since data on both their boundaries and logging export data were available for analysis. All four concessions are now being logged by KK Connections Ltd operating out of Hong Kong.

PDR.44 The documentation required in the reference area selection requirements that the selected reference area meets the Reference Area Selection Requirements.

As the reference area falls within the designated geographic area, meets the relevant Eligibility Criteria for reference area selection, especially Eligibility Criteria #8. The maps in Figures 14-16 demonstrate some of these key similarities. Additionally, the area was analyzed within a GIS to ensure that it meets the landcover requirements of Eligibility Criteria #8.c. The results of this analysis are found in Table 7 below.

Eligibility Criteria	Value	Units
Maximum Elevation	1,594	meters
Maximum Slope (degrees)	64.9	degrees

Table 7: Reference area fulfilment of Eligibility Criteria 9.d

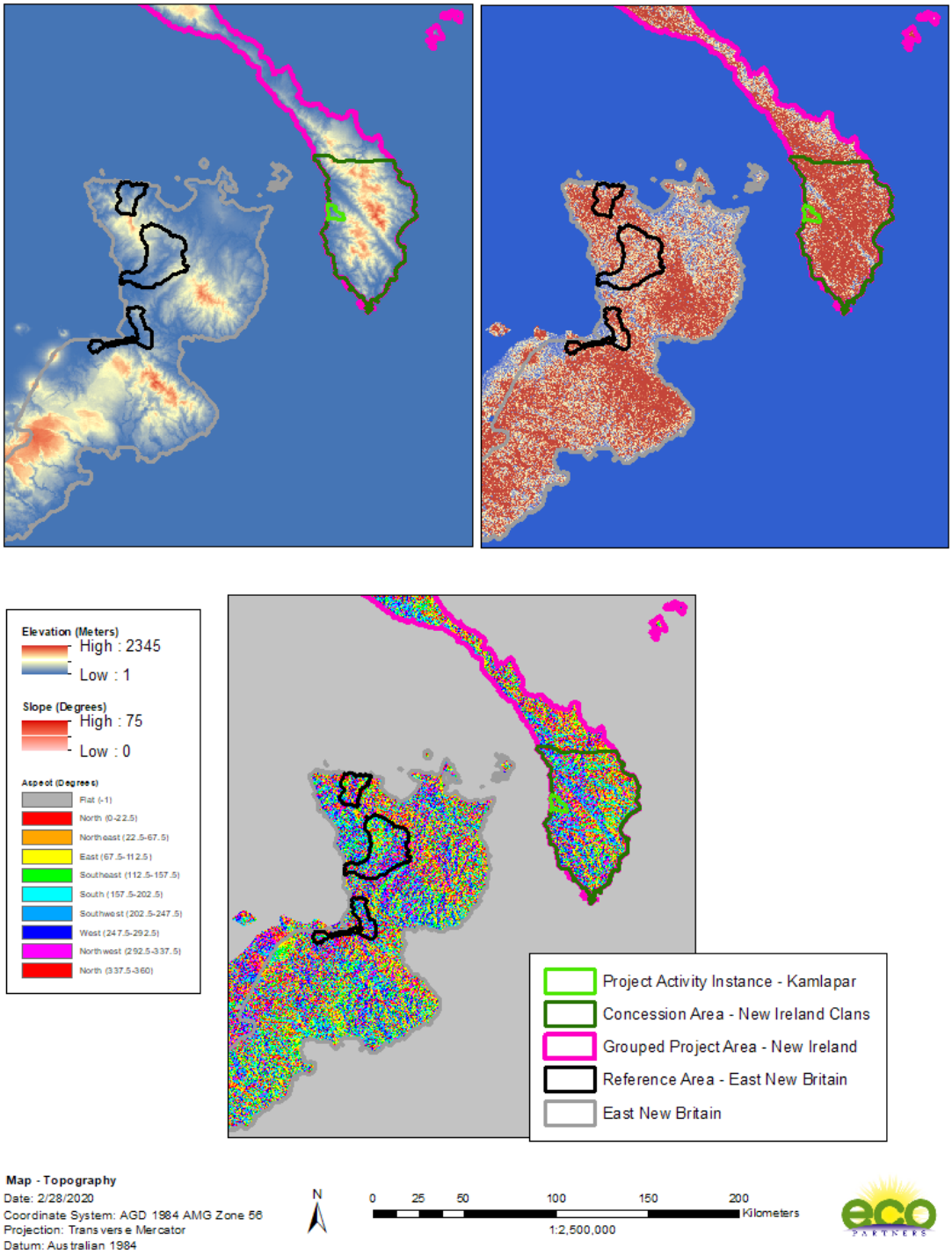
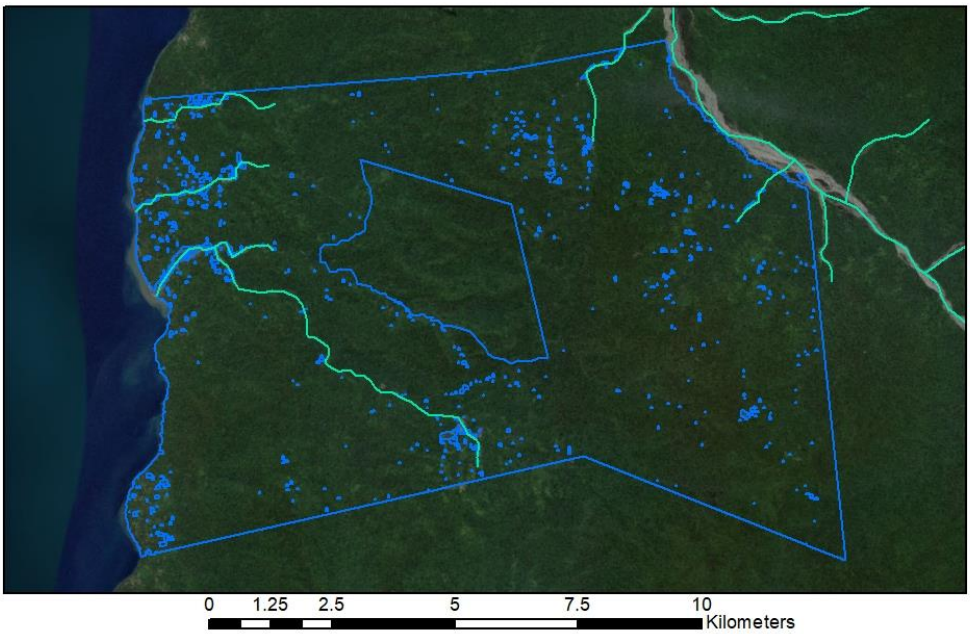


Figure 14. Maps showing the similarities of elevation, slope, and aspect between the Reference Area and Kamlapar PAI.

East New Britain has a long history of development and human habitation, including a large deep-water port in Rabaul and a more developed road network. Rabaul is about 60 km away from the proxy area and Kokopo, the capital of East New Britain is slightly farther and had a population of 20,262 in 2000.

There is a road leading to some regions of the reference area from the more developed areas of Rabaul and Kokopo (Figure 15) . The majority of logging roads do not seem to show up in the available road data as logging roads are typically small, poorly maintained, and closed to the public while logging operations are active. However, secondary agents of deforestation would use timber roads for access once logging activities cease and roads are no longer patrolled by the logging agent. The social conditions in the reference area are similar to that of the Kamlapar PAI, subsistence level farming and forest harvesting are common practice, most people get their water from rivers and do not have access to filtration systems, and the majority of people do not have access to electricity.



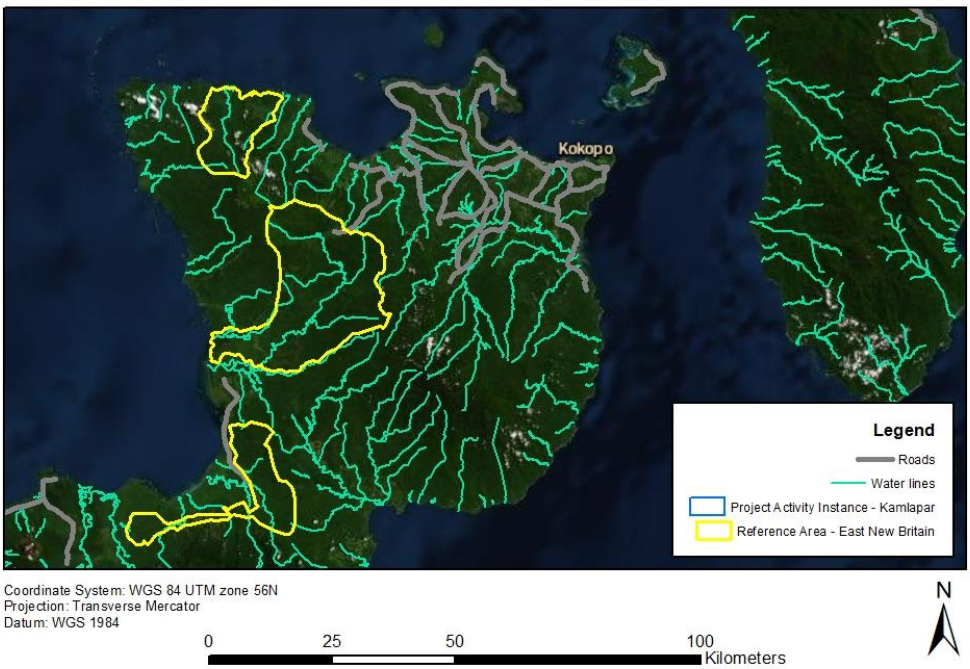


Figure 15. Map of roads, rivers and streams in the Reference Area and Kamlapar PAI.

Due to minimal available information regarding current socioeconomic conditions or economic studies in the reference area, it is difficult to compare the socioeconomic conditions in these two areas empirically. One study was identified (D'SA, 1985) which attempts to classify the districts of Papua New Guinea by their levels of development using socioeconomic indicators such as education status, health status and services, smallholder income, land transport, and government staffing (PNG Forest Authority, 2011). According to this study, there was a slight development disparity between districts in the reference area, with Pomio ranking low in the aforementioned categories and Gazelle (identified as Rabaul in this study) ranking higher. In some categories considered by this study, such as nutritional status and urbanization, the PAA aligns more with the Pomio district.

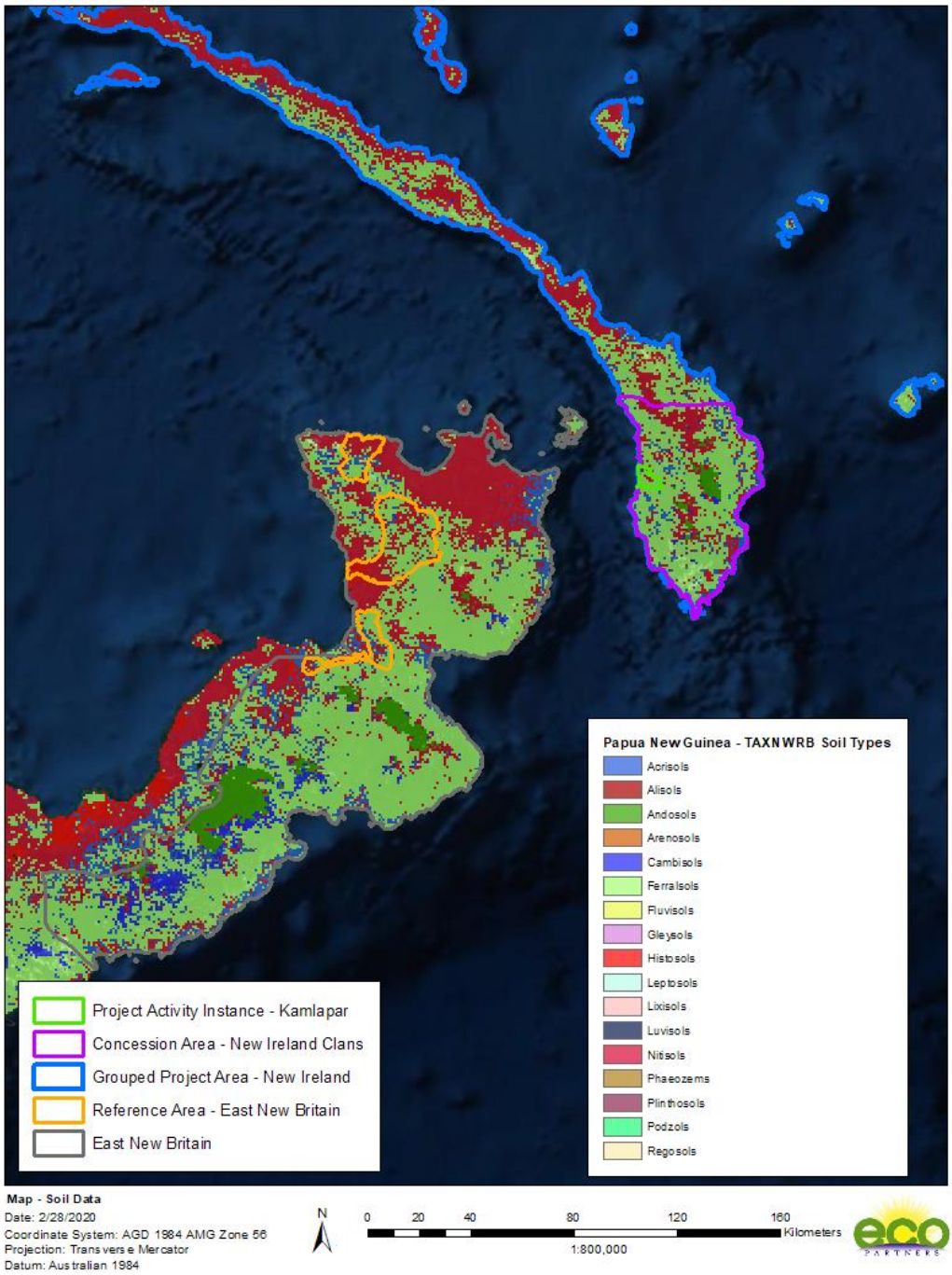


Figure 16. Map of soil types in the Reference Area and Kamplapar PAI. Both regions are dominated by Ferralsols and Nitisols which fulfills eligibility criteria #3.

The reference area boundaries cover a large part of the designated geographic area and were purposefully selected to be representative of the much of the designated geographic area. This ensures that the reference area will be relevant to all PAIs that fulfill the Eligibility Criteria.

PDR.45 Evidence that secondary agents have been considered in the delineation of the reference area for baseline types F-P1.a and F-P1.b.

The VM0009 methodology also requires that the reference area is appropriate for the secondary class of agents of deforestation. In the baseline scenario, these secondary agents are local people that utilize logging roads to access harvested areas abandoned by the primary agent upon completion of logging activities. These areas would be inaccessible before the arrival of roads and the removal of merchantable trees by the primary agent allowed for easier conversion to agriculture. This same cascading effect of deforestation observed in the reference region would have occurred in the project accounting area in the baseline scenario since both areas have similar secondary agents.

The FCAs in the Reference Area span across two different districts, Gazelle and Pomio, in the East New Britain Province. Villages and towns have been identified within the boundaries or within two kilometers of the boundaries of each concession (Table 6) confirming that the reference area fulfills Eligibility Criteria #8.a). Other available population information for the reference area is included in Table 8 below. The reference area, located in two different districts, show a steady increase in population and significant increase in the number of households.

	2000 Census				2011 Census			
Province - District	House-holds	Persons	Male	Female	House-holds	Persons	Male	Female
East New Britain - Gazelle	17,033	89,776	47,885	41,891	24,823	129,317	66,428	62,889
East New Britain - Pomio	8,739	44,964	22,968	21,996	13,315	71,836	36,865	34,971

Table 8. A table comparing the population demographics in the districts that contain the reference area (NSO ICT Branch, 2020).

Province	Annual Growth Rate (1980-1990)	Annual Growth Rate (1980-2000)	Annual Growth Rate (1980-2011)	Annual Growth Rate (2000-2011)
New Ireland	2.80%	2.90%	3.50%	4.50%
East New Britain	3.30%	2.50%	2.90%	3.60%

Table 9. A table comparing the annual population growth rates in the Provinces that contain the PAA and RA (The National Statistics Office of Papua New Guinea).

PDR.46 Established reference period boundaries.

The reference period extends from 15 January 2008 until 23 February 2020.

PDR.47 The date when the agent acquired control of the reference area or when the land management practices employed in the reference area changed.

The VM0009 methodology requires that the reference period be established by the date on which the primary agent acquired control of a landholding in the reference area. Table 6 provides information on when the first exports were made from the four FCAs, although information for when each FCA was acquired is unavailable. However, the Toriu Head Waters concession was the first of the four FCAs to export timber and was acquired on 15 January 2008 as listed in the 2011 National Forest Plan (PNG Forest Authority, 2011). This marks the beginning of the historic reference period. The historic reference period ends on February 23rd, 2020, the date of the most recent image included in the reference area conversion analysis.

PDR.52 A map of the reference area showing the area of "double coverage".

Sufficient historic imagery is available in the reference area during the reference period to ensure double coverage in 98.2% of the reference area (Figure 18). As seen in Figure 17, when Landsat 7 and Landsat 8 imagery with a spatial resolution of 30 meters is compared to high-resolution Sentinel 2 imagery with a resolution of 10 meters, the Landsat 7 and 8 imagery is of sufficient quality to resolve changes in land use and land cover, noting that the spatial model is only interested in distinguishing areas as either forest or non-forest (see “Landcover Classification SOP”).

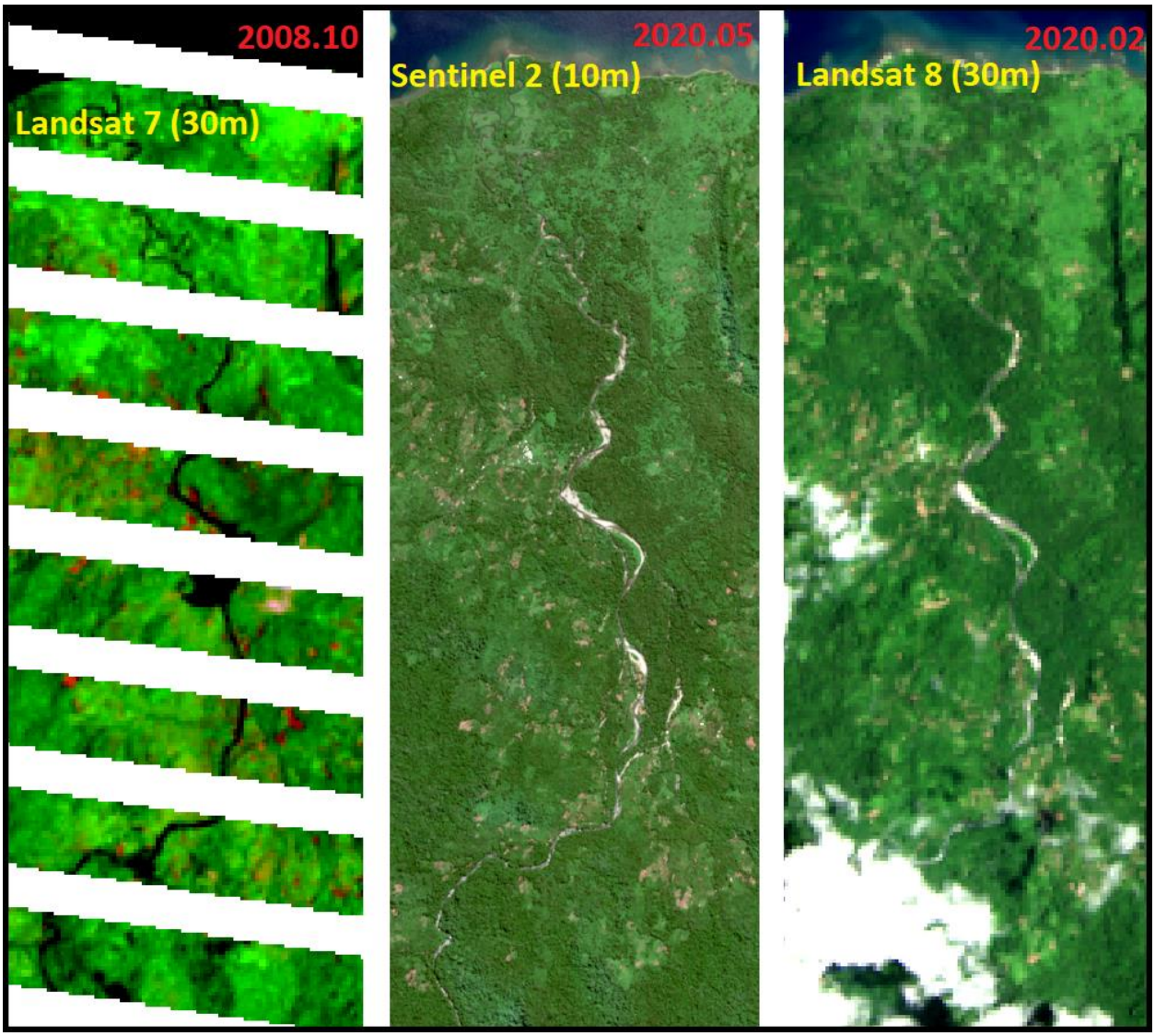


Figure 17: Landsat 7, Sentinel 3, and Landsat 8 satellite imagery comparison.

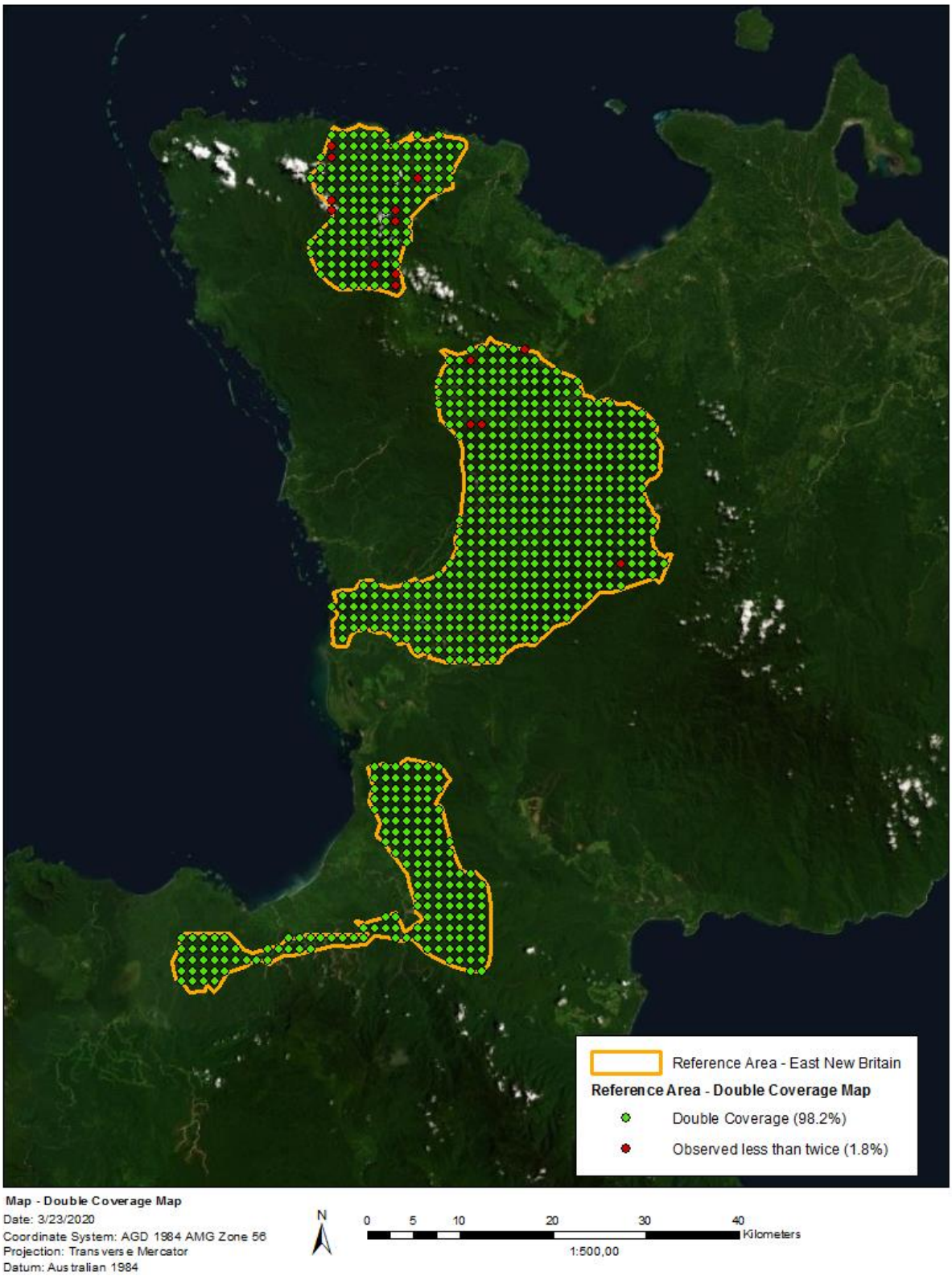


Figure 18: Map of "double coverage" within reference area during historical reference period.

PDR.53 Quantification of "double coverage" (greater than 90%).

Analysis of the point interpretation exercise performed using satellite imagery from the historical reference period shows that 98.2% of the reference area point interpretation points meet the double coverage requirement. Of 831 points, 17 were observed less than two times across all historical imagery analyzed (Figure 18).

PDR.54 A line plot of the historic image dates to confirm stationarity.

The satellite imagery used in the point interpretation exercise of the historical reference period is distributed throughout the historical reference period (Figure 19). Therefore, the corresponding estimated time components of the image weights per equation [A.3] of the VM0009 Methodology are unbiased.

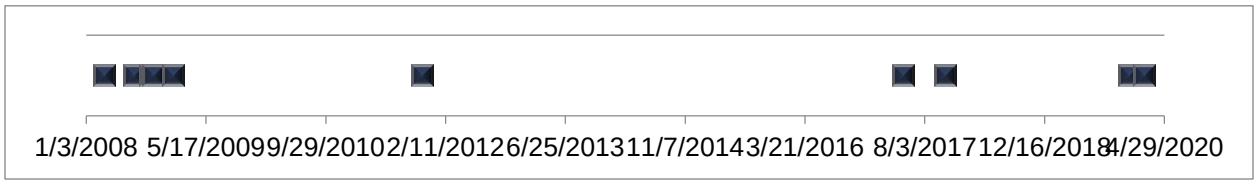


Figure 19: Line plot of historic image dates to confirm stationarity.

PDR.55 Evidence that all image pixels are not more than 30m x 30m.

The point interpretation exercise utilized Landsat 7 and Landsat 8 imagery, both of which have a spatial resolution of 30 meters. Thus, the pixels of the satellite images were 30m x 30m, which fulfills this PDR.

PDR.56 Empirical evidence that imagery is registered to within 10% RMSE, on average.

Metadata files containing RMSE values for the Landsat 7 and Landsat 8 imagery tiles used in the point interpretation exercise have been provided to the audit team (see Full Point Interpretation Exercise - Satellite Image Metadata.zip). All utilized imagery was published and provided by the United States Geological Survey under the Landsat program.

PDR.57 The sample size.

An initial pilot point interpretation exercise was performed with a regular grid of 322 points to determine the necessary sample size to estimate deforestation parameters with the required precision. As a result, a second regular grid of 831 points was created and used for the point interpretation exercise estimating deforestation parameters. The initial pilot grid was not used for any purpose beyond estimating the necessary size of the primary point interpretation grid.

PDR.58 A map of the reference area showing the sample point locations.

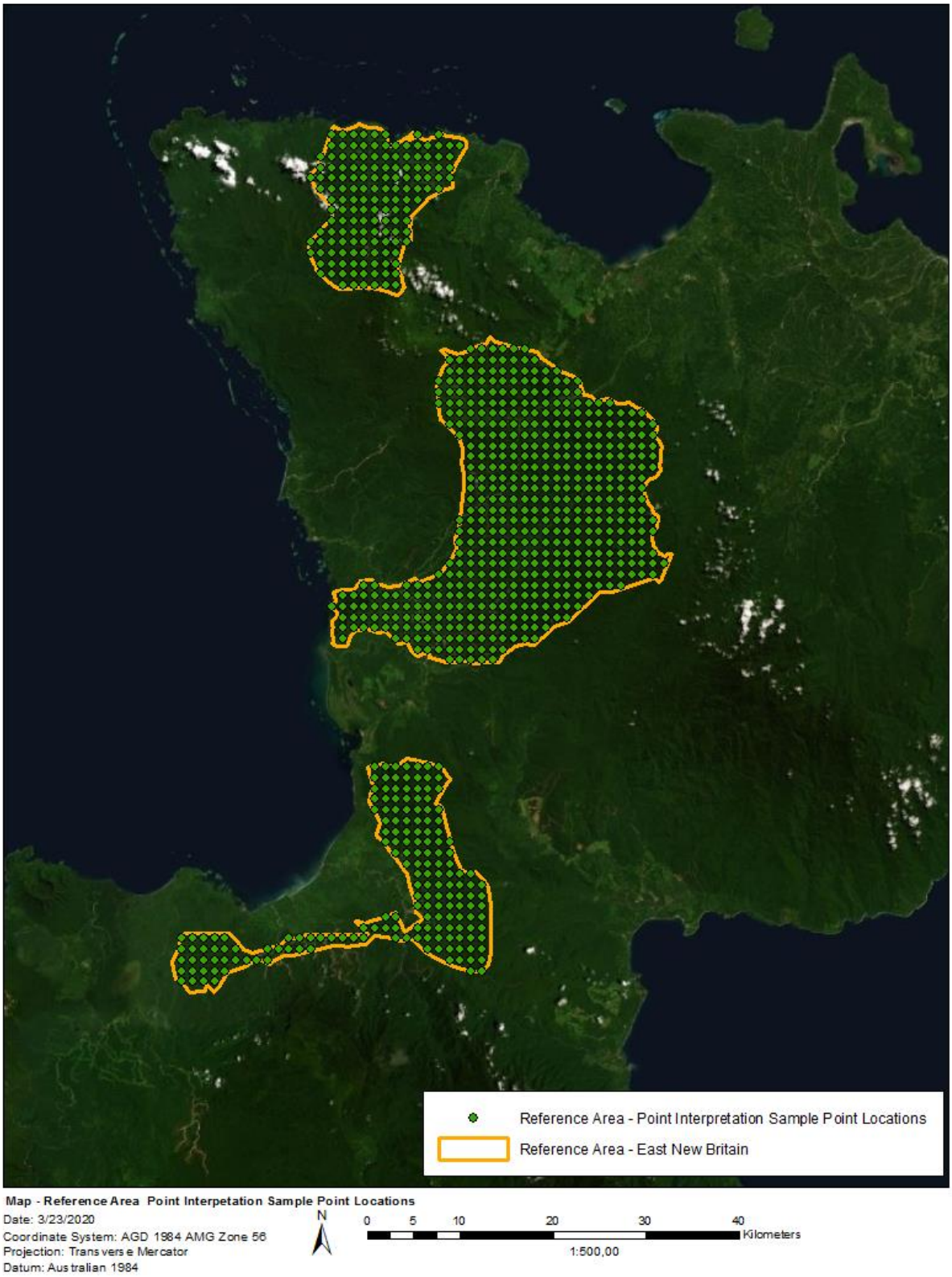


Figure 20. Map of point interpretation sample point locations in the reference area

PDR.59 The covariates that were considered and their data sources.

Covariates are conservatively excluded.

PDR.60 The parameters in θ that were evaluated during model selection.

PDR.61 The parameters in θ of the selected model.

PDR.62 The rationale used for selecting θ including comparisons of AIC.

PDR.60, PDR.61, and PDR.62 are not relevant to this project as the parameter θ is a covariate and is conservatively excluded.

The parameters α and β were estimated using the logistic function defined by equation A.4 and A.5 of the methodology:

$$F_{DF}(t,n) = \frac{1}{1 + exp[-n(t,\theta)]}$$

$$n = \alpha + \beta t + \theta x^T + \delta_{PR}$$

Covariates were conservatively excluded and θ was not included in the model. These estimates were made using an R script that has been shared with auditors (see CDM_final_v5.R). Figure 21 provides a visual representation of the logistic model of deforestation. The values for α and β were -3.728 and 0.0005, respectively.

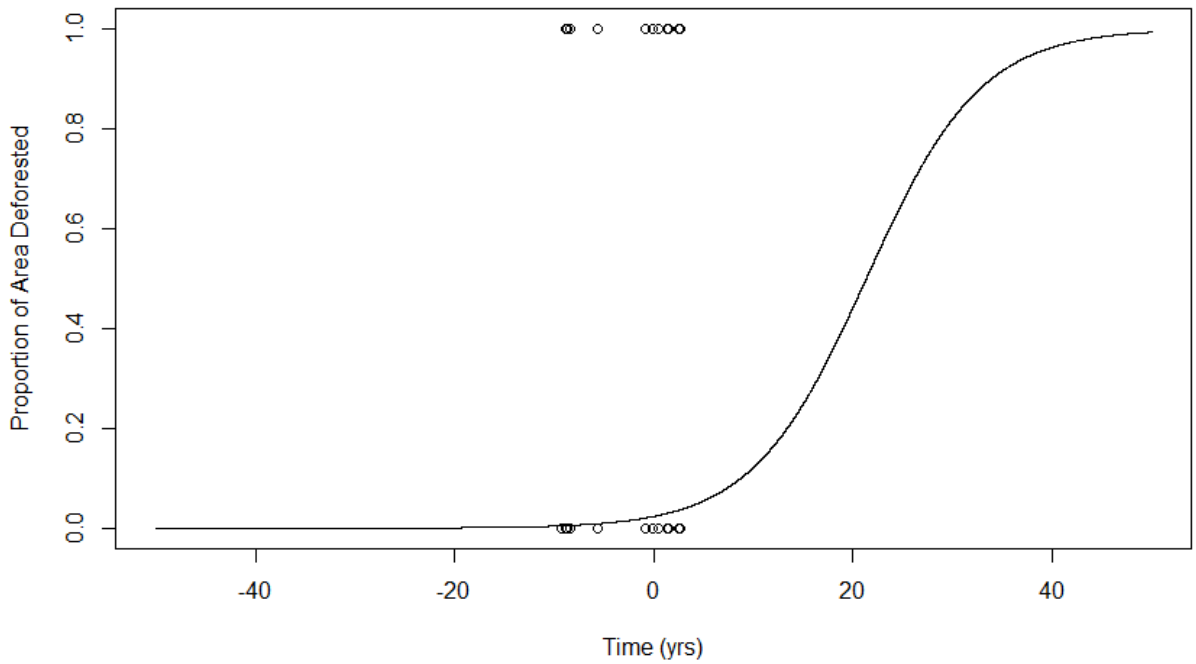


Figure 21: Logistic function of deforestation over time within the project area relative to the project start date

PDR.63 A protocol for interpreting land cover state from imagery, which must include guidance for interpreting the following: Discerning conversion features using shape, texture and context in the reference area landscape Addressing seasonal variation of vegetation (phenology) within imagery Identifying and addressing the characteristics of specific landscape configurations (ie, mosaic forest, grassland, etc.)

The protocol for interpreting land cover imagery has been shared with auditors in the document "Landcover Classification SOP". Each point was classified into a sub-class listed in table 10, but for the purposes of the methodology these sub-classes have been grouped into a class of forest, non-forest, or no image. This was done since the methodology calculates values for parameters based on the conversion rate of forest to non-forest, ignoring points in time that are unable to be classified due to cloud, cloud shadow, or areas of no image in Landsat-7 imagery.

Original Land Cover Class	Class Group
No Image	No Image/Cloud/Shadow
Cloud/Shadow	No Image/Cloud/Shadow
Primary Forest	Forest

Secondary Forest	Forest
Grassland	Non-Forest
Bare Soil	Non-Forest
Burn Scar	Non-Forest
Wetland	Non-Forest
Settlement	Non-Forest
Other	Non-Forest

Table 10. Land cover classes and groups for parameters and accuracy assessment

PDR.64 The results of an independent check of the interpretation

Class Grouping	Forest	Non-Forest	Cloud / Cloud Shadow / No Image	Total	User's Accuracy
Forest	**503**	6	0	509	**98.82%**
Non-Forest	12	**8**	3	23	**34.78%**
Cloud / Cloud Shadow / No Image	100	1	**197**	298	**66.11%**
Total	615	15	200	830	
Producer's Accuracy	**81.79%**	**53.33%**	**98.50%**		**83.30%**

Table 11. Results of independent check of the reference area point interpretation

PDR.65 Evidence that systematic errors, if any, from the independent check of the interpretation were corrected.

No systematic errors were identified in the accuracy assessment. The VM0009 Methdology does not provide a threshold for accuracy, but overall accuracy of 83.3% exceeds the thresholds of other methodologies.

PDR.66 The estimated uncertainty σEM from [F.13] and statistical summaries from model fitting software, if available.

The estimated uncertainty σEM has a value of 0.103.

PDR.67 Reference to uncertainty calculations.

This value of σEM was calculated in the workbook "UncertaintyCalculations_RefRegionENB".

4.1.3 Determining Parameters for the BEM

PDR.68 The parameter *tSA* as the number of days after the primary agent begins commercial logging until when the secondary agent of deforestation is likely to begin degrading the project accounting area.

PDR.69 A description of how *tSA* was obtained.

Per the VM0009 methodology, t_{SA} is the number of days after the primary agent begins commercial logging until when the secondary agent of deforestation is likely to begin degrading the project accounting area [PDR.68]. Literature on deforestation within PNG has determined that subsistence agriculture significantly contributes to deforestation within PNG (Shearman, et al., 2008). Additionally, this research team later determined that the "older a logging concession is in PNG, the greater the proportion of the logged area that is likely to be converted" and point out that post-logging deforestation does not plateau as would be expected if deforestation in concessions was only due to the construction of roads and related logging infrastructure (Bryan, Kirkpatrick, Shearman, & Ash, 2011). These researchers attribute this continued deforestation partially to natural disturbances such as fire, but note that many fires within PNG forests are a result of anthropogenic activities as part of the slash-and-burn agriculture commonly practiced within PNG. As this continued deforestation by secondary agents is part of the baseline scenario for this project, all PAIs will need to fulfill Eligibility Criteria #8 to ensure that this baseline scenario of continued deforestation by secondary agents following the departure of the primary agent is applicable.

T_{SA} will be determined using available information on how secondary agents respond to the industrial harvesting that would have occurred in the baseline scenario and will be dependent on the harvesting length for the entirety of each individual PAI. The methodology notes that in many cases this parameter "is the length of the logging period to harvest the first regulated harvest unit" and that secondary agents then utilize the remaining infrastructure and the end of forest patrols by the primary agent to access areas of secondary forest. As noted above, many logging concessions continue to be deforested within PNG following the end of logging activities, supporting this being applicable to concessions within PNG near villages and settlements. Thus, T_{SA} will be calculated separately for each PAI, and will be determined based on the harvest length for each specific PAI, at which time the primary agent leaves to log a new harvest bloc (see Figure 10 of the VM0009 Methodology).

Scheduled harvesting in the Kamlapar PAI would take 2 years (see PDR.77 below) and the project conservatively assumes that secondary agents would be unable to use the roads and other access points until the primary agent is no longer working in the area. As suggested by the VM0009 methodology, the project proponent determined that using the logging period of the first harvest length is applicable to this PAI, as it would be legally-sanctioned commercial logging. This is a conservative assumption, as there is evidence of increased deforestation within the proxy area immediately following initial logging activities. Figure 22 is a map produced using the Hansen dataset within the proxy area

and shows an increase in deforestation following the arrival of industrial logging that began in 2008. Analysis of this data found that 29.34 hectares of the proxy area were deforested between 2000 and 2007 (prior to initiation of logging activities), while 74.88 hectares of the proxy area was deforested between 2008 and 2010 (period immediately following initial logging activities). While the available data does not allow for distinction between deforestation from secondary agents and as a part of logging activities, the visible pattern of mosaic deforestation is consistent with patterns of slash-and-burn agriculture. This suggests that the cascading deforestation by secondary agents can happen immediately following implementation of logging activities, even before the departure of the primary agent. Thus, it is conservative to use the length of the harvest period for a PAI. The parameter t_{SA} has a value of 730 days for the initial PAI and this parameter will be updated for later PAIs as they are added to the project.

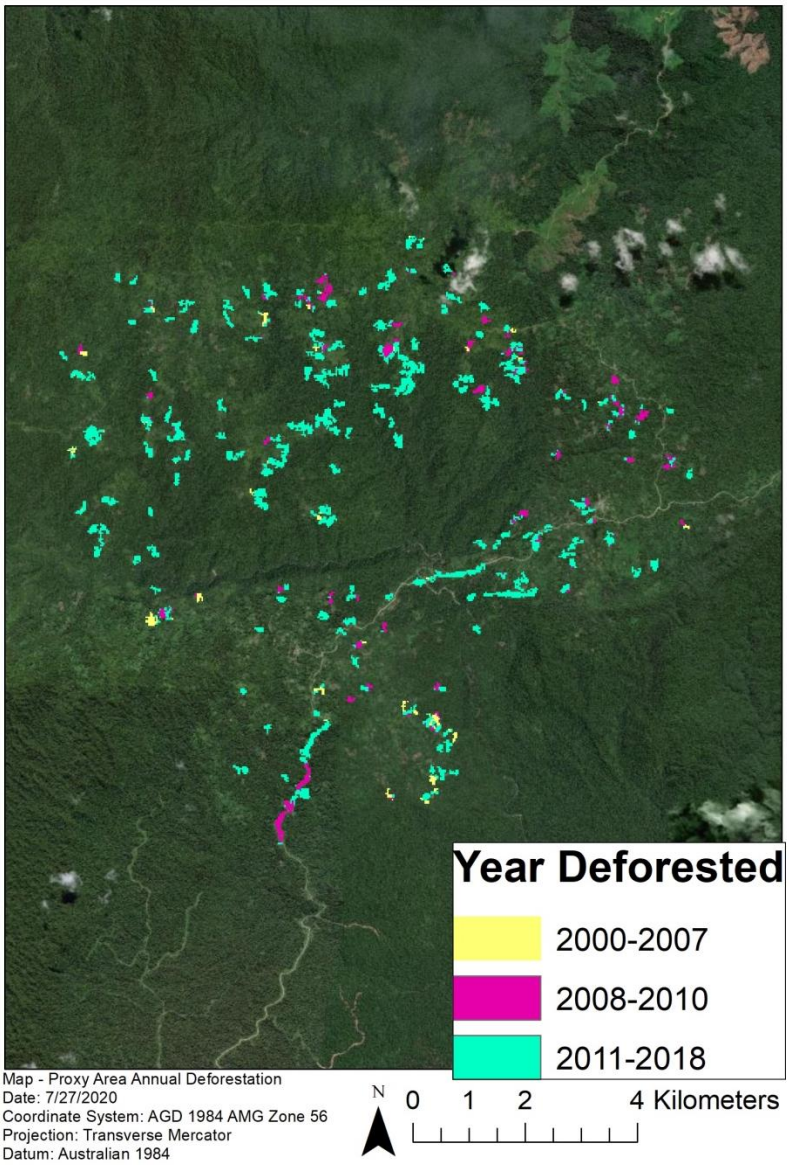


Figure 22: Annual deforestation within the proxy area

PDR.70 Harvest plans for the project accounting area under the baseline scenario, results from the PRA or analysis of the reference area to determine the parameter.

The document 'NIHT Timber Plan in Konoagil' details the logging that would have occurred in the initial PAI and surrounding instances controlled by the primary agent of the initial PAI.

PDR.71 The parameter tPA as the number of days relative to the project start date when the primary agent began or would have begun legally-sanctioned commercial logging in the project accounting area.

The value for t_{PA} is 0.

PDR.72 A description of how tPA was obtained.

The value for t_{PA} was obtained calculated from the difference between the project start date and the date on which the initial PAI was added to the project, which for the initial PAI are the same date.

PDR.73 Harvest plans for the project accounting area under the baseline scenario or public records to support the determination of the parameter.

The parameter t_{PA} is the number of days relative to the project start date when the primary agent began or would have begun legally-sanctioned commercial logging [PDR.71]. According to the harvest plans prepared by the primary agent, commercial logging would have begun on the project start date of 1 June 2017, so parameter t_{pa} has a value of 0. While commercial logging by the primary agent was never started due to their shift to a conservation project, harvest plans have been prepared by a PNG forester in order to demonstrate how the primary agent would have acted under the baseline scenario. These harvest plans are found in attachment 'Konoagil Logging Plan'.

PDR.74 A table of covariate values as of the project start date and a description of how the values were determined including any interpolation or extrapolation methods.

PDR.75 Justification for why the rate of conversion predicted by covariates exceeds the rate indicated from historical conversion patterns.

PDR.74 and PDR.75 are not applicable as no covariate values were used.

PDR.76 The parameter m as the average carbon in merchantable trees cut each year as a result of legally-sanctioned commercial logging.

The parameter *m* has a value of 1,581,020 $tCO_2e\ yr^{-1}$.

PDR.77 Documentation of how m was determined. This may include an analysis of carbon stocks in merchantable trees in the project accounting area, timber harvest plans for the

project accounting area or reference to a publication containing the maximum allowable cut applicable to the project area. The parameter must be greater than zero.

The parameter *m* is the average carbon in merchantable trees cut each year as a result of legally-sanctioned harvesting [PDR.76]. It will be calculated separately for each PAI based on carbon stocks and the annual harvest area for that PAI. It is calculated by multiplying the sum of $C_{AGMT}^{[m=0]}$ (296.5 tCO_2e ha^{-1}[1]) and $C_{BGMT}^{[m=0]}$ (109.7 tCO_2e yr^{-1}) by the annual harvest area (3,892.1 ha). The annual harvest area was conservatively estimated using the annuable allowable cut (AAC) estimated in the Konoagil Logging Plan and feedback from a professional forester in PNG who has experience implementing logging projects within the country. The clans of Konoagil transferred logging rights to the entirety of the Konoagil region to the project proponent. Based on this logging plan, the AAC would be 9,000 hectares. However, while the AAC cannot be exceeded, there is nothing prohibiting the primary agent from harvesting less than the AAC. Thus, the annual harvest area for each PAI will be determined as it is added to the project. This value cannot exceed the AAC and should be conservatively selected based on the total area of the PAI and carbon stocks within it. Additionally, in the baseline scenario for Konoagil it is likely that logging activities would ramp up over time, as infrastructure would need to be developed and the business would need time to expand.

The initial PAI has a harvestable area of 7,784.1 hectares. As this area was found to have high carbon stocks and it would have been the first area within Konoagil logged in the baseline scenario, it is conservative for it to be logged over a period of two years instead of one, even though the AAC would permit the entirety of the PAI to be harvested within one year. Thus, the annual harvest area for the initial PAI is 3,892.1 hectares, as that divides the harvestable area of the Kamlapar PAI over a period of two years.

Carbon stocks for $C_{AGMT}^{[m=0]}$ and $C_{BGMT}^{[m=0]}$ were estimated from an inventory of merchantable trees within the harvestable areas of the initial PAI and will be updated for new PAIs as they are added to the project. The inventory workbook estimating $C_{AGMT}^{[m=0]}$ and $C_{BGMT}^{[m=0]}$ in addition to the *m* parameter has been provided to auditors in “NIHT_KamlaparILG_Treelist”. While PNG does not provide an area for the maximum annual allowable cut (AAC) applicable to the project area, an annual harvest area of 3,892.1 ha is well below common practice for industrial logging within PNG, with literature sources identifying annual coupes that have exceeded 22,000 hectares (Food and Agriculture Organization, 2011). More information on the industrial logging in the baseline scenario for the initial PAI will be included in the monitoring report and Konoagil Logging Plan.

PDR.78 The project shift parameter γ as the number of days between the beginning of the historical reference period and the project start date.

[1] Values in parentheses are for the Kamlapar PAI

The project shift parameter *γ* is the number of days between the beginning of the historical reference period and the project start date [PDR.78]. As the reference area has multiple agents (logging companies) operating within it, per section 6.8.2.1 of the VM0009 methodology the reference period start date is established as the earliest date that an agent acquired control of the land. The project proponent has timber export records from each concession within the reference region and identified the Toriu Head Waters (FCA 15-04) as the first established logging operation there. The first record of logging exports is dated 16 July 2008 and according to the PNG Forest Authority's 2013 National Forest Plan the Forest Clearance Authority for this area was issued 15 January 2008 (PNG Forest Authority, 2011). The value for the γ parameter is -3,425, the number of days between 15 January 2008 and the project start date of 1 June 2017.

PDR.79 The parameter q as the number of days between the onset of degradation and the beginning of conversion.

PDR.80 If the default of zero is not selected for q, then a justification for the determination of q.

The parameter *q* is the number of days between the onset of degradation and the beginning of conversion [PDR.79]. The conservative methodological default value of zero days was selected.

4.1.4 Baseline Emissions from Selected Pools

Cumulative baseline emissions were quantified using the Biomass Emissions Model (BEM) of the VM0009 Methodology. Since the soil carbon pool was conservatively excluded, the Soil Emissions Model (SEM) is not required. The BEM estimates total emissions from biomass due to both deforestation and degradation, including emissions as a result of industrial harvesting in the baseline scenario. This approach is documented in sections 6.6-6.18 and 8.1 as well as Appendices F and G of the VM0009 methodology v3.0.

Calculating Baseline Emissions from Biomass

Cumulative baseline emissions from biomass ($E_{B\,BM}^{[m]}$) for F.p1.b project types are estimated using equation [F.19] of the VM0009 methodology:

$$E_{B\,BM}^{[m]} = BEM_{P1}\left(c_{P\,BM}^{[m=0]}, c_{B\,BM}^{[m]}, t^{[m]}, x^{[m]}\right)$$

Equation [F.2] estimates BEMP1 for F.p1.b projects:

$$BEM_{P1}(c_P, c_B, t, x) = \frac{m(t - t_{PA})}{365(1 + e^{t - t_{SA} - t_{PA} - t_{PAI}})} + \frac{A_{PAA}(c_P - c_B)e^{t - t_{SA} - t_{PA} - t_{PAI}} + \frac{HA_{P1}(c_P, c_B)t}{t_{PL} - t_{PAI}}}{(1 + e^{t - t_{SA} - t_{PA} - t_{PAI}})\left[1 + e^{ln\left(\frac{365A_{PAA}(c_P - c_B)}{m(t_{SA} - t_{PAI})} - 1\right) - \beta(t - t_{SA} - t_{PA} - t_{PAI}) - \boldsymbol{\theta}(\boldsymbol{x}_{SA} - \boldsymbol{x} - \boldsymbol{x}_{PAI})^T}\right]} - HA_{P1}(c_P, c_B)$$

Where:

$$HA_{P1}(c_P, c_B) = \frac{m}{365(1 + e^{-t_{SA} - t_{PA} - t_{PAI}})} + \frac{A_{PAA}(c_P - c_B)e^{-t_{SA} - t_{PA} - t_{PAI}}}{(1 + e^{-t_{SA} - t_{PA} - t_{PAI}})\left[1 + e^{ln\left(\frac{365A_{PAA}(c_P - c_B)}{m(t_{SA} - t_{PAI})} - 1\right) + \beta(t_{SA} + t_{PA} + t_{PAI}) - \boldsymbol{\theta}(\boldsymbol{x}_{SA} - \boldsymbol{x} - \boldsymbol{x}_{PAI})^T}\right]}$$

Calculating Baseline Carbon not Decayed in DW

Current emissions from DW are estimated using equation [F.35] of the VM0009 Methodology:

$$E_{B\,\Delta DW}^{[m]} = E_{B\,DW}^{[m]} - E_{B\,DW}^{[m-1]}$$

Carbon not decayed in DW is estimated using equation [F.36] of methodology:

$$C_{B\,DW}^{[m]} = \sum_{i \in M} DEM_{DW}\left(E_{B\,\Delta \mathrm{DW}}^{[m]}, t, t^{[m-1]}, t^{[m]}\right)$$

The Decay Emissions Model for carbon in dead wood and below-ground biomass are based on the default VCS decay models for these pools. Carbon not decayed in DW is removed from annual baseline emissions.

Calculating Carbon Not Decayed in BGB ($C_{B\,BGB}^{[m]}$)

Current emissions from BGB are estimated using equation [F.31] of the methodology:

$$E_{B\,\Delta BGB}^{[m]} = E_{B\,BGB}^{[m]} - E_{B\,BGB}^{[m-1]}$$

Carbon not decayed in BGB is estimated using equation [F.32] of the methodology:

$$C_{B\,BGB}^{[m]} = \sum_{i \in M} DEM_{DW,BGB}\left(E_{B\,\Delta \mathrm{BGB}}^{[i]}, t, t^{[m]}, t^{[i-1]}\right)$$

The Decay Emissions Model for carbon in dead wood and below-ground biomass are based on the default VCS decay models for these pools. Carbon not decayed in BGB is removed from annual baseline emissions.

Calculating Carbon Stored in WP

As described in section 3.4, all AGMT that is not considered slash is sequestered in long-lived wood products, specifically as roundwood, the primary timber export from PNG. The amount of carbon stored in wood products is determined using equation [C.1] of the VM0009 methodology:

$$C_{B\,WP}^{[m]} = (1-w)\left(E_{B\,AGMT}^{[m]}\right)\sum_{ty\in\mathcal{T}} p_{ty}^{[m]} l_{ty}\left(1-f_{ty}\right)^{95}$$

The values for parameters w, $l_{t,y}$, and f_{ty}, were all taken from tables 8 and 9 of Appendix C of the methodology. Carbon stored in wood products is removed from the annual BEM estimate.

Calculating Cumulative Baseline Emissions

Cumulative total baseline emissions are estimated using equation [F.16] of the methodology:

$$E_{B}^{[m]} = E_{B\,BM}^{[m]} - C_{B\,BGB}^{[m]} - C_{B\,DW}^{[m]} - C_{B\,WP}^{[m]}$$

This equation provides an estimate of baseline emissions for each monitoring period by subtracting carbon stored in the BGB, DW, and WP pools from the biomass emissions estimate provided by the BEM.

4.2 Project Emissions

The VM0009 methodology calculates project emissions from biomass from fire, burning, logging, or other disturbances. These emissions are calculated using equation [F.41] of the methodology:

$$E_{P\,\Delta}^{[m]} = E_{P\,\Delta\,BRN}^{[m]} + A_{PAA}\left(c_{P}^{[m-1]} - c_{P}^{[m]}\right) - C_{P\,\Delta\,WP}^{[m]}$$

4.2.1 Calculating Emissions from Changes in Project Stocks

Changes in project stocks are observed through monitoring of carbon stocks within each PAI during each monitoring period. Additional monitoring will include routine field patrols that will be supplemented with an analysis of remote sensing imagery to identify the full extent of disturbances. The changes in carbon stocks are calculated as the difference between project stocks between the current and prior monitoring period [F.41]:

$$E_{P\,\Delta}^{[m]} = E_{P\,\Delta\,BRN}^{[m]} + E_{P\,\Delta\,LS}^{[m]} + E_{P\,\Delta\,SF}^{[m]} + A_{PAA}\left(C_{P}^{[m-1]} - C_{P}^{[m]}\right) - C_{P\,\Delta\,WP}^{[m]}$$

Loss from burning, wood products, and leakage are accounted for separately as described below.

4.2.2 Calculating Emissions from Burning

No planned project activity will require burning of biomass and it is will likely not be included in carbon accounting. However, if any future activities lead to the burning of biomass they will be calculated using equation [F.42]:

$$E_{P\,\Delta\,BRN}^{[m]} = \left(\frac{44}{12}\right) 0.66 \sum_{b \in \mathcal{W}^{[m]}} r_{CF\,b}\, B_{b^{[m]}}$$

4.2.3 Calculating Carbon Stored in WP

The project proponent has not yet implemented any timber harvesting or made plans with community partners to begin developing artisanal timber projects. However, some level of timber harvesting is expected as a project activity. When this activity is implemented, project emissions from carbon stored in wood products will be calculated using equation [C.2] of the methodology and reported during each monitoring period:

$$C_{P\,\Delta\,WP}^{[m]} = (1 - w) \sum_{ty \in \mathcal{T}} C_{P\,ty}^{[m]} l_{ty} \left(1 - f_{ty}\right)^{95}$$

4.2.4 Ex-Ante Estimate of Project Emissions

Initial project activities have had no negative impacts on carbon stocks within the initial project accounting area and there have been no identified disturbances during the initial monitoring period. Thus, project emissions for the initial monitoring period are 0 tCO_2e. However, in order to provide an ex-ante estimate of project emissions across the project lifetime, it was conservatively estimated that there will be 20 ha of deforestation annually within each PAI once it is added to the project. This is conservative because historical disturbances within the area are minimal (see Non-Permanence Risk Report) and the greatest threat to these forests, industrial logging, will be prohibited. At this time, it is not known how frequently PAIs will be added to the project or how large they will be since this will depend on adoption of the project by local communities. In order to provide an estimate of ex-ante project emissions, the project proponent has made the assumption that two additional PAIs will be added every three years, with one PAI added in the first year, another added in the second year, and then none added in the third year, starting at the end of the initial monitoring period until the end of the 30 year project lifetime.

The emissions factor for each ha of deforestation in this scenario is estimated as the difference between total carbon stocks in the initial project accounting area and the proxy area. This is conservative as it ignores the decay over time of the BGB and DW pools. Ex-ante estimates of project emissions are provided in Table *12*. Project emissions for the first three years of the project are 0 tCO_2e as there were no recorded emissions for the initial monitoring period (see Monitoring Report).

Year	Total number of PAIs	Annual deforestation (ha)	Estimated project emissions (tCO_2e)
1	1	20	0

2	1	20	0
3	1	20	0
4	2	40	13,020
5	3	60	19,530
6	3	60	19,530
7	4	80	26,041
8	5	100	32,551
9	5	100	32,551
10	6	120	39,061
11	7	140	45,571
12	7	140	45,571
13	8	160	52,081
14	9	180	58,591
15	9	180	58,591
16	9	180	58,591
17	10	200	65,101
18	10	200	65,101
19	11	220	71,612
20	12	240	78,122
21	12	240	78,122
22	13	260	84,632
23	14	280	91,142
24	14	280	91,142
25	15	300	97,652
26	16	320	104,162
27	16	320	104,162
28	17	340	110,672

29	18	360	117,183
30	19	380	123,693
Total	**N/A**	**5,540**	1,783,779

Table *12*. Ex-ante estimate of project emissions across the project lifetime

4.3 Leakage

4.3.1 Activity Shifting Leakage

The VM0009 Methodology requires that activity-shifting leakage emissions be monitored within an activity-shifting leakage area where there are areas outside the PAA subject to deforestation and/or degradation by the agents of conversion. Activity-shifting leakage emissions are estimated by monitoring changes in carbon stocks within inventory plots allocated in the delineated activity-shifting leakage area. The inventory protocol for the leakage area should be the same as the one used for the PAA.

PDR.104 A list of project activities designed to mitigate leakage.

The primary driver of conversion in the PAA in the baseline scenario is industrial logging. To address this issue, the project proponent has taken measures to prevent this logging from occurring within the areas it controls logging rights by developing this REDD+ project. The project has been designed to mitigate the risk of activity-shifting leakage by including Eligibility Criteria #10. This will prevent primary agents from enrolling only some of their lands in the project while continuing to log elsewhere. The primary agent in the initial PAI will not be doing this type of logging either inside or outside of the PAA within PNG. Benefits from this project will be shared with secondary agents (i.e. local communities). This will provide alternative livelihood options that will reduce conversion pressure on forested areas both inside and outside of the PAA.

PDR.105 A map of the delineated boundaries (Delineation of the activity shifting leakage area).

PDR.106 Delineation of the Activity Shifting Leakage Area. Maps of the landscape configuration, including: a. Topography (elevation, slope, aspect); b. Recent land use and land cover (either a thematic map created by the project proponent or publicly available map); c. Access points; d. Soil class maps (if available); e. Locations of important markets; f. Locations of important resources like waterways or roads; and g. Land ownership/tenure boundaries.

PDR.107 Delineation of the Activity Shifting Leakage Area. A narrative describing the rationale for selection of activity shifting leakage area boundaries. If the activity-shifting leakage area is smaller than the project accounting area or cannot be defined, justification for the size of the area. If foreign agents have been identified as an agent of

conversion, justification that they are unlikely to shift their activities outside the activity-shifting leakage area.

PDR.105, PDR.106, and PDR.107 are not applicable as Eligibility Criteria #10 prohibits primary agents from moving logging activities elsewhere within PNG. An activity-shifting leakage area is only required when an agent of conversion has access to areas outside the PAA to shift conversion activities. Since this is an F-P1.b project and the primary driver of conversion is industrial logging, an activity shifting leakage area would only be required for a PAA in which the primary agent is actively harvesting outside of the PAA but within PNG. Since this would not fulfill Eligibility Criteria #10, such a scenario is not possible for a PAI included in the project. Secondary agents are similarly restricted due to limited access to logged areas as required for their conversion activities.

PDR.108 Delineation of the Activity Shifting Leakage Area. Results of a spatial analysis to demonstrate the activity shifting leakage area is entirely forested as of the project start date.

PDR.109 Delineation of the Activity Shifting Leakage Area. Results of a spatial analysis to demonstrate the activity shifting leakage area is no larger than the project accounting area.

PDR.108 and PDR.109 are not applicable as there will be no activity-shifting leakage areas.

PDR. 124 Summary of sampling procedures for the activity-shifting leakage areas, with a copy of a sampling protocol used to carry out measurements.

PDR.124 is not applicable as there is no activity-shifting leakage area.

4.3.2 Market Leakage

Market leakage occurs when there is a shift in commodity production due to a reduction in supply of those commodities (most likely wood products/timber) due to project activities. Within the context of this project, market leakage would only occur if an added PAI is being actively logged prior to joining the project, since this would result in a reduction of the supply of wood products within PNG. However, per Eligibility Criteria #11, only areas in which there has been no industrial commercial timber project for at least 10 years prior to the PAI start date will be eligible to join the project. There will be no market leakage from this project.

PDR.110 The selected discount factor pL ME.

The market leakage discount factor is 0%, as Eligibility Criteria #11 disqualifies areas that contain an industrial timber project at the scale required to impact the PNG's supply of timber from joining the project.

PDR.111 Calculations of cL AGMT in the market leakage area, including references to literature if cited.

PDR.111 is not applicable as there is no market leakage area for the initial PAI. There is no estimate for the value of $c_{L\ AGMT}$.

PDR.112 Justification for the selection of the discount factor.

The selected discount factor of 0% is justified as there will have been no industrial timber projects within any PAI that is included in the project, as required by Eligibility Criteria #11. There is no reduction in the supply of wood products as a result of project activities and thus no market leakage.

PDR.113 A map of the delineated market leakage boundaries.

PDR.114 Maps of the market leakage area landscape configuration, including: a. Topography (elevation, slope, aspect); b. Recent land use and land cover (either a thematic map created by the project proponent or publicly available map); c. Access points; d. Soil class maps (if available); e. Locations of important markets; f. Locations of important resources like waterways or roads; and g. Land ownership/tenure boundaries.

PDR.115 A narrative describing the rationale for selection of market leakage area boundaries.

PDR.113, PDR.114, and PDR.115 are not applicable, as Eligibility Criteria #11 eliminates the possibility of market leakage and thus no market leakage area is required.

PDR.116 Results of a spatial analysis to demonstrate the market leakage area is entirely forested as of the project start date.

PDR.117 Results of a spatial analysis to demonstrate the market leakage area is as large or larger than the project accounting area.

PDR.116 and PDR.117 are not applicable.

4.4 Net GHG Emission Reductions and Removals

4.4.1 Quantifying Gross Emissions Reductions for a PAA

Gross Emissions Reductions (GERs) are calculated for each PAA at each monitoring period using equation [F.53] of the methodology:

$$E_{\Delta GER}^{[m]} = E_{B\,\Delta}^{[m]} - E_{P\,\Delta}^{[m]} - E_{L\,\Delta}^{[m]} - E_{U}^{[m]}$$

Equations for calculating baseline, project, and leakage emissions have been described in above sections. Uncertainty deductions are calculated with equation [F.57] and should be documented for each monitoring period:

$$E_{U}^{[m]} = E_{B\,\Delta}^{[m]}\left[\frac{1.64}{E_{B\,\Delta}^{[m]} + A_{PAA}c_{P}^{[m]} + A_{PX}c_{B}^{[m]}}\sqrt{\left(U_{EM}^{[M]}\right)^2 + \left(U_{P}^{[m]}\right)^2 + \left(U_{B}^{[m]}\right)^2} - 0.15\right]$$

PDR.118 The projected avoided baseline emissions, project emissions and leakage for each monitoring period and vintage year over the lifetime of the project.

PDR.119 A narrative description of sources used to estimate the leakage rate and demonstration that the estimated rate is conservative.

PDR.120 If included in project activities, a description of procedures used to estimate the rate of biomass burning, charcoal production or logging and demonstration that these estimates are conservative

Net Emissions Reductions (NERs) are estimated with equation [F.55]:

$$E_{\Delta\,NER}^{[m]} = E_{\Delta\,GER}^{[m]} - E_{BA}^{[m]}$$

Ex-ante estimates are provided in Table 13. below. These ex-ante estimates are for the entire designated geographic area based on BEM estimates for the first PAI in Kamlapar. This assumes that future PAIs will have similarly stocked forests and harvest areas to this first PAI, which may not be the case due to uncertainty for future PAIs. However, per the methodology, ex-ante estimates are only required to determine whether changes within carbon pools or increased GHG emissions due to project activities are insignificant. As the project has only conservatively excluded selected pools such as SDW and LDW will account for all significant emissions due to project activities, these ex-ante estimates are only meant to provide potential crediting estimates across the project lifetime.

Estimated baseline emissions will change as future PAIs are added to the project. The addition of future PAIs will require delineation of the area of the PAA as well as an inventory of carbon stocks within that specific PAA. Thus, reported baseline emissions are only an estimate that assumes that future PAIs will have similar areas and carbon stocks to the original PAI. This design for estimating ex-ante baseline emissions across all PAIs is the same as was done for ex-ante project emissions (see Section 4.2.4). Future reported baseline emissions will likely change significantly at verification events due to the addition of new PAIs and inventory results. Project emissions will vary based on actual monitored disturbances within each PAA.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
1	426,685	0	0	426,685
2	803,415	0	0	803,415
3	450,206	0	0	450,206
4	657,076	13,020	0	644,056

5	1,523,244	19,530	0	1,503,714
6	1,500,952	19,530	0	1,481,421
7	1,293,835	26,041	0	1,267,795
8	1,845,782	32,551	0	1,813,231
9	1,858,083	32,551	0	1,825,532
10	1,632,365	39,061	0	1,593,304
11	2,170,003	45,571	0	2,124,432
12	2,120,914	45,571	0	2,075,343
13	1,823,037	52,081	0	1,770,956
14	2,330,369	58,591	0	2,271,778
15	2,270,602	58,591	0	2,212,011
16	1,951,454	58,591	0	1,892,862
17	2,372,912	65,101	0	2,307,810
18	2,326,222	65,101	0	2,261,120
19	1,975,567	71,612	0	1,903,956
20	2,389,585	78,122	0	2,311,463
21	2,344,709	78,122	0	2,266,588
22	2,005,590	84,632	0	1,920,958
23	2,398,849	91,142	0	2,307,707
24	2,357,572	91,142	0	2,266,430
25	2,013,246	97,652	0	1,915,593
26	2,395,149	104,162	0	2,290,987
27	2,359,385	104,162	0	2,255,223
28	2,020,955	110,672	0	1,910,283
29	2,398,732	117,183	0	2,281,550
30	2,858,073	123,693	0	2,734,381
Total	56,874,569	1,783,779	0	55,090,789

Table *13*. Ex-ante estimate of emissions reductions across the project lifetime

5 MONITORING

5.1 Data and Parameters Available at Validation

PDR.121 The value for each variable in Appendix G.

Data / Parameter	α
Data unit	unitless
Description	Combined effects of β and q at the start of the historic reference period
Source of data	Reference area and historic reference period
Value applied	-3.7278244
Justification of choice of data or description of measurement methods and procedures applied	Landcover point interpretation within reference area
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	b
Data unit	unitless
Description	Effect of time on the cumulative proportion of deforestation over time
Source of data	Reference area and historic reference period
Value applied	0.0004784
Justification of choice of data or description of measurement methods and procedures applied	Landcover point interpretation within reference area
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	γ
Data unit	days

Description	Time shift from beginning of historic reference period to project start date
Source of data	Historic reference period
Value applied	-3425
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	q
Data unit	unitless
Description	Effect of certain covariates on the cumulative proportion of deforestation over time
Source of data	Reference area and historic reference period
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	All covariates conservatively excluded

Data / Parameter	ISOC
Data unit	proportion (unitless)
Description	Exponential soil carbon decay parameter
Source of data	Default values, literature estimates or empirical estimation based on reference area sampling
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	Soil carbon conservatively excluded at validation

Data / Parameter	σˆEM
Data unit	standard deviation (unitless)
Description	The estimated standard deviation of the state observations used to fit the logistic function
Source of data	Remote sensing image interpretation
Value applied	0.103
Justification of choice of data or description of measurement methods and procedures applied	Calculations completed in workbook provided to auditors (UncertaintyCalculations_RefRegionENB)
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	$\mathcal{B}$
Data unit	set
Description	The set of all selected carbon pools in biomass. Is a subset of $\mathcal{C}$
Source of data	PDD Section 3.3
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline emissions
Comments	Selected carbon pools are listed in Table 3 of the PDD

Data / Parameter	$\mathcal{C}$
Data unit	set
Description	The set of all selected carbon pools
Source of data	PDD Section 3.3
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline emissions
Comments	Selected carbon pools are listed in Table 3 of the PDD

Data / Parameter	$\mathcal{J}$
Data unit	set
Description	The set of all observations of deforestation. When superscripted with a monitoring period, the deforestation observations are taken for leakage analysis.
Source of data	Remote sensing image interpretation or field observations in the leakage area.
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	

Data / Parameter	$\mathcal{M}$
Data unit	set
Description	The set of all monitoring periods
Source of data	Monitoring records
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of project emissions
Comments	All monitoring periods for each project accounting area

Data / Parameter	ApAA
Data unit	ha
Description	Area of project accounting area
Source of data	GIS analysis prior to sampling
Value applied	10443.029
Justification of choice of data or description of measurement methods	N/A

and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	Apx
Data unit	ha
Description	Area of proxy area
Source of data	GIS analysis prior to sampling
Value applied	447.722
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	CLp
Data unit	tCO2e/ha
Description	Carbon stocks in project leakage
Source of data	Leakage area sampling
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	A leakage area is not required at validation or for first monitoring period

Data / Parameter	m
Data unit	tCO2e/ha/yr
Description	Average carbon in merchantable trees cut each year as a result of legally-sanctioned commercial logging
Source of data	Timber harvest plans or measurement of carbon stocks in merchantable trees in the project accounting area

Value applied	1,581,020.5
Justification of choice of data or description of measurement methods and procedures applied	Inventory of carbon stocks in merchantable trees in project accounting area
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	nd
Data unit	sample points
Description	Number of spatial points in the reference area
Source of data	Remote sensing image interpretation
Value applied	831
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline emissions
Comments	nd

Data / Parameter	oi
Data unit	binary
Description	State observation for the $\boldsymbol{i\ t\ h}$ sample point in the reference area
Source of data	Remote sensing image interpretation
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	Landcover point interpretation within reference area
Purpose of Data	Determination of baseline scenario
Comments	

Data / Parameter	pLME
Data unit	proportion (unitless)
Description	Portion of leakage related to market effects

Source of data	PDD Section 4.3.2
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	There is no market leakage at validation or for initial monitoring period

Data / Parameter	q
Data unit	days
Description	Lag between start of degradation and deforestation
Source of data	Methodology default
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	rCF B
Data unit	unitless
Description	Carbon fraction of biomass for burned wood $\boldsymbol{b}$
Source of data	Methodology default
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of project emissions
Comments	Burning is not a part of any project activities.

Data / Parameter	rRS

Data unit	unitless
Description	Expansion factor for above-ground biomass to below-ground biomass (root/shoot ratio)
Source of data	IPCC default root-to-shoot ratio for wet tropical forests
Value applied	0.37
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	rU
Data unit	unitless
Description	Onset proportion of deforestation immediately adjacent to project area
Source of data	GIS analysis and image interpretation
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	Not applicable for FP1 projects

Data / Parameter	ti
Data unit	days
Description	The point in time of the observation made at point i
Source of data	Remote sensing image interpretation
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	Please see workbook UncertaintyCalculations_RefRegionENB for details of calculation.
Purpose of Data	Determination of baseline scenario
Comments	Each point in time has a unique value based on the landcover

	observed

Data / Parameter	tPA
Data unit	days
Description	Time prior to the project start date when the primary agent began commercial logging in the project accounting area
Source of data	Harvest plans prepared for the project accounting area
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Harvesting in the baseline scenario would have begun on the project start date

Data / Parameter	tm
Data unit	days
Description	Length of project or logging in baseline scenario
Source of data	PD
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	N/A
Comments	Will vary based on harvest plan for project accounting area. Emissions calculations use parameter tSA instead for end of commercial harvesting.

Data / Parameter	tPL
Data unit	days
Description	Length of project crediting period
Source of data	PD
Value applied	10957.5
Justification of choice of	

data or description of measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Total length of project crediting period of 30 years

Data / Parameter	tSA
Data unit	days
Description	Arrival time of secondary agents after start of commercial logging
Source of data	Expert knowledge and calculations of harvest period for initial PAI
Value applied	730
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Secondary agents begin arriving immediately following the end of commercial harvesting within a project accounting area. Thus, it will vary depending on the PAI. It will be conservatively assumed that T_{SA} will be the number of days for the entirety of a PAI to be harvested. After completion of harvesting, the primary agent will leave an area and no longer patrol it, leaving behind infrastructure (specifically roads) that provide access to degraded forest that is easier to be cleared for agriculture.

Data / Parameter	wi
Data unit	unitless
Description	weight applied to the $it\ h$ sample point in the reference area
Source of data	Remote sensing image interpretation
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	Please see workbook UncertaintyCalculations_RefRegionENB for details of calculation.
Purpose of Data	Calculation of baseline emissions
Comments	Estimated for each point in time of the landcover observation within reference area. Calculated using equation A.6 of the

	methodology.

Data / Parameter	x
Data unit	unitless
Description	Covariate values
Source of data	Participatory Rural Appraisal, analysis of public records, and/or expert interpretation of inventory data or remotely sensed imagery
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	Covariate values are conservatively excluded

Data / Parameter	xi
Data unit	geographic coordinates
Description	Latitude of the ith sample point
Source of data	Remote sensing image interpretation
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	N/A
Comments	Covariate values are conservatively excluded

Data / Parameter	xSA
Data unit	unitless
Description	Covariate values of secondary agents
Source of data	Participatory Rural Appraisal, analysis of public records, and/or expert interpretation of inventory data or remotely sensed imagery
Value applied	N/A
Justification of choice of	N/A

data or description of measurement methods and procedures applied	
Purpose of Data	N/A
Comments	Covariate values are conservatively excluded

Data / Parameter	yi
Data unit	geographic coordinates
Description	Longitude of the ith sample point
Source of data	Remote sensing image interpretation
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Determination of baseline scenario
Comments	Used to check the horizontal accuracy of historical reference imagery

5.2 Data and Parameters Monitored

MR.85 List of parameters from Appendix H, their values and the time last measured.

Data / Parameter	w[m]
Data unit	set
Description	The set of all burned wood
Source of data	Monitoring records
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Every monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	N/A

Calculation method	Summation over measurements
Comments	Parameter not used

Data / Parameter	A[m=0]P1
Data unit	ha
Description	Area of project area stratum 1 at project start
Source of data	GIS analysis prior to sampling
Description of measurement methods and procedures to be applied	GIS analysis of best available data
Frequency of monitoring/recording	At project start
Value monitored	10443.029016
Monitoring equipment	GIS
QA/QC procedures to be applied	Cross-check of GIS analysis
Purpose of the data	Calculation of baseline emissions
Calculation method	GIS analysis
Comments	

Data / Parameter	A[m=0]P2
Data unit	ha
Description	Area of project area stratum 2 at project start
Source of data	GIS analysis prior to sampling
Description of measurement methods and procedures to be applied	GIS analysis of best available data
Frequency of monitoring/recording	At project start
Value monitored	N/A
Monitoring equipment	GIS
QA/QC procedures to be applied	Cross-check of GIS analysis
Purpose of the data	N/A
Calculation method	GIS analysis
Comments	Parameter not used

Data / Parameter	B[m]b
Data unit	tonnes
Description	Biomass in burned wood b
Source of data	Measurements of biomass
Description of measurement methods and procedures to be applied	Scale
Frequency of monitoring/recording	Every monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	Summation
Comments	Parameter not used as no biomass was burned as part of project activities

Data / Parameter	C[m]B
Data unit	tCO2e/ha
Description	Baseline carbon stocks at the end of the current monitoring period
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	B.2,6.4
Frequency of monitoring/recording	Every monitoring period
Value monitored	140.36
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	B.31
Comments	Determined by analysis of carbon inventory within proxy area

Data / Parameter	C[m]B B G B
Data unit	tCO2e
Description	Carbon not decayed in BGB at the end of the current monitoring period
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	8.1.4
Frequency of monitoring/recording	Every monitoring period
Value monitored	726,840
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.32
Comments	Total carbon not decayed in BGB at end of first monitoring period

Data / Parameter	C [m] B DW
Data unit	tCO2e
Description	Carbon not decayed in DW at the end of the current monitoring period
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	8.1.3
Frequency of monitoring/recording	Every monitoring period
Value monitored	765,143
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.36
Comments	Total carbon not decayed in DW at end of first monitoring period

Data / Parameter	C[m]B S O C
Data unit	tCO2e
Description	Carbon not decayed in SOC at the end of the current monitoring period
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	B.2.4 and B.2.5
Frequency of monitoring/recording	Every monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	N/A
Calculation method	Subtraction
Comments	Parameter not used

Data / Parameter	C[m]B W P
Data unit	tCO2e
Description	Carbon not decayed in WP at the end of the current monitoring period.
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	Appendix C
Frequency of monitoring/recording	Every monitoring period
Value monitored	277
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	C.1
Comments	Total carbon not decayed in WP at end of first monitoring period

Data / Parameter	c[m]B AGMT

Data unit	tCO2e/ha
Description	Baseline carbon stocks in above-ground merchantable trees at the end of the current monitoring period
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	B.2.1
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	45.5
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	Weighted per ha average. Described in NIHT Field Measurement Protocol.
Comments	

Data / Parameter	C[m]B BGMT
Data unit	tCO2e/ha
Description	Baseline carbon stocks in below-ground merchantable trees at the end of the current monitoring period
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	B.2.1
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	16.8
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	Weighted per ha average. Described in NIHT Field Measurement Protocol.
Comments	

Data / Parameter	C[m=0]P AGMT
Data unit	tCO2e
Description	Project carbon stocks in above-ground merchantable trees at project start
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2.1
Frequency of monitoring/recording	At project start
Value monitored	296.5
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	Summation across plots in project accounting area
Comments	

Data / Parameter	C[m=0]P BGMT
Data unit	tCO2e
Description	Project carbon stocks in below-ground merchantable trees at project start
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2.3
Frequency of monitoring/recording	At project start
Value monitored	109.7
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	Summation across plots in project accounting area

Comments	

Data / Parameter	c[m]B b
Data unit	tCO2e/ha
Description	Baseline scenario average carbon stock in selected carbon pools
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	B.2.3
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	140.4
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	Weighted per ha average B.33
Comments	

Data / Parameter	C[m]B BM
Data unit	tCO2e/ha
Description	Baseline carbon stocks in biomass at the end of the current monitoring period
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	B.2.3
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	140.4
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	Weighted per ha average B.33

Comments	

Data / Parameter	c[m]B SOC
Data unit	tCO2e/ha
Description	Baseline soil carbon stocks at the end of the current monitoring period
Source of data	Proxy area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	N/A
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	B.9
Comments	Soil carbon conservatively excluded

Data / Parameter	C[m]P
Data unit	tCO2e/ha
Description	Project carbon stocks at the end of the current monitoring period
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	465.9
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	B.33
Comments	

Data / Parameter	c[m-1]P
Data unit	tCO2e/ha
Description	Project carbon stocks at the beginning of the prior monitoring period
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Already monitored
Value monitored	465.9
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Already reviewed
Purpose of the data	Calculation of project emissions
Calculation method	B.33
Comments	There were no disturbances to carbon stocks during this monitoring period

Data / Parameter	C[m-0]P
Data unit	tCO2e/ha
Description	Project carbon stocks prior to first verification event
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	At project start
Value monitored	465.9
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	B.33
Comments	This is the first monitoring period and

	there were no disturbances to carbon stocks during this monitoring period.

Data / Parameter	c[m=0]P 1 BM
Data unit	tCO2e/ha
Description	Project carbon stocks in biomass in stratum 1 at project start
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Prior to first monitoring event
Value monitored	465.9
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	F.17
Comments	Weighted average across project accounting area. All included pools are biomass, so project carbon stocks are equal to project carbon stocks in biomass.

Data / Parameter	C[m=0]P 2 BM
Data unit	tCO2e/ha
Description	Project carbon stocks in biomass in stratum 2 at project start
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Prior to first monitoring event
Value monitored	N/A
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records

Purpose of the data	N/A
Calculation method	F.17
Comments	Parameter not used

Data / Parameter	c[m=0]P 3 BM
Data unit	tCO2e/ha
Description	Project carbon stocks in biomass in stratum 3 at project start
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Prior to first monitoring event
Value monitored	N/A
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	N/A
Calculation method	F.17
Comments	Parameter not used

Data / Parameter	C[m=0]P n BM
Data unit	tCO2e/ha
Description	Project carbon stocks in biomass in stratum n at project start
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Prior to first monitoring event
Value monitored	N/A
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records

Purpose of the data	N/A
Calculation method	F.17
Comments	Parameter not used

Data / Parameter	c[m=0]P AMGT
Data unit	tCO2e/ha
Description	Project carbon stocks in above-ground merchantable trees at project start
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Prior to first monitoring event
Value monitored	296.5
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	Average of merchantable aboveground biomass in all plots in project accounting area
Comments	There were no disturbances to carbon stocks during this monitoring period

Data / Parameter	C[m=0]P BM
Data unit	tCO2e
Description	Project carbon stocks in biomass prior to first verification event
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2.1
Frequency of monitoring/recording	Prior to first monitoring event
Value monitored	465.9
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol

QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.17
Comments	There were no disturbances to project accounting area carbon stocks during this monitoring period

Data / Parameter	c[m]P b
Data unit	tCO2e/ha
Description	Average carbon in biomass in the project accounting area
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	465.9
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.17
Comments	There were no disturbances to project accounting area carbon stocks during this monitoring period

Data / Parameter	C[m]P s b
Data unit	tCO2e/ha
Description	Average carbon in biomass for each project accounting area stratum s
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	465.9

Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.17
Comments	Weighted average across project accounting area

Data / Parameter	c[m=0]P SOC
Data unit	tCO2e/ha
Description	Project soil carbon stocks prior to first verification event
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	B.2.6
Frequency of monitoring/recording	At project start
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	N/A
Calculation method	N/A
Comments	Soil carbon conservatively excluded

Data / Parameter	C[m]P ΔWP
Data unit	tCO2e
Description	Project carbon stocks in wood products at the end of the current monitoring period
Source of data	Project accounting area sampling
Description of measurement methods and procedures to be applied	C
Frequency of monitoring/recording	Every monitoring period
Value monitored	0

Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	C.2
Comments	No timber harvested within the project accounting area during this monitoring period

Data / Parameter	E[m]Δ GER
Data unit	tCO2e
Description	GERs for the current monitoring period
Source of data	Area measurements
Description of measurement methods and procedures to be applied	8.4.1
Frequency of monitoring/recording	Every monitoring period
Value monitored	1,680,306
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of GER calculations
Purpose of the data	Calculation of emissions reductions
Calculation method	F.53
Comments	Calculations completed in document NIHT Accounting Model

Data / Parameter	E[i]Δ GER
Data unit	tCO2e
Description	GERs for monitoring period i
Source of data	Area measurements
Description of measurement methods and procedures to be applied	8.4.1
Frequency of monitoring/recording	Already monitored
Value monitored	1,680,306

Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of GER calculations
Purpose of the data	Calculation of emissions reductions
Calculation method	F.53
Comments	Calculations completed in document NIHT Accounting Model. This is for the first and only monitoring period.

Data / Parameter	E[i]Δ NER
Data unit	tCO2e
Description	NERs for monitoring period i
Source of data	Area measurements
Description of measurement methods and procedures to be applied	8.4.3
Frequency of monitoring/recording	Already monitored
Value monitored	1,327,442
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of NER calculations
Purpose of the data	Calculation of emissions reductions
Calculation method	F.52
Comments	Calculations completed in document NIHT Accounting Model

Data / Parameter	E[m]B
Data unit	tCO2e
Description	Cumulative baseline emissions at the end of the current monitoring period
Source of data	Proxy area measurements
Description of measurement methods and procedures to be applied	8.1
Frequency of monitoring/recording	Every monitoring period
Value monitored	1,680,306

Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.16
Comments	Calculations completed in document NIHT Accounting Model

Data / Parameter	E[m-1]B
Data unit	tCO2e
Description	Cumulative baseline emissions at the beginning of the current monitoring period
Source of data	Proxy area measurements
Description of measurement methods and procedures to be applied	8.1
Frequency of monitoring/recording	Prior monitoring period
Value monitored	0
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.16
Comments	Calculations completed in document NIHT Accounting Model. This is the first monitoring period, so at the beginning of the current monitoring period there were no baseline emissions.

Data / Parameter	E[m]B Δ
Data unit	tCO2e
Description	Change in baseline emissions
Source of data	Proxy area measurements

Description of measurement methods and procedures to be applied	8.1
Frequency of monitoring/recording	Every monitoring period
Value monitored	1,680,306
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.15
Comments	Calculations completed in document NIHT Accounting Model. Difference between cumulative baseline emissions at beginning and end of current monitoring period.

Data / Parameter	E[i]B Δ BGB
Data unit	tCO2e
Description	Change in baseline emissions from below-ground biomass during monitoring period i
Source of data	Proxy area measurements
Description of measurement methods and procedures to be applied	B.2.3
Frequency of monitoring/recording	Already monitored
Value monitored	129,985
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.30
Comments	Calculations completed in document NIHT Accounting Model. Difference between cumulative baseline emissions from BGB during monitoring period and carbon stored in BGB at end of monitoring period.

Data / Parameter	E[i]B Δ DW
Data unit	tCO2e
Description	Baseline emissions from dead wood in monitoring period i
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	B.2.4 and B.2.5
Frequency of monitoring/recording	Already monitored
Value monitored	135,820
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.35
Comments	Calculations completed in document NIHT Accounting Model. Difference between cumulative baseline emissions from DW during monitoring period and carbon stored in DW at end of monitoring period.

Data / Parameter	E[m]B Δ SOC
Data unit	tCO2e
Description	Baseline change in emissions from soil carbon
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.2 and B.2.6
Frequency of monitoring/recording	Every monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	N/A
Calculation method	F.26

Comments	Soil carbon conservatively excluded

Data / Parameter	E[i]B Δ SOC
Data unit	tCO2e
Description	Baseline emissions from soil carbon in monitoring period i
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.2 and B.2.6
Frequency of monitoring/recording	Already monitored
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	N/A
Calculation method	F.26
Comments	Soil carbon conservatively excluded

Data / Parameter	E[m]B AGMT
Data unit	tCO2e
Description	Cumulative baseline emissions from above-ground commercial trees at the end of the current monitoring period
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.6
Frequency of monitoring/recording	Every monitoring period
Value monitored	2,337,699
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.37
Comments	

Data / Parameter	E[m]B BGB
Data unit	tCO2e
Description	Cumulative baseline emissions from below-ground biomass at the end of the current monitoring period
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.4
Frequency of monitoring/recording	Every monitoring period
Value monitored	726,840
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.30
Comments	

Data / Parameter	E[m-1]B BGB
Data unit	tCO2e
Description	Cumulative baseline emissions from below-ground biomass at the beginning of the current monitoring period
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.4
Frequency of monitoring/recording	Already monitored
Value monitored	0
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.30

Comments	This is the first monitoring period so cumulative emissions for the prior monitoring period are 0.

Data / Parameter	E[m]B BM
Data unit	tCO2e
Description	Cumulative baseline emissions from biomass at the end of the current monitoring period
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.1, 8.1.2.1
Frequency of monitoring/recording	Every monitoring period
Value monitored	3,172,566
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.21, F.24
Comments	Result of Biomass Emissions Model

Data / Parameter	E[m]B DW
Data unit	tCO2e
Description	Cumulative baseline emissions from dead wood at the end of the current monitoring period
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.3
Frequency of monitoring/recording	Every monitoring period
Value monitored	900,963
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records

Purpose of the data	Calculation of baseline emissions
Calculation method	F.35
Comments	

Data / Parameter	E[m]B SOC
Data unit	tCO2e
Description	Cumulative baseline emissions from soil carbon at the end of the current monitoring period
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.2
Frequency of monitoring/recording	Every monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	N/A
Calculation method	N/A
Comments	Soil carbon conservatively excluded

Data / Parameter	E[m-1]B SOC
Data unit	tCO2e
Description	Cumulative baseline emissions from soil carbon at the beginning of the current monitoring period
Source of data	Measurements in the proxy area
Description of measurement methods and procedures to be applied	8.1.2
Frequency of monitoring/recording	Already monitored
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A

Purpose of the data	N/A
Calculation method	N/A
Comments	Soil carbon conservatively excluded

Data / Parameter	E[m]B A
Data unit	tCO2e
Description	Cumulative emissions allocated to the buffer pool at the end of the current monitoring period
Source of data	N/A
Description of measurement methods and procedures to be applied	8.4.4
Frequency of monitoring/recording	Every monitoring period
Value monitored	352,864
Monitoring equipment	
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of emissions reductions
Calculation method	VCS Non-Permanence Risk Tool
Comments	

Data / Parameter	E[m]L
Data unit	tCO2e
Description	Cumulative emissions from leakage at the end of the current monitoring period
Source of data	Measurements in the leakage area(s)
Description of measurement methods and procedures to be applied	8.3
Frequency of monitoring/recording	Every monitoring period
Value monitored	0
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records

Purpose of the data	Calculation of leakage
Calculation method	F.45
Comments	

Data / Parameter	E[m-1]L
Data unit	tCO2e
Description	Cumulative emissions from leakage at the beginning of the current monitoring period
Source of data	Measurements in the leakage area(s)
Description of measurement methods and procedures to be applied	8.3
Frequency of monitoring/recording	Already monitored
Value monitored	0
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of leakage
Calculation method	F.45
Comments	This is the first monitoring period so cumulative emissions for the prior monitoring period are 0.

Data / Parameter	E[m]L Δ
Data unit	tCO2e
Description	Change in emissions due to leakage
Source of data	N/A
Description of measurement methods and procedures to be applied	8.3
Frequency of monitoring/recording	Every monitoring period
Value monitored	0
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records

Purpose of the data	Calculation of leakage
Calculation method	F.43
Comments	Difference between E [m] L and E [m-1] L

Data / Parameter	E[m]L ASF
Data unit	tCO2e
Description	Cumulative emissions from activity-shifting leakage in forested areas at the end of the current monitoring period
Source of data	Measurements in the activity-shifting leakage area
Description of measurement methods and procedures to be applied	8.3
Frequency of monitoring/recording	Every monitoring period
Value monitored	0
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of leakage
Calculation method	F.46
Comments	No activity-shifting leakage in forested areas for the first monitoring period

Data / Parameter	E[m]L ASG
Data unit	tCO2e
Description	Cumulative emissions from activity-shifting leakage in grasslands at the end of the current monitoring period
Source of data	Measurements in the activity-shifting leakage area
Description of measurement methods and procedures to be applied	8.3.3.4
Frequency of monitoring/recording	Every monitoring period

Value monitored	N/A
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	N/A
Calculation method	F.46
Comments	Grasslands are not an included stratum in this project

Data / Parameter	E[m]L ME
Data unit	tCO2e
Description	Cumulative emissions from market effects leakage at the end of the current monitoring period
Source of data	Measurements in the market-effects leakage area
Description of measurement methods and procedures to be applied	8.3
Frequency of monitoring/recording	Every monitoring period
Value monitored	0
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of leakage
Calculation method	F.51
Comments	No market effects leakage for the first monitoring period

Data / Parameter	E[m]P Δ
Data unit	tCO2e
Description	Change in project emissions
Source of data	Monitoring records for Forest Fire, Burning, logging, wood products, and natural disturbance events
Description of measurement methods	8.2

and procedures to be applied	
Frequency of monitoring/recording	Every monitoring period
Value monitored	0
Monitoring equipment	GIS, Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	F.41
Comments	

Data / Parameter	E[m]P ΔBRN
Data unit	tCO2e
Description	Cumulative project emissions due to burning at the end of the current monitoring period
Source of data	Monitoring plots in the project
Description of measurement methods and procedures to be applied	8.2.2
Frequency of monitoring/recording	Every monitoring period
Value monitored	0
Monitoring equipment	0
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	F.42
Comments	No monitored burns during the first monitoring period

Data / Parameter	E[m]P ΔLS
Data unit	tCO2e
Description	Cumulative project emissions due to livestock grazing at the end of the current monitoring period
Source of data	Monitoring plots in the project

Description of measurement methods and procedures to be applied	8.2.4
Frequency of monitoring/recording	Every monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions
Calculation method	F.43
Comments	Livestock grazing not included as a project activity

Data / Parameter	E[m]P ΔSF
Data unit	tCO2e
Description	Cumulative project emissions due to burning at the end of the current monitoring period
Source of data	Monitoring plots in the project
Description of measurement methods and procedures to be applied	8.2.2
Frequency of monitoring/recording	Every monitoring period
Value monitored	0
Monitoring equipment	0
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	F.42
Comments	Synthetic fertilizers not included as part of project activities

Data / Parameter	E[m]U
Data unit	tCO2e
Description	Cumulative confidence deduction at the end of the current monitoring period
Source of data	N/A

Description of measurement methods and procedures to be applied	8.4.1.1
Frequency of monitoring/recording	Every monitoring period
Value monitored	0
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of emissions reductions
Calculation method	F.57
Comments	

Data / Parameter	n LS i
Data unit	count
Description	The number of head of livestock species/category I in the project area
Source of data	Monitoring in the project area
Description of measurement methods and procedures to be applied	8.2.4
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	0
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	No livestock species during this monitoring period

Data / Parameter	p[m]L DEG
Data unit	proportion (unitless)
Description	Portion of leakage due to degradation at the end of the current monitoring period
Source of data	Monitoring in the leakage area
Description of measurement methods	8.3.2.3

and procedures to be applied	
Frequency of monitoring/recording	Every monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of leakage
Calculation method	B.9
Comments	No leakage area required during this monitoring period

Data / Parameter	p[m=0]L DEG
Data unit	proportion (unitless)
Description	Portion of leakage due to degradation at project start
Source of data	Monitoring in the leakage area
Description of measurement methods and procedures to be applied	8.3.2.3
Frequency of monitoring/recording	At project start
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Project verification
Purpose of the data	Calculation of leakage
Calculation method	B.9
Comments	No leakage area required during this monitoring period

Data / Parameter	p[m=0]L CON G
Data unit	proportion (unitless)
Description	Portion of leakage due to native grasslands prior to the first verification event
Source of data	Monitoring in the leakage area
Description of measurement methods	8.3.2.4

and procedures to be applied	
Frequency of monitoring/recording	First monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of leakage
Calculation method	N/A
Comments	Grasslands are not an included stratum in this project

Data / Parameter	p[m]L CON G
Data unit	proportion (unitless)
Description	Portion of leakage due to native grasslands conversion at the end of the current monitoring period
Source of data	Monitoring in the leakage area
Description of measurement methods and procedures to be applied	8.3.2.4
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of leakage
Calculation method	N/A
Comments	Grasslands are not an included stratum in this project

Data / Parameter	p[m-1]L CON G
Data unit	proportion (unitless)
Description	Portion of leakage due to native grasslands conversion at the beginning of the current monitoring period
Source of data	Monitoring in the leakage area

Description of measurement methods and procedures to be applied	8.3.2.4
Frequency of monitoring/recording	Every time measured (≤5 years)
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of leakage
Calculation method	N/A
Comments	Grasslands are not an included stratum in this project

Data / Parameter	p[m]SL
Data unit	proportion (unitless)
Description	Proportion of AGMT that is not merchantable and goes into slash estimated from inventory
Source of data	Estimated from inventory
Description of measurement methods and procedures to be applied	8.1.6.3
Frequency of monitoring/recording	Every monitoring period
Value monitored	0.385
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	B.29 and B.30
Comments	

Data / Parameter	t[i-1]
Data unit	days
Description	Time from project start date to beginning of monitoring period i
Source of data	Monitoring records

Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Already monitored
Value monitored	0
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of baseline emissions
Calculation method	Subtraction
Comments	Project start date is also beginning of initial monitoring period

Data / Parameter	t[m-1]
Data unit	days
Description	Time from project start date to beginning of current monitoring period
Source of data	Monitoring records
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Already monitored
Value monitored	0
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of baseline emissions
Calculation method	Subtraction
Comments	Project start date is also beginning of initial monitoring period

Data / Parameter	U[m]B
Data unit	tCO2e
Description	Total uncertainty in proxy area carbon stock estimate
Source of data	N/A

Description of measurement methods and procedures to be applied	6.8.10
Frequency of monitoring/recording	Every monitoring period
Value monitored	38.32
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	B.34
Comments	

Data / Parameter	U[m]EM
Data unit	tCO2e
Description	Total uncertainty in Baseline Emissions Models
Source of data	N/A
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Every monitoring period
Value monitored	0.103
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	F.14
Comments	

Data / Parameter	U[m]P
Data unit	tCO2e
Description	Total uncertainty in project accounting area carbon stock estimate
Source of data	N/A
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Every monitoring period

Value monitored	27.05
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	B.34
Comments	

Data / Parameter	WC [m=0] Pi
Data unit	tCO2e
Description	Weighted average carbon stocks for biomass or SOC in the project for the set of selected strata
Source of data	Estimated from inventory
Description of measurement methods and procedures to be applied	Inventory, GIS
Frequency of monitoring/recording	Every monitoring period
Value monitored	465.9
Monitoring equipment	Equipment list in NIHT Field Measurement Protocol
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	Weighted average within project accounting area
Comments	Weighted average of all carbon stocks in project accounting area

Data / Parameter	x[m]
Data unit	varies
Description	Covariate values
Source of data	Participatory Rural Appraisal, analysis of public records, and/or expert interpretation of inventory data or remotely sensed imagery
Description of measurement methods	N/A

and procedures to be applied	
Frequency of monitoring/recording	Every monitoring period
Value monitored	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Review of monitoring records
Purpose of the data	Calculation of baseline emissions
Calculation method	N/A
Comments	Covariate values conservatively excluded

5.3 Monitoring Plan

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5.3.1 Monitoring Methods

The objective of the monitoring plan as set out in the VCS Project Description is to quantify the emissions reductions achieved by the project during each monitoring period, and consists of three main components: forest patrols and observations, plot measurements, and identification of disturbances. These core monitoring components will be able to help the project technical team to accurately assess the project's effectiveness and VCU generation during each monitoring period. The details of the monitoring plan are laid out in the sections below. As the project intends to undertake CCB validation and verification at some point in the future, the monitoring plans for impacts on community and biodiversity will be developed separately and presented at the time of CCB validation.

As new project activities are carried out within the project area, their specific monitoring methods will be added to the NIHT monitoring plan. If any project activities or monitoring activities are to be phased out or incorporated at a later date due to adaptive management, the monitoring and implementation plans for the NIHT Topaiyo REDD+ project will be updated accordingly. The project's monitoring activities for quantifying its climate benefits are summarized in Table *14* below.

Activity	Frequency	Method
Forest Patrols and Community Observations	Once every reporting period	Patrol teams monitor project area perimeters and various routes through project area
Plot Measurements	Once before every baseline update	Inventory teams re-inventory carbon stocks and merchantability within

		project area, proxy area
Identification of Significant Disturbances	Once every reporting period	Technical team reviews remote sensing products, satellite imagery, and field teams conduct ground-based verification of disturbances if necessary

Table *14*. Activity frequency and methods

5.3.2 Monitoring Team Organizational Structure

The teams responsible for carrying out monitoring activities and the roles within each team are as follows:

Field Patrol Team

- Field Patrol Lead – responsible for carrying out patrol, noting all relevant patrol data and observations in field patrol forms, and conducting ground-truthing of any identified areas with disturbances
- Field Patrol Supports – optional support personnel that can contribute to patrol logs or can act as in-field support for lead

Carbon Inventory Field Team

- Carbon Cruise Manager – responsible for training team members, conducting quality control checks, data recording and transcription, and conducting ground-truthing of any identified areas with disturbances
- Carbon Cruise Technicians – responsible for taking measurements in the field based on training and inventory protocol, support manager in data collection and transcription

Technical Team

- Technical Manager – responsible for overseeing technical work to methodological and standard requirements, conducting quality control checks
- Technical Analyst – responsible for conducting technical analyses related to remote sensing and carbon stock quantification, quality control checks

5.3.3 Measures and Oversight for Quality Control, Accuracy

The technical team is responsible for carrying out all quality control measures on remote sensing, carbon stock estimates, and GHG quantification. The timber cruise manager is responsible for carrying out all quality control checks of field data and for ensuring that the data collected is done in keeping with the inventory protocol. If there a systematic deviation is found in the measurement and re-measurement of the parameter, the deviation is to be investigated and resolved. When updating data stored electronically, the file should be versioned.

The NIHT field teams and the Timber Cruise Manager minimize error by working to check the identification of tree species and diameter measurements, and to review the data collected and inputted. To reduce and eliminate transcriptional error, a subset of spreadsheets is proofed by re-reading the field notebooks and comparing it to the data that has been entered. Checks are also made for any values or variables that are outliers against the recorded data, and corrected if deemed to be transcription errors. All publically available satellite data used in monitoring, validation, verification and certification will be archived and made available to auditors. Inventory plot sheets are saved both digitally as PDFs while physical copies of the sheets are saved by the lead forester.

Additional QAQC checks are made by the technical team that reviews and analyzes the data. Initial checks identify any outliers in the data, specifically with regards to height and diameter at breast height that would suggest a transcription error. Due to the large range of sizes in trees found within the project area, no specific value was identified as an outlier value. Instead, the treelist was sorted by both height and DBH and the trees with the highest and lowest values were manually checked on the plot sheets. Identified transcription errors were then corrected in the treelist. Species names are also confirmed by checking that there were not multiple spellings or names for the same species. This ensures that the wood gravity lookup accurately identifies the appropriate value for that species. An additional QAQC measure was to check that merchantable biomass did not exceed total biomass for any tree as this would indicate either a transcription or measurement error. If a tree does not pass this check, plot sheets are manually checked to ensure that data is correctly transcribed. If it is not, the values are corrected in the treelist. If it is not clear if the data was correctly transcribed from the plot sheet, the technical team informs the project proponent, who works with the lead forester to correct this error. If the forester is able to identify the issue by reviewing the plot sheet and notes, the project proponent informs the technical team and an update is made to the treelist. If the forester cannot resolve the issue by looking at the plot sheet, it may be necessary to revisit the plot to measure the tree.

These QAQC procedures are detailed within the inventory protocol ‘NIHT Field Measurement Protocol’. A summary of these procedures detailed below:

- Find outliers in DBH and correct with plot sheet data – sort by diameter and filter through species
- Find outliers in height and correct with plot sheet data – sort by height and filter through species
- Check that total height > merchantable height

- Check DBH relative to max height for outliers – pivot graph of diameter and max/min height
- Check biomass defect to ensure no percentages over 100
- Check carbon calculations to ensure reasonable results – sort by carbon density
- Check to ensure no repeat plot numbers in the plot list
- Check for duplicate trees
- In excel, use conditional formatting to highlight trees of the same height
- Filter trees by the highlighted color and sort from smallest to largest
- Check that there are no trees with the same DBH, species, and height. If there are, plot sheets should be checked to see if this was correctly input or if a tree and/or plot was duplicated during data entry.
- Check that horizontal distance measurements for total height and merchantable height (if applicable) are equal to each other:
- If not, check plot sheets and correct value if necessary.
- Check that lower angle for total height and merchantable height (if applicable) are equal to each other:
- If not, check plot sheets and correct values if necessary.
- Check to ensure no missing plot numbers in the plot list
- Review plot data sheet and data entry questions with foresters
- If necessary, ask foresters to return to plot to make re-measurements
- Verify with foresters that original datasheets are retained
- Ensure that scans of original datasheets are stored on Dropbox and also backed up on a remote server

Once the analysis of the inventory data has been completed, the combined standard error for all pools is calculated within the treelist using equation B.34 of the VM0009 methodology:

For estimates of the PAA:

$$U_p = \sqrt{\sum_{j \epsilon c} U_j^2}$$

For estimates of the proxy area:

$$U_B = \sqrt{\sum_{j \epsilon c} U_j^2}$$

As stated in Section B.1.3 of the VM0009 methodology, there are no specific requirements with regard to the sample size, but instead credit generation is discounted based on the magnitude of the sampling

error. Thus, the sample size was not determined with any desired precision. However, if the precision of the initial sample size results in a confidence deduction, the project proponent may decide to add additional plots to the sample in order to reduce this deduction. These decisions will be made by the project proponent once the data has been analyzed and the magnitude of the deduction is understood. The magnitude of the confidence deduction is completed using equation [F.57] of the VM0009 Methodology:

$$E_U^{[m]} = E_{B\,\Delta}^{[m]} \left[\frac{1.64}{E_{B\,\Delta}^{[m]} + A_{PAA} c_p^{[m]} + A_{px} c_B^{[m]}} \sqrt{\left(U_{EM}^{[m]}\right)^2 + \left(U_P^{[m]}\right)^2 + \left(U_B^{[m]}\right)^2} - 0.15 \right]$$

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