



**Verified Carbon
Standard**

PNG COMMUNITIES BEST REDD - TAVOLO PROJECT



Document Prepared by FORCERT Limited, Kimbe, Papua New Guinea, with technical assistance from Face the Future, Wageningen, The Netherlands

Project Title	PNG Communities BEST REDD - Tavolo Project
Version	1.7
Report ID	2022 IQ MD 13
Date of Issue	18 July 2024
Project ID	2483
Monitoring Period	23-01-2019 – 01-01-2022
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Tavolo Community is located in East New Britain Province, on the South Coast of the island of New Britain, Papua New Guinea (PNG). The clans of the Tavolo Community hold customary land rights to a total area of 21,164 ha (hereafter referred to as the 'Tavolo Land Use Area'). This area has been under consistent threat from large scale logging and conversion to oil palm plantations.

The aim of this PNG Communities BEST REDD – Tavolo Project (hereafter referred to as the 'Tavolo REDD Project') is to assist the Tavolo Community to conserve and protect the natural rainforest in the Tavolo Land Use Area from being cleared and converted as part of the Kakuna-Lote Agro Forestry & Reforestation Plantation Development Project. In order to protect the forest from the planned deforestation the Tavolo REDD Project implements the following activities in the Tavolo Land Use Area:

1. A Court's or official Government administrative decision will be obtained to declare the Mukus-Melkoi SABL and the Kakuna Lote Resource Development Ltd FCA null and void;
2. The communities within the Tavolo Land Use Area who organized themselves into the Tavolo Community Conservation Association will develop and implement Community Conservation Laws, in which rules are set by the communities regarding the land use and the conservation of the forest in the project area. A system will be set up by the communities to enforce and monitor compliance with the rules set out in the Community Conservation Laws;
3. The communities will manage and conserve their forests under a sustainable land use plan which is designed by the communities in cooperation with FORCERT. These land use plans will focus on forest conservation, small scale eco-forestry and sustainable small scale agriculture;
4. The communities will participate in the PNG Communities Benefits from Environmental Services Trust (BEST). Through this Payment for Ecosystem Services (PES) fund the communities will receive financial benefits from preserving the forest in the project area, additional to the direct ecosystem service benefits their forest provides, and this will enable the communities to carry out the activities necessary for the sustainable use of their land and natural resources, also in the future. Resources for the PNG Communities BEST will be attracted by obtaining FSC certification, Fairtrade certification and VCS & CCB validation and verification, carbon credit issuance, and finally selling these carbon credits on the voluntary market;

5. A formal protection status will be obtained for the forests under the REDD project. The Tavolo Community has now put the forest areas area under a Conservation Deed, which was signed in November 2019.

Through the above-mentioned project activities the forests under the Tavolo REDD Project are protected from clearance and net GHG emission reductions or removals are achieved.

This Monitoring Report is based on the monitoring plan provided in the VCS Project Document (PD) for Tavolo (v1.1). It describes the results of project monitoring carried out from the 23rd of January 2019 to the 1st of January 2022 for the purpose of verification of the GHG emission reductions resulting from project implementation. Since the start of the REDD project activities 5,587 hectares have been protected from deforestation originally planned under the Mukus-Melkoi SABL.

The results of the 2022 carbon monitoring campaign show that since the beginning of the REDD project in 2019 a total of 960,689 tCO_{2e} of emissions from deforestation have been avoided within the project area. After a buffer subtraction of 17%, 746,372 VCU are eligible for issuance.

1.2 Sectoral Scope and Project Type

VCS Sectoral scope: Scope 14 - Agriculture Forestry and Other Land Use (AFOLU)

AFOLU project category: Reduced Emissions from Deforestation and Degradation (REDD).

REDD activity type: Avoiding Planned Deforestation and/or Degradation (APDD).

Grouped project: No

1.3 Project Proponent

Organization name	FORCERT Limited
Contact person	Cosmas Makamet
Title	Manager
Address	P.O. Box 772 Kimbe, West New Britain Province, Papua New Guinea
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1.4 Other Entities Involved in the Project

Organization name	Tavolo Community Conservation Association
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Role in the Project	project beneficiary
Contact person	Peter Kikele
Title	Chairman
Address	P.O. Box 1789 Kokopo, East New Britain Province, Papua New Guinea
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Email	-

Organization name	Face the Future
Role in the Project	Technical assistance in VCS&CCB project development
Contact person	Wouter van Goor / Kars Riemer
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1.5 Project Start Date

Project start date of the Tavolo REDD Project is **23 January 2019**. This is the signing date of the Cooperation Agreement between FORCERT, Face the Future and Greenchoice (the project pre-financer). With this agreement the three parties have agreed to aid the Tavolo Community in a court case aiming to nullify the Mukus-Melkoi SABL and the Lote-Kakuna Project, and to develop a Payment for Ecosystem Service (PES) fund for the communities in the Tavolo Land Use Area, in order for them to benefit from preserving the forest, also in the future.

1.6 Project Crediting Period

The crediting period start date is 23 January 2019 and the end date is 22 January 2049.

Project Crediting Period is **30 years**.

The projection of baseline emissions is presented in the VCS Project Document (PD) for the first 10-year period after the project start date. After every 10 years the baseline will be reassessed and revised. Emission reductions/removals will be claimed for the 10-year periods for which the baseline is fixed and a monitoring plan has been implemented.

1.7 Project Location

The Tavolo Project is located in East New Britain Province, on the South Coast of the island of New Britain, Papua New Guinea (PNG). It is formed by the customary lands of three different communities, namely Mukus, Tavolo and Lausus. The customary land under the Land Use Plan of these three communities covers a total area of 21,164 ha. 16,493 ha of these lands are zoned as the Tavolo REDD Project Area. Within the boundaries of the Tavolo REDD Project Area, 14,695 ha was zoned to be deforested under the Mukus-Melkoi SABL as part of the Kakuna-Lote FCA Project (see VCS PD). The Tavolo REDD project aims to stop the planned deforestation in The Tavolo REDD Project Area. The boundaries of the Tavolo REDD Project Area are given in Figure 1.

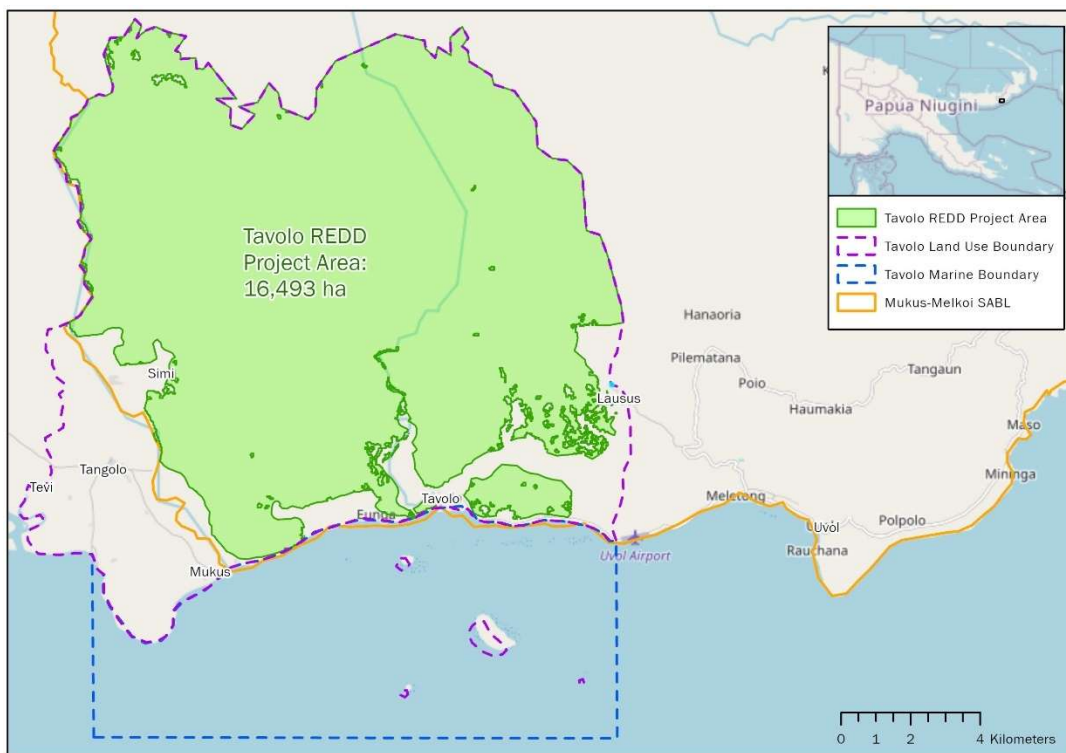


Figure 1 - Map with the geographical boundary of the Tavolo REDD Project Area (in green)

1.8 Title and Reference of Methodology

The Tavolo REDD Project is designed for validation under the Verified Carbon Standard Version 4.4.

The project applies VM0007 REDD+ Methodology Framework (REDD-MF) version 1.6 ([VM0007 REDD+ Methodology Framework \(REDD+MF\), v1.6 - Verra](#)). Under this REDD Methodology Framework, the following modules and tools are applied by the REDD project:

	Modules/Tools
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Additionality	CDM Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (T-ADD), v1
Permanence	VCS AFOLU Non-Permanence Risk Tool, v4.0 (T-BAR)
Baseline	VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation and planned degradation (BL-PL), v1.3
Carbon pool above- and belowground biomass	VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools (CP-AB), v1.1
Carbon pool wood products	VMD0005 Estimation of carbon stocks in the long-term wood products pool (CP-W), v1.1
Activity shifting leakage	VMD0009 Estimation of emissions from activity shifting for avoided planned deforestation (LK-ASP), v1.3
Market effect leakage	VMD0011 Estimation of emissions from market effects (LK-ME), v1.1
Emissions	VMD0013 Estimation of greenhouse gas emissions from biomass and peat burning (E-BPB), v1.2
Monitoring	Methods for monitoring of greenhouse gas emissions and removals (M-REDD), v2.2
Stratification	VMD0016 Methods for stratification of the project area (X-STR), v1.2
Uncertainty	VMD0017 Estimation of uncertainty for REDD project activities (X-UNC), v2.2
Significance	CDM Tool for testing significance of GHG emissions in A/R CDM project activities (T-SIG), v1

1.9 Participation under other GHG Programs

The Tavolo REDD Project has not been registered, or is not seeking registration under any other GHG programs.

1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

1.10.1 Emissions Trading Programs and Other Binding Limits

The Tavolo REDD Project will not participate in an emissions trading programme or any other mechanism that includes GHG allowance trading.

1.10.2 Other Forms of Environmental Credit

The Tavolo REDD project has not sought or received another form of GHG-related environmental credit.

1.10.3 Supply Chain (Scope 3) Emissions

The carbon project activities does not impact the emissions of goods and services in a supply chain and, therefore, Scope 3 emissions.

1.11 Sustainable Development Contributions

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	1.1	Proportion of families with more than one long-term sustainable income earning source	Finalization of TCCA Management Plan details on activity implementation & prioritization and agreement on the rules for Family Business Support	No quantifiable impact yet	
2)	1	All families in Mukus, Tavolo and Lausus to have a permanent house	Permanent housing scheme to remain priority activity for TCCA, activities to increase	Purchase and distribution of 2140 sheets of 14 feet roofing iron to all 14 clans of the TCCA, and 120 sheets to Church and school buildings	

3)	3.1	Fully equipped local health facilities in Mukus, Lausus and Tavolo	Finalization of TCCA Management Plan details on activity implementation & prioritization and agreement on the rules for Community Projects, including health facilities	No quantifiable impact yet	
4)	3	Trained Village Health Workers and Village Birth Attendants in all three villages	Finalization of TCCA Management Plan detailing ongoing training support for Village Health Workers and Village Birth Attendants	No quantifiable impact yet	
5)	4.1	Fully equipped local ECH and Primary School Facilities in Mukus, Lausu and Tavolo	Finalization of TCCA Management Plan details on activity implementation & prioritization and agreement on the rules for Community Projects, including school facilities	No quantifiable impact yet	
6)	4.1	Fully equipped secondary school in Tavolo	Finalization of TCCA Management Plan details on activity implementation & prioritization and agreement on the rules for Community Projects, including school facilities	No quantifiable impact yet	

7)	4.1	Number of children by sex, accessing and completing secondary and technical vocation education	Finalization of TCCA Management Plan detailing ongoing training support for Village Health Workers and Village Birth Attendants	50% school fee support for secondary school students by TTCA for 2020, 2021 and 2022	
8)	5.5	At least 30% women in TCCA management and workforce	Inclusion in TCCA-FORCERT project agreement of at least 30% of TCCA Management and Workforce to be women	40% women in TTCA Management Committee 20% women in TCCA workforce	
9)	5.5	At least 30% women participation in meetings, workshops, training and other activities	Inclusion in TCCA-FORCERT project agreement of at least 30% women participation for all project meetings, workshops, trainings and other activities	54% women participation in the TCCA 2021 AGM Overall more than 30% women participation in meetings, workshops, trainings and other activities	
10)	5.5	Proportion of family bank accounts managed by women	TCCA members decision for all families to open bank accounts, with the women of the family becoming the signature of these bank accounts.	Small number iof families have opened bank accounts, with the women being the signatory	
11)	7	Proportion of families with access to affordable and sustainable energy	Feasibility study into micro-hydro and support for solar panels included in TCCA Management plan	No quantifiable impact yet	

12)	11.4	Number of clans valuing & maintaining their natural and cultural heritage		Conservation Deed signed in October 2019 by all 14 clans of the Tavolo Community	
13)		All community development projects, including transport infrastructure are designed to minimize environmental impact	Finalization of TCCA Management Plan details on activity implementation & prioritization and agreement on the rules for Community Projects, including transport infrastructure	No quantifiable impact yet	
14)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By conserving 5,587 ha of tropical rainforest which was planned to be deforested during the monitoring period, the project has prevented the release of 960,689 tCO ₂ e into the atmosphere during the monitoring period	Prevented the release of 960,689 tCO ₂ e into the atmosphere
15)	13	Proportion of families including drought resistant crops in their food planting schedules	TCCA has included a dedicated Theme on Climate change adaptation and mitigation in their Management Plan with 4 associated Objectives and planned activities	No quantifiable impact yet	

2 SAFEGUARDS

2.1 No Net Harm

Any potential negative environmental and socio-economic impacts of the project, and the steps taken to mitigate them are described in detail in the project's CCB Monitoring Report (MR) sections 4.1.2, 4.2.1, 4.4.2, 5.1.2, 5.1.5 – 5.1.8 and 5.2.1.

2.1.1 Community / Socio-economic

No negative project community impacts were identified in the project monitoring period. However, in line with the precautionary principle, several mitigation measures were implemented during the monitoring period to address (mitigate / avoid) the potential negative community impacts identified by the community and listed in the CCB PD (section 4.2.2). TCCA Financial Manual and Rules for all Community Funds were developed by the Tavolo Community members, based on their own identification of the risks for the community benefit distribution and TCCA activity implementation funded by the 65% community benefit share under the project.

Also, it was agreed by TCCA Management to employ a professional full-time admin & finance manager (female) on a 3-year contract to lead and support the TCCA Admin staff, and to allow them time to build their capacity through training and on the job experience gathering, with a gradual transfer of the responsibility of the admin & finance manager to the various dedicated TCCA Admin staff over the 3-year time period, guided by proven increased capacity of these staff.

No negative impacts were found on the identified marginalized groups (women and youth). As the project is yet to generate carbon revenue benefit, there is currently little to report. It is expected that through annual monitoring by TCCA at the community and family level in the next monitoring periods, will generate more information on positive as well as any potential negative impacts.

2.1.2 Environmental and biodiversity

As described in the CCB PD, the Tavolo Community developed Community Conservation Laws. To address a potential lack of adherence to the Community Conservation Laws by members of the Tavolo Community, the TCCA clearly linked compliance with the Community Conservation laws with the rights and access to benefits for families. The other mitigation measures developed (See CCB PD 5.2.2.) are yet to be implemented.

Also, the TCCA Management Committee agreed to allocate an annual budget to the Community Conservation Law Committee, which will allow them to implement the identified areas for improvement during their monitoring meeting with FORCERT in April 2021.

The first sensing monitoring results on forest loss (15ha during this monitoring period) have been shared and discussed with the Tavolo Community, and further ground truthing will be done to try identify the causes for all individual areas, and decide on any further necessary and possible remedial action. This will be further discussed and follow up on during next community visits, and will be reported on by TCCA and discussed with FORCERT during the first PNG Communities BEST REDD Tavolo Project annual monitoring meeting at Tavolo village, scheduled for the end of 2022.

Non-native species

The project did not introduce non-native species. No planting or plantation activities were undertaken. As mention in the CCB PD section 5.2.5, TCCA intends to promote Balsa in the Garden and Cash crop Zone as part of widening the range of income earning options. Till date Balsa has not been planted. Should planting of Balsa take place in the future, TCCA and FORCERT will closely monitor this situation, and ensure that any abandoned Balsa plantation blocks with be fully cleared.

Use of GMOs

No GMOs are used to generate GHG emissions reductions or removals.

Use of fertilizers, pesticides, biological control agents or other inputs

Not applicable. No fertilizers, chemical pesticides, biological control agents or other inputs are used for the project

2.2 Local Stakeholder Consultation

The process for, and the outcomes from, ongoing communication with local stakeholders conducted prior to validation and verification are described in the project's CCB PD and CCB MR. Sections 2.2.1 – 2.2.2 and 2.2.5 – 2.2.10 of the CCB MR describe the procedures followed during the project monitoring period.

All project documentation, including project description documentation and monitoring reports are made available to all affected and interested stakeholders online on the FORCERT website. A printed copy of the VCS and CCBS Project Documents and the VCS and CCBS Monitoring Report is made available to TCCA. To date, there have been no request from other stakeholders for printed copies of these documents.

The summary of both the VCS and CCBS project documentation has been translated into PNG Pidgin English and shared with the Mukus, Tavolo and Lausus communities at community meetings in Lausus and Tavolo in May 2022. The TTCA Management Committee will actively distribute copies at all affected communities through a round of information meetings at these communities. Further copies are made available for other interested communities upon request.

During the monitoring period, no new discussion meetings were held on project costs, risks and benefits, since the last in 2018. Validation and first verification audit took place simultaneously.

See description in CCBS PD Section 2.3.4. Information to stakeholders on this first verification process was provided at the same time when information was provided on the validation process. Validation and first verification took place simultaneously. See CCBS PD Section 2.3.5

Section 2.3.3 of the CCB PD and 2.2.7 of the CCB MR provide an overview of informational community-, local- and national stakeholder meetings held between 2008 and 2021, covering the monitoring period January 2019 and January 2022.

During the monitoring period, the Participatory Process of Change (PpoC, see CCBS PD Section 2.3.10 and Appendix 1) was further applied. I.e. a participatory HCV assessment was carried out. community land use, action plans and community conservation laws were developed, government collaboration and approval was obtained, community conservation monitoring was tested and the TCCA management plan objectives and indicators were updated, the communities BEST program was developed, along with community development priorities. These results are further described in sections 4.3.1 and 5.3.1. of the CCB MR. Equal participation was encouraged (as can be verified in the attendance lists held by FORCERT).

Public comments

No public comments were received during the joint VCS & CCB validation and verification Public Comment Period.

2.3 AFOLU-Specific Safeguards

The AFOLU specific safeguards are addressed in detail in the project's CCB Monitoring Report (Jan 2019 – Jan 2022).

- Sections 2.4.1 and 2.4.2 describe the activities implemented during the monitoring period to ensure the project will not impact local stakeholder's property rights without the free, prior and informed consent. The Tavolo Community, with assistance from FORCERT, has made a submission to the National Forest Board in April 2020, to object to the approval by the East New Britain Provincial Forest Management Committee (ENB PFMC) of the FCA for the Kakuna-Lote Project. This led to a letter sent by the Chairperson of the ENB PFMC to the Kakuna-Lote Land Owner Company, asking them to exclude the Tavolo SLUP area from the overall FCA area, and also to relocate the planned log export pond, which originally was situated within the Tavolo SLUP area. Legal clearance of the draft PNG Communities BEST Program membership agreement, covering the REDD Tavolo project, between TCCA and FORCERT was received in November 2021 from the State Solicitor's Office as per the requirement of the Climate Change Management Act. Indirectly, this membership agreement legal clearance also provides further legal recognition of the Tavolo Conservation Deed, as the establishment of the Deed within the existing SABL area forms the basis of the project agreement. An official notification letter was sent out on 23 March 2022 to inform all relevant government authorities, Land Owner Companies and their associated logging companies or other companies that the 14 clans united under the Tavolo Community Conservation Association (TCCA) have signed a Conservation Deed

covering their combined land area, and are sustainably managing this area for nature conservation purposes. It also informed that TCCA has signed an agreement to go into a carbon credit project over this area with FORCERT Ltd. and that this Project Agreement together with the Conservation Deed has received legal clearance from the State Solicitor's Office. To date, no official confirmation or documentation has been obtained regarding the endorsement by the National Forest Board of the ENB PFMC decision to grant the FCA to Kakuna-Lote, nor any official documentation that confirms the instructions from the ENB PFMC Chairperson have been followed, with exclusion of the Tavolo SLUP area and relocation of the log export pond. The TCCA lawyer is on stand-by to initiate any necessary legal action, if information becomes available that would prove that these instructions have not been followed.

The participatory processes described in CCB PD Section 2.5.3, were applied to ensure that the project does not encroach on private property, community property or government property without consent.

There has been no involuntary removal or relocation of property rights holders, as all customary landowning clans are involved in TCCA, and have developed their sustainable community land use plan and community conservation laws together. They have jointly developed and agreed to the limitations in (potential) activities that result from both the sustainable land use plan (zoning of land uses) and the community conservation laws (e.g., restrictions in tree felling, hunting, gathering, fishing).

- Sections 2.2.2 and 2.2.8 describe the processes to ensure ongoing communication and consultation with local stakeholders. The summary of both the VCS and CCBS project documentation was translated into PNG Pidgin English and shared with the Mukus, Tavolo and Lausus communities at community meetings in Lausus and Tavolo in May 2022. Any updated project documentation will be subsequently shared as well. The TCCA Management Committee will actively distribute copies at all affected communities through a round of information meetings at these communities. Further copies are made available for other interested communities upon request.

The project design, -implementation, -management and -monitoring is a joint effort of the Tavolo Community and FORCERT. They jointly developed the TCCA Management plan (which will be updated every 10 years), Community Conservation Laws and annually execute community (BEST) monitoring as well as Community Conservation Monitoring. This ensures continued consultation and adaptive management throughout the project lifetime, as demonstrated in the table under 2.2.7 of the CCB MR.

The development and implementation of the project has been a highly consultative and participatory process, over many years of awareness, meetings, workshops and trainings, all of them done at the Tavolo Community, mostly through open community meetings, held at times and locations determined by the Tavolo committee, with separate meetings held for Tavolo & Mukus at Tavolo village, and for Lausus (3 hours walk uphill), to allow access by all community members. This has been recorded through the FORCERT Community

Enhancement Program Team community visit reports, with an overview of all visits and their purpose given in the table under 2.3.3 and the detailed reports held on file.

Awareness to neighbouring communities and clans was done on SLUP and Community Conservation laws on both Northern and Western sides, but not yet on Coastal and Inland sides. Awareness on the SSLUP and Community Conservation Laws and the BEST project has also been done by Tavolo Community reps together with FORCERT staff at the Melkoi LLG and the Pomio DDA. A presentation meeting on PNG Communities BEST Program and the REDD Tavolo Project was held with the Member of Parliament for Pomio in 2021. The President of the Melkoi LLG signed the Tavolo Conservation Deed as a witness. Members of all surrounding communities, the Melkoi LLG President, Pomio DDA rep, PNGFA and CCDA representatives came to the public signing ceremony of the PNG Communities BEST Program membership agreement.

- With respect to grievances, To date, no grievances have been received on the project during the monitoring period.

2.3.1 Disputes and conflicts on property rights

2.3.1.1 Ongoing disputes

See CCB MR, section 2.4.5. There was a dispute over the Silang area, in the North-West corner of the SLUP area, for which a mediation process was started with one meeting held led by a land mediator, with the dispute settled in favour of TCCA in July 2021. Kakuna Tribe members are the challenging party, who were settled by TCCA clan ancestors on their land. The disputing party did not agree to the outcome, and was given to option to take the matter to the Land Court within six months, but this did not happen. TCCA was approached by the disputing party in March 2022, requesting for a meeting to discuss the option of them accepting the mediation outcome and joining TCCA. This meeting was held DATE and the Tavolo Community has recognized that as the Kakuna Tribe members at Simi and Tangolo were given some user rights over the Silang part of the Tavolo Community SLUP area by their ancestors, they will be included in the TCCA's benefit sharing arrangement for the Education Fund and possibly other funds too, pending further discussions by the TCCA Management Committee. This offer has been accepted by the members of the Simi and Tangolo communities. TCCA has started to adjust their Standard Operating Procedures to accommodate this agreement and change. The dispute has thus been resolved.

2.3.1.2 Conflicts on property rights with Kakuna Lote LOC and Mekar Ltd.

As described in detail in section 2.5.9 of the CCB PD and 3.4.2 of this VCS PD, the Tavolo Community never gave their consent for their land to be included in the Mukus-Melkoi SABL. The Tavolo Community also never gave their consent for large scale deforestation and land use conversion under the Kakuna-Lote project on their land. This Lease currently conflicts with the community ownership and rights to claim benefits from the project. Furthermore, the Kakuna Lote LOC do not represent the views of the community as a whole and the actually do not have a mandate to operate on the community's behalf.

During the monitoring period, the following project activities are/were undertaken to reclaim ownership, i.e.:

- 1) A Court's case was filed by the Tavolo Community Conservation Association, which was initiated in December 2022, to declare the Mukus-Melkoi SABL and any accompanying or underlying logging permits and project plans over the Tavolo Sustainable Land Use Plan area null and void.
- 2) A formal protection status was obtained for the forests under the REDD project. Tavolo Community has put their whole Sustainable Land Use Plan area under a Conservation Deed, which was signed in November 2019. Additionally, Tavolo has submitted an application for the extension of the present Wildlife Management Area (WMA) covering only 2,400ha of their LUIP area, to cover the whole area, with the Conservation & Environmental Protection Authority (CEPA).

The court case against Kakuna Lote LOC and Mekar Ltd. to nullify the FCA and SABL will pacify and resolve the long-outstanding matter of the illegally issued SABL, with the project enabling implementation of the results and recommendations of two official Government investigations (COI) into the Mukus-Melkoi SABL.

The legal clearance for the Tavolo Project by the office of State Solicitor Mr. Daniel Rolpagarea (who was the Chairperson of the Ministerial SABL Investigation Committee) acknowledges the customary ownership and management rights as specified in the Tavolo Community Conservation Deed, and through legalising the Agreement, authorises the REDD Tavolo Project to go ahead. This clearly implies acknowledgement of the Tavolo Community's customary landownership rights and sustainable management claim over the Project area.

As described in the CCB PD, section 2.3 and CCB MR, section 2.4.3 there is no involuntary removal or relocation of actual property rights holders, as all customary landowning clans are involved in TCCA, and have developed their sustainable community land use plan and community conservation laws together. They have jointly developed and agreed to the limitations in (potential) activities that result from both the sustainable land use plan (zoning of land uses) and the community conservation laws (e.g., restrictions in tree felling, hunting, gathering, fishing). The community conservation laws provide for natural resource access for local consumption and livelihood needs under specific conditions. While these laws have been communicated to neighboring communities, further work is needed on monitoring and enforcement. The FPIC processes followed throughout the process have been documented in FORCERT community visit reports since 2008.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

3.1.1 Mukus-Melkoi SABL Court Case

The Tavolo Community, with assistance from FORCERT, has made a submission to the National Forest Board to object to the approval by the East New Britain Provincial Forest Management Committee (ENB PFMC) of the FCA for the Kakuna-Lote Project. This led to a letter sent by the Chairperson of the ENB PFMC to the Kakuna-Lote Land Owner Company, asking them to exclude the Tavolo SLUP area from the overall FCA area, and also to relocate the planned log export pond, which originally was situated within the Tavolo SLUP area.

Legal clearance of the draft PNG Communities BEST Program membership agreement, covering the REDD Tavolo project, between TCCA and FORCERT was received in November 2021 from the State Solicitor's Office as per the requirement of the Climate Change Management Act. Indirectly, this membership agreement legal clearance also provides further legal recognition of the Tavolo Conservation Deed, as the establishment of the Deed within the existing SABL area forms the basis of the project agreement.

An official notification letter was sent out on 23 March 2022 to inform all relevant government authorities, Land Owner Companies and their associated logging companies or other companies that the 14 clans united under the Tavolo Community Conservation Association (TCCA) have signed a Conservation Deed covering their combined land area, and are sustainably managing this area for nature conservation purposes. It also informed that TCCA has signed an agreement to go into a carbon credit project over this area with FORCERT Ltd. and that this Project Agreement together with the Conservation Deed has received legal clearance from the State Solicitor's Office.

To date, no official confirmation or documentation has been obtained regarding the endorsement by the National Forest Board of the ENB PFMC decision to grant the FCA to Kakuna-Lote, nor any official documentation that confirms the instructions from the ENB PFMC Chairperson have been followed, with exclusion of the Tavolo SLUP area and relocation of the log export pond. The TCCA lawyer is on standby to initiate any necessary legal action, if information becomes available that would prove that these instructions have not been followed.

3.1.2 Tavolo Community Sustainable Land Use Plan and Conservation Laws

The Tavolo Community Conservation Committee or HCV Committee was renamed Community Conservation Law Committee to emphasise that the Committee is mandated to monitor and enforce official community conservation laws, established through general agreement under custom at the community/clan level, with these laws being enforceable through Village Court.

A draft Community Conservation Monitoring system was developed by the Tavolo Community members, with assistance from the New Guinea Binatang Research Centre (BRC) and FORCERT.

The implementation and enforcement of the Community conservation laws is governed by the Tavolo Community Conservation Committee, consisting of representatives of all clans involved.

The Community Conservation Law Committee for all three villages (Lausus, Mukus and Tavolo) report that their work needs to be strengthened, and have identified a number of measures to assist with this, e.g., through placement of sign boards at strategic entry places around the SLUP area, provision of uniforms and ID cards for committee members, and using the Village Court for prosecution of stubborn or repeat offenders. TCCA Management has agreed to include a dedicated budget for the Community Conservation Law Committee's functioning in their overall annual TCCA management budget, that can cover any costs associated with the suggested improvements.

3.1.3 Benefits from Environmental Service Trust (BEST) for PNG communities

FORCERT has opened a separate PNG Communities BEST bank account with BSP, Kimbe.

The Tavolo Community Conservation Association (TCCA) was officially registered with the PNG Investment Promotion Authority on 25 January 2021, with TCCA and FORCERT signing their PNG Communities BEST Program membership agreement in November 2021, covering the governance of the VCS-CCBS REDD Tavolo Project for the 30-year project period.

TCCA has finalised their Management Plan details on activity implementation & prioritization and agreement on the rules for all Community Funds. A TCCA Financial Management Manual has been developed and is being finalized.

The proposed Government tax percentage of 15% and its division over the various levels of Government (4% Local, 3% District, 1% Provincial, 7% National) remains preliminary, as to date there is no final version of National REDD+ Benefit Sharing Distribution System Policy yet, and no resulting Regulations governing benefit sharing under the Climate Change Management Act (CCMA, 2021 Amended) have yet been established.

3.1.4 Formal Protection Status

The Tavolo Community is still looking at extending their current Wildlife Management Area (WMA) of only 2,400 ha to cover the whole of the Tavolo Project Area, however their application for this extension with the Conservation & Environmental Protection Authority (CEPA) has not been processed. Therefore the Tavolo Community has now put their whole LUP area under a Conservation Deed, which was signed in November 2019.

3.2 Deviations

2.1.1 Methodology Deviations

There are no deviations to the methodology.

2.1.2 Project Description Deviations

There are no deviations to the description of the project.

3.3 Grouped Projects

The project is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	<i>i</i>
Data unit	dimensionless
Description	Stratum
Source of data	Baseline forest cover classification
Value applied	Land-use categories used for the Tavolo Forest Cover Benchmark Map: • Forest • Non-forest
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions Calculation of project emissions
Comments	

Data / Parameter	<i>t</i>
Data unit	years
Description	Years elapsed since the projected start of the REDD project activity
Source of data	

Value applied	1, 2, 3, ...
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Comments	

Data / Parameter	$\Delta C_{BSL,planned}$
Data unit	tCO ₂ e
Description	Net GHG emissions in the baseline from planned deforestation
Source of data	Based on deforestation plan provided in the Kakuna-Lote FCA application 2019, and default C-stocks provided in PNG's FREL and IPCC 2006 Guidelines
Value applied	960,689 tCO ₂ e over first 3 years; See Table 5
Justification of choice of data or description of measurement methods and procedures applied	Project proposal and logging map attached to this PD as Appendix 3 and Appendix 4
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$\Delta C_{BSL,i,t}$
Data unit	tCO ₂ e
Description	Sum of the baseline carbon stock change in all pools in stratum <i>i</i> at time <i>t</i>
Source of data	Based on deforestation plan provided in the Kakuna-Lote FCA application 2019, and default C-stocks provided in PNG's FREL and IPCC 2006 Guidelines

Value applied	See Table 5
Justification of choice of data or description of measurement methods and procedures applied	Project proposal and logging map attached to this PD as Appendix 3 and Appendix 4
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$GHG_{BSL-E,i,t}$
Data unit	tCO ₂ e
Description	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum <i>i</i> during project year <i>t</i>
Source of data	
Value applied	0 tCO ₂ e
Justification of choice of data or description of measurement methods and procedures applied	The GHG emissions as a result of deforestation activities in the baseline for the Tavolo REDD Project Area are conservatively set to 0 tCO₂e for all years
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$AA_{planned,i,t}$
Data unit	ha
Description	Annual area of baseline planned deforestation for stratum <i>i</i> at time <i>t</i>
Source of data	Deforestation plan provided by the Kakuna-Lote FCA application 2019
Value applied	See VCS PD

Justification of choice of data or description of measurement methods and procedures applied	Project proposal and logging map attached to this PD as Appendix 3 and Appendix 4
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$A_{planned,i}$
Data unit	Ha
Description	Total area of planned deforestation over the baseline period for stratum i
Source of data	Deforestation plan provided by the Kakuna-Lote FCA application 2019
Value applied	14,695 ha; See VCS PD
Justification of choice of data or description of measurement methods and procedures applied	Project proposal and logging map attached to this PD as Appendix 3 and Appendix 4
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$D_{planned,i,t}^{\%}$
Data unit	%
Description	Projected annual proportion of land that will be deforested in stratum i during year t
Source of data	Deforestation plan provided by the Kakuna-Lote FCA application 2019
Value applied	See VCS PD Year 1: 33% Year 2: 33% Year 3: 22%

	Year 4: 5% Year 5: 8%
Justification of choice of data or description of measurement methods and procedures applied	Project proposal and logging map attached to this PD as Appendix 3 and Appendix 4
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	Will be revisited at the time of baseline revision

Data / Parameter	$L - D_i$
Data unit	%
Description	Likelihood of deforestation for stratum i
Source of data	VMD0006
Value applied	100%
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed: For all areas not both under Government control and zoned for deforestation, L-Di shall be equal to 100%
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$\Delta C_{ABtree,i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Baseline carbon stock change in aboveground tree biomass in stratum i
Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	228.9 tCO ₂ e ha ⁻¹
Justification of choice of data or description of	VMD0006 is followed as guideline for calculations

measurement methods and procedures applied	
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$C_{ABtree_{bsl},i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Forest carbon stock in aboveground tree biomass in stratum <i>i</i>
Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	400.8 tCO ₂ e ha ⁻¹ ; See VCS PD
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed as guideline for calculations
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$C_{ABtree_{post},i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Post-deforestation carbon stock in aboveground tree biomass in stratum <i>i</i>
Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	172.0 tCO ₂ e ha ⁻¹ ; See VCS PD
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed as guideline for calculations
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions

Comments	
Data / Parameter	$\Delta C_{BBtree,i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Baseline carbon stock change in belowground tree biomass in stratum <i>i</i>
Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	84.7 tCO ₂ e ha ⁻¹
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed as guideline for calculations
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$C_{BBtree_{bsl},i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Forest carbon stock in belowground tree biomass in stratum <i>i</i>
Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	148.3 tCO ₂ e ha ⁻¹ ; See VCS PD
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed as guideline for calculations
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$C_{BBtree_{post},i}$
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Data unit	tCO ₂ e ha ⁻¹
Description	Post-deforestation carbon stock in belowground tree biomass in stratum <i>i</i>
Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	63.6 tCO ₂ e ha ⁻¹ ; See VCS PD
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed as guideline for calculations
Purpose of Data	Determination of baseline scenario (AFOLU projects only) Calculation of baseline emissions
Comments	

Data / Parameter	RS
Data unit	dimensionless
Description	Ratio of belowground biomass to aboveground biomass
Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	0.37
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed as guideline for calculations
Purpose of Data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Comments	

Data / Parameter	CF
Data unit	dimensionless
Description	Conversion factor for conversion of oven-dry weight to carbon stock in tree biomass

Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	0.47 tC tdm ⁻¹
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed as guideline for calculations
Purpose of Data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Comments	

Data / Parameter	CO ₂ F
Data unit	Dimensionless
Description	Standard ratio molecular weight of CO ₂ to carbon
Source of data	PNG's FREL and IPCC 2006 Guidelines
Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	VMD0006 is followed as guideline for calculations
Purpose of Data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Comments	

Data / Parameter	$C_{WP,i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Carbon stock entering the wood products pool at the time of deforestation from stratum <i>i</i>
Source of data	Deforestation plan provided by the Kakuna-Lote FCA application 2019

Value applied	21.1 tCO ₂ e ha ⁻¹
Justification of choice of data or description of measurement methods and procedures applied	Followed VMD0005, using values from deforestation plan
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$C_{XB,i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Mean stock of extracted biomass carbon at the time of deforestation from stratum i
Source of data	Deforestation plan provided by the Kakuna-Lote FCA application 2019
Value applied	27.8 tCO ₂ e ha ⁻¹
Justification of choice of data or description of measurement methods and procedures applied	Followed VMD0005, using values from deforestation plan
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	WW_{ty}
Data unit	dimensionless
Description	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product ty
Source of data	VMD0005
Value applied	0.24

Justification of choice of data or description of measurement methods and procedures applied	Default factor for wood waste of 0.24 as given by VCS module VMD0005 for developing countries Since VMD0005 provides a single default wood waste factor for all timber categories in the developing countries, only one class of Wood products is used for the calculation of the Harvested Wood Product pool
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	<i>ty</i>
Data unit	
Description	Wood product class
Source of data	VMD0005
Value applied	defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
Justification of choice of data or description of measurement methods and procedures applied	Since VMD0005 provides a single default wood waste factor for all timber categories in the developing countries, only one class of Wood products is used for the calculation of the Harvested Wood Product pool
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$C_{WP100,i}$
Data unit	tCO ₂ e ha ⁻¹
Description	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum <i>i</i>

Source of data	Deforestation plan provided by the Kakuna-Lote FCA application 2019
Value applied	16.7 tCO ₂ e ha ⁻¹
Justification of choice of data or description of measurement methods and procedures applied	Followed VMD0005, using values from deforestation plan
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	<i>SLF_{ty}</i>
Data unit	Dimensionless
Description	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product <i>ty</i>
Source of data	VMD0005
Value applied	0.3
Justification of choice of data or description of measurement methods and procedures applied	Followed VMD0005, using default fraction parameters for roundwood
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	<i>OF_{ty}</i>
Data unit	Dimensionless
Description	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product <i>ty</i>
Source of data	VMD0005

Value applied	0.7
Justification of choice of data or description of measurement methods and procedures applied	Followed VMD0005, using default fraction parameters for roundwood
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$E_{FC,i,t}$
Data unit	tCO ₂ e
Description	Emission from fossil fuel combustion in stratum i in year t
Source of data	
Value applied	0 tCO ₂ e
Justification of choice of data or description of measurement methods and procedures applied	The Emission from fossil fuel combustion in the baseline for Tavolo the Project Area are conservatively set to 0 tCO₂e for all years
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$E_{BiomassBurn,i,t}$
Data unit	tCO ₂ e
Description	Non-CO ₂ emissions due to biomass burning in stratum i in year t
Source of data	
Value applied	0 tCO ₂ e
Justification of choice of data or description of measurement methods and procedures applied	The Non-CO ₂ emissions due to biomass burning in the baseline for Tavolo the Project Area are conservatively set to 0 tCO₂e for all years

Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

Data / Parameter	$N_2O_{direct-N,i,t}$
Data unit	tCO ₂ e
Description	Direct N ₂ O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum <i>i</i> in year <i>t</i>
Source of data	
Value applied	0 tCO ₂ e
Justification of choice of data or description of measurement methods and procedures applied	The Direct N ₂ O emission as a result of nitrogen application in the baseline for Tavolo the Project Area are conservatively set to 0 tCO₂e for all years
Purpose of Data	Determination of baseline scenario Calculation of baseline emissions
Comments	

4.2 Data and Parameters Monitored

Data / Parameter	ΔC_{PRJ}
Data unit	tCO ₂ e
Description	Net greenhouse gas emissions within the project area under the project scenario
Source of data	Tavolo Land Use Plan
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	

Value applied	See Table 10; 5,049 tCO ₂ e
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method	See paragraph 5.2
Comments	

Data / Parameter	$\Delta C_{PRJ,DefPA,i,t}$
Data unit	tCO ₂ e
Description	Net carbon stock change as a result of deforestation in the project area in the project scenario in stratum <i>i</i> at time <i>t</i>
Source of data	Landsat 8 and Landsat 9 Image Classification
Description of measurement methods and procedures to be applied	See paragraph 4.3.1
Frequency of monitoring/recording	
Value applied	See Table 10; 5,049 tCO ₂ e
Monitoring equipment	
QA/QC procedures to be applied	See paragraph 4.3.1
Purpose of data	Calculation of project emissions
Calculation method	See paragraph 4.3.1
Comments	

Data / Parameter	$\Delta C_{PRJ,DistPA,i,t}$
Data unit	tCO ₂ e

Description	Net carbon stock change as a result of natural disturbance in the project area in the project scenario in stratum <i>i</i> at time <i>t</i>
Source of data	
Description of measurement methods and procedures to be applied	See paragraph 4.3.1
Frequency of monitoring/recording	
Value applied	See Table 10; 0 tCO ₂ e
Monitoring equipment	
QA/QC procedures to be applied	See paragraph 4.3.1
Purpose of data	Calculation of project emissions
Calculation method	See paragraph 4.3.1
Comments	

Data / Parameter	$\Delta C_{PRJ,Deg-IT,i,t}$
Data unit	tCO ₂ e
Description	Net carbon stock change as a result of forest degradation through extraction of trees for illegal timber or fuelwood and charcoal in the project area in the project scenario in stratum <i>i</i> at time <i>t</i>
Source of data	Tavolo Land Use Plan and PRA
Description of measurement methods and procedures to be applied	See paragraph 4.3.2
Frequency of monitoring/recording	
Value applied	See Table 10; 0 tCO ₂ e
Monitoring equipment	

QA/QC procedures to be applied	See paragraph 4.3.2
Purpose of data	Calculation of project emissions
Calculation method	See paragraph 4.3.2
Comments	

Data / Parameter	$\Delta C_{PRJ,Deg-FSC,i,t}$
Data unit	tCO ₂ e
Description	Net carbon stock change as a result of forest degradation due to selective logging of forest management areas possessing a FSC certificate in the project area in the project scenario in stratum <i>i</i> at time <i>t</i>
Source of data	Tavolo Land Use Plan and FSC Logging Plan for Tavolo
Description of measurement methods and procedures to be applied	See paragraph 4.3.3
Frequency of monitoring/recording	
Value applied	See Table 10; 0 tCO ₂ e (estimation)
Monitoring equipment	
QA/QC procedures to be applied	See paragraph 4.3.3
Purpose of data	Calculation of project emissions
Calculation method	See paragraph 4.3.3
Comments	

Data / Parameter	ΔC_{LK}
Data unit	tCO ₂ e
Description	Net GHG emissions due to leakage from the REDD project activity over the project period

Source of data	PNGi Forest Portal (www.pngiforest.org) or other operational licenses
Description of measurement methods and procedures to be applied	See paragraph 4.3.4
Frequency of monitoring/recording	
Value applied	See Table 10; 0 tCO ₂ e
Monitoring equipment	
QA/QC procedures to be applied	See paragraph 4.3.4
Purpose of data	Calculation of project emissions
Calculation method	See paragraph 4.3.4
Comments	

Data / Parameter	NER_{REDD}
Data unit	tCO ₂ e
Description	Total net GHG emission reductions of the REDD project activity over the project period
Source of data	
Description of measurement methods and procedures to be applied	See paragraph 5.4
Frequency of monitoring/recording	
Value applied	
Monitoring equipment	
QA/QC procedures to be applied	See paragraph 5.4
Purpose of data	Calculation of project emissions
Calculation method	See paragraph 5.4

Comments	
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4.3 Monitoring Plan

After the implementation of the project, the ex-post emissions and removals of GHGs due to deforestation and forest degradation that has been induced as a result of project implementation within the project area and as a result of natural disturbances will be monitored by the project periodically.

This monitoring plan for the Tavolo REDD project includes the following:

1. Monitoring deforestation and natural disturbances in the project area ($\Delta C_{PRJ,DefPA,i,t}$ and $\Delta C_{PRJ,DistPA,i,t}$)
2. Monitoring forest degradation due to illegal logging or fuelwood and charcoal in the project area ($\Delta C_{PRJ,Deg-IT,i,t}$)
3. Monitoring forest degradation due to selective logging under FSC in the project area ($\Delta C_{PRJ,Deg-FSC,i,t}$)
4. Monitoring leakage due to project implementation

4.3.1 Monitoring deforestation and natural disturbances

This first step will produce an estimate of the emissions resulting from any deforestation and natural disturbances that occurs within the project area ($\Delta C_{PRJ,DefPA,i,t}$ and $\Delta C_{PRJ,DistPA,i,t}$).

The net carbon stock change as a result of deforestation and natural disturbances is equal to the area deforested multiplied by the emission per unit area.

$$\Delta C_{PRJ,DefPA,i,t} = \sum_{u=1}^U (A_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t}) \quad (1)$$

$$\Delta C_{PRJ,DistPA,i,t} = \sum_{u=1}^U (A_{DistPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t}) \quad (2)$$

Where:

$\Delta C_{PRJ,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t ; tCO ₂ e
$A_{DefPA,u,i,t}$	Area of recorded deforestation in the project area stratum i converted to land use u at time t ; ha
$\Delta C_{PRJ,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project scenario in stratum i at time t ; tCO ₂ e

$A_{DisPA,u,i,t}$	Area of recorded natural disturbances in the project area stratum i converted to land use u at time t ; ha
$\Delta C_{pools,Def,u,i,t}$	Net carbon stock changes in all pools as a result of deforestation in the project case in land use u in stratum i at time t ; tCO ₂ e ha ⁻¹
u	1, 2, 3 ... U post-deforestation land uses
i	1, 2, 3 ... M strata
t	1, 2, 3, ... t^* years elapsed since the start of the REDD project activity

The emission per unit area is equal to the difference between the stocks before and after deforestation minus any wood products created from timber extraction in the process of deforestation:

$$\Delta C_{pools,Def,u,i,t} = C_{BSL,i} - C_{P,post,i} - C_{WP,i} \quad (3)$$

Where:

$\Delta C_{pools,Def,u,i,t}$	Net carbon stock changes in all pools as a result of deforestation in the project case in land use u in stratum i at time t ; tCO ₂ e ha ⁻¹
$C_{BSL,i}$	Carbon stock in all pools in the baseline case in stratum i ; tCO ₂ e ha ⁻¹
$C_{P,post,u,i}$	Carbon stock in all pools in post-deforestation land use u in stratum i ; tCO ₂ e ha ⁻¹
$C_{WP,i}$	Carbon stock sequestered in wood products from harvests in stratum i ; tCO ₂ e ha ⁻¹
u	1, 2, 3 ... U post-deforestation land uses
i	1, 2, 3 ... M strata
t	1, 2, 3, ... t^* years elapsed since the start of the REDD project activity

As indicated in the VCS PD for the project, only above- and belowground tree biomass are selected as carbon pools for this project. The harvested wood products are conservatively excluded as carbon pool. It is assumed that no wood products are produced from the deforestation occurring in the project area. Therefore the carbon stock for each post-deforestation land use (u) is calculated as follows:

$$C_{P,post,i} = C_{ABtree_{post,i}} + C_{BBtree_{post,i}} \quad (4)$$

Where:

$C_{P,post,u,i}$	Carbon stock in all pools in post-deforestation land use u in stratum i ; $tCO_2e\ ha^{-1}$
$C_{ABtree_{post},i}$	Carbon stock in aboveground tree biomass in stratum i ; $tCO_2e\ ha^{-1}$
$C_{BBtree_{post},i}$	Carbon stock in belowground tree biomass in stratum i ; $tCO_2e\ ha^{-1}$
u	1, 2, 3 ... U post-deforestation land uses
i	1, 2, 3 ... M strata

Monitoring area of recorded deforestation

Forest cover change due to deforestation and natural disturbance is monitored through periodic assessment of classified satellite imagery covering the project area.

The project boundary, as set in the VCS PD (see paragraph 1.7 and Figure 2 below), serves as the initial “forest cover benchmark map” against which changes in forest cover will be assessed over the interval of the first monitoring period; the entire project area has been demonstrated to meet the forest definition at the beginning of the crediting period in 2019. For this monitoring period, change in forest cover will be assessed against the preceding classified forest cover map marking the beginning of the monitoring interval.

Data collection and analysis to determine forest cover change at each monitoring event will follow the procedures detailed below. The resulting classified image is compared with the preceding classified image (forest cover benchmark map marking the start of the monitoring interval) to detect forest cover change over the monitoring interval, and subsequently becomes the updated forest cover benchmark map for the next monitoring interval. Thus, the forest benchmark map is updated at each monitoring event. All changes in forest cover detected for the monitoring interval will be annualized (to produce estimates of ha for each year) by dividing the area by the number of years in the period.

Satellite data acquisition

For each monitoring/verification date, satellite imagery for that year will be acquired and interpreted to produce a classified forest cover map in which forest and non-forest are distinguished. The satellite images used by the project for the forest cover classification will meet the minimum required resolution of 30 meters in the GOFC-GOLD 2016 guidelines.¹

The satellite imagery will cover the entire project area and will be from a single year, though it may include a mosaic of scenes over several months. Imagery will be 90% cloud free. To achieve 90% classified area, multiple scenes or portions of multiple scenes may be mosaicked.

¹ GOFC-GOLD, 2016, A sourcebook of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals associated with deforestation, gains and losses of carbon stocks in forests remaining forests, and forestation. GOFC-GOLD Report version COP22-1, (GOFC-GOLD Land Cover Project Office, Wageningen University, The Netherlands).

Where possible, areas that are continually clouded will be classified on the basis of other data sources (e.g. ground surveys in the year of interest, radar, over-flights or classified imagery from a year subsequent to the monitored year).

Interpretation and Classification

The satellite images will be processed using supervised pixel-based classification. Pixels will be grouped according to similarities in band values and assigned to one of the following classes:

- Forest (including primary and secondary/degraded forest)
- Non-forest (including all land use types other than forest)

Conform the national forest definition of PNG¹ and the GOFC-GOLD guidelines,¹ isolated pixel-groups of less than 1 hectare (11 Landsat pixels, 0.99 ha) will be dissolved in the surrounding class to get a minimum mapping unit (MMU) of 1 hectare. This MMU will be used throughout the duration of the project crediting period.

Change detection

Post-classification change detection techniques will be implemented to identify forest cover change. Basic cross-tabulation techniques will be used to identify changes from forest to non-forest. Area data from the two maps (benchmark map at beginning of monitoring interval and newly-generated map for current monitoring year) will be cross-tabulated to identify locations that change from forest to non-forest during the monitoring period, which represent deforestation in the actual with-project case.

Quality Assurance and Quality Control

The accuracy of the forest cover classification will be assessed by comparing the classification with samples of high-resolution satellite imagery (e.g. NICFI, SPOT or RapidEye).

Data Archiving

All data sources and processing, classification and change detection procedures will be documented and archived by the project proponent.

2019 Tavolo Forest Cover Benchmark Map

Following the procedure described above, the Forest Cover Benchmark Map was produced for the Tavolo REDD Project Area based on the 2019 Landsat images. The 2019 forest cover classification of the landsat images is given in Figure 2 below.

As can be seen, 19,373 hectares out of the 21,164 hectares has been classified as forest cover in 2019. However, since only the three different forest zones, as defined by the Tavolo community in their Land Use Plan (see VCS PD v1.0), are included as forest conservation area, 16,493 hectares out of the 19,373 hectares of 2019 forest cover has been selected as REDD

¹ Papua New Guinea, 2017, Papua New Guinea's National REDD+ Forest Reference Level, https://redd.unfccc.int/files/png_frl_submission-15.01.2017.pdf

project area and together form the 2019 Forest Cover Benchmark Map for the Tavolo REDD project (see Figure 3).

The accuracy of the 2019 Forest Cover Benchmark Map was assessed by using high resolution NICFI satellite imagery. The SEPAL.io “Stratified area estimator - Design”- tool was used to generate random samples per identified class, with a minimum of 50 sample points per class. Ground-truthing was done by uploading the random samples to Collect Earth Online and assessing them using high-resolution NICFI imagery. The confusion matrix of the accuracy assessment of the 2019 LULC map, is shown in Table 2. The overall accuracy of the 2019 map is 90.00%.

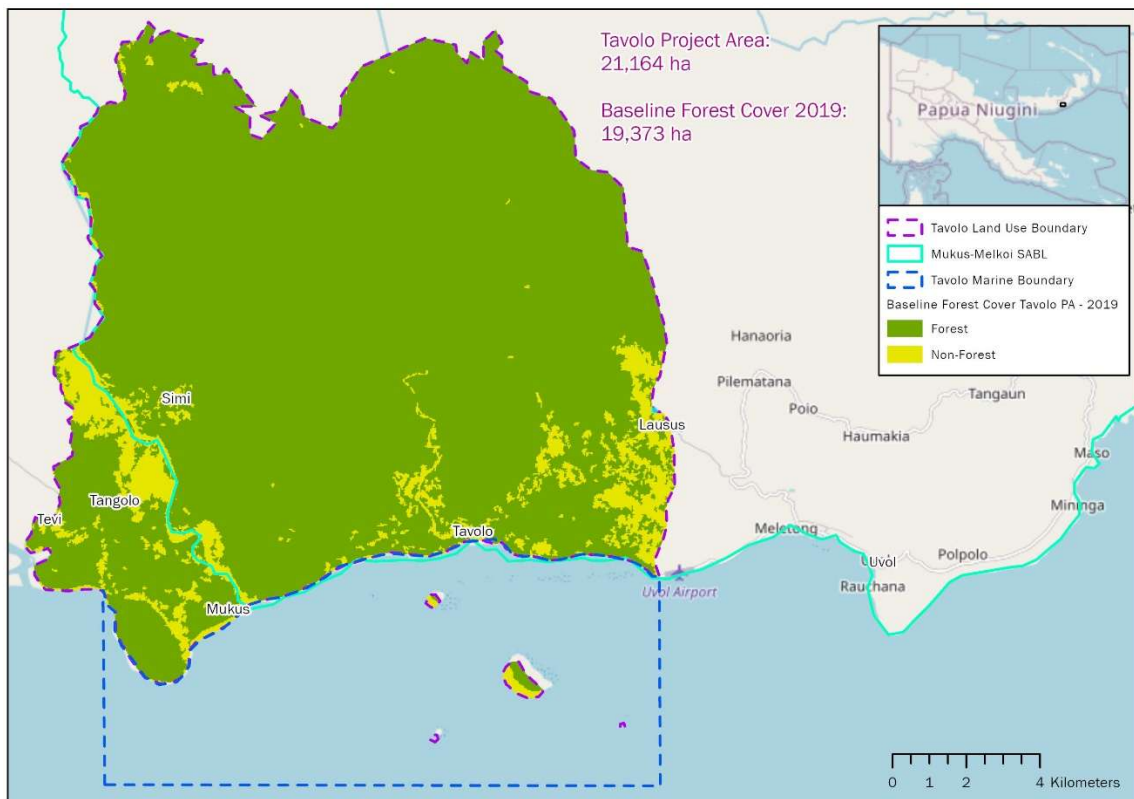


Figure 2 - 2019 Forest Cover Classification based on Landsat 8 Images

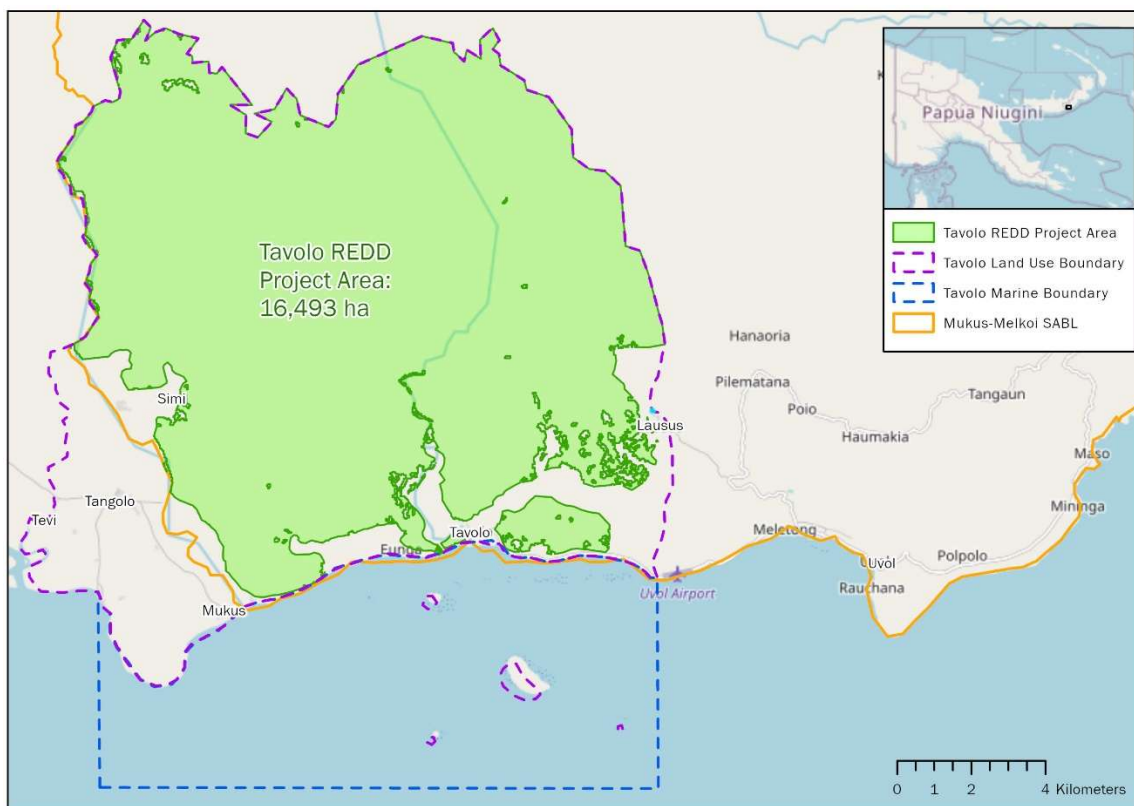


Figure 3 - 2019 Forest Cover Benchmark Map based on Landsat 8 Image Classification

Table 2 – Confusion Matrix forest cover classification - 2019 Forest Cover Benchmark Map

Land use class as classified	Reference data		Total	User's Accuracy	Error of Commission
	Forest	Non-forest			
Forest (50 samples)	50	0	50	100%	0%
Non-forest (50 samples)	10	40	50	80%	20%
Total	60	40	100		
Producer's Accuracy	83.33%	100%			
Error of Omission	16.67%	0%			

Change in carbon stock due to deforestation

As already presented in the VCS PD, the pre- and post-deforestation carbon stocks are estimated for the Tavolo project as follows:

Pre-deforestation carbon stock

The pre-deforestation carbon stock is based on the results of the 2020 baseline forest carbon stock inventory done within the Tavolo REDD Project Area. The resulting pre-deforestation carbon stocks are presented in Table 3 below. Please note that the forest area is not stratified,

so only one pre-deforestation carbon stock applies for forest areas within the Tavolo REDD project area.

Table 3 - Results of the 2020 baseline assessment of the above ground tree biomass in forest area planned to be cleared in the Tavolo REDD Project Area

Pre-deforestation strata	$C_{ABtree_{bsl}}$ (tCO _{2e} ha ⁻¹)	Root-Shoot factor	$C_{BBtree_{bsl}}$ (tCO _{2e} ha ⁻¹)	$C_{ABtree_{bsl}} + C_{BBtree_{bsl}}$ (tCO _{2e} ha ⁻¹)	Uncertainty (at 95% CL)
Forest area under Kakuna-Lote FCA	400.8	37%	148.3	549.2	15,9%

Post-deforestation carbon stock

For the Tavolo project one potential post-deforestation (*u*) land uses are identified for the project scenario: Subsistence & other land use.

The IPCC Guidelines 2006 and PNG's FREL provides default carbon stocks for the identified post-deforestation land use, these carbon stocks are given in Table 4 below.

Table 4 – Post-deforestation land use and the carbon stock values for above- and belowground tree biomass

Post-deforestation land use	$C_{ABtree_{post}}$ (tCO _{2e} ha ⁻¹)	Root-Shoot factor	$C_{BBtree_{post}}$ (tCO _{2e} ha ⁻¹)	$C_{P,post,u,i}$ (tCO _{2e} ha ⁻¹)	Reference
Subsistence & other land use	77.6	37%	28.7	106.2	Table 6.3 PNG FREL, Table 5.1, IPCC 2007

4.3.2 Monitoring forest degradation due to illegal logging or fuelwood and charcoal

For monitoring forest degradation due to illegal logging or fuelwood and charcoal, VCS module VMD0015 will be followed.¹

The Tavolo Community has gone through a participatory process to develop its Sustainable Land Use Plan agreeing on the various user zones (see Figure 1, Section 1.12) and its Community Conservation Laws. For the monitoring and enforcement of the SLUP and Conservation Laws a Community Conservation Law Committee has been established, at all three villages (Mukus, Tavolo and Lausus). This Committee monitors the compliance by Tavolo Community members and neighbouring clans on an ongoing basis. There is no charcoal production or sales done anywhere in PNG. Firewood is collected from food garden areas. The potential for illegal extraction of trees to occur, at a larger scale than an incidental tree felled for local house building purposes in the conservation zones is very low. This will be confirmed in

¹ VCS Module VMD0015 REDD Methodological Module: Methods for Monitoring of GHG Emissions and Removals (M-REDD)

the first annual project monitoring meeting between FORCERT and TCCA, and if this lack of potential pressure for these activities is confirmed, then degradation ($\Delta C_{PRJ, Deg_IT, i, t}$) can be assumed to be zero and no monitoring is needed. The Community Conservation Law Committee monitoring will be ongoing and the FORCERT-TCCA project monitoring meetings will be held every year.

If there would be a potential for degradation activities, then limited field sampling must be undertaken. First, the area that is potentially subject to degradation needs to be delineated ($A_{Deg_IT, i}$). An output of the PRA shall be a distance of degradation penetration from all access points (access buffer), such as roads and rivers or previously cleared areas, to the project area. The distance of degradation penetration will vary by form of degradation with a deeper penetration likely for illegal logging than for fuelwood/charcoal.

The area subject to degradation shall be delineated ($A_{Deg_IT, i}$) based on an access buffer from all access points, such as roads and rivers or previously cleared areas, to the project area, with a width equal to the distance of degradation penetration. $A_{Deg_IT, i}$ shall be sampled by surveying several transects of known length and width across the access-buffer area (equal in area to at least 1% of $A_{Deg_IT, i}$) to check whether new tree stumps are evident or not. If there is little to no evidence that trees are being harvested (see next paragraph on how to estimate emissions and use tool T- SIG to determine if significant or not) then degradation can be assumed to be zero and no monitoring is needed. This limited sampling must to be repeated each time the PRA indicates a potential for degradation.

If the limited sampling does provide evidence that trees are being removed in the buffer area, then a more systematic sampling must be implemented. The sampling plan must be designed using plots systematically placed over the buffer zone so that they sample at least 3% of the area of the buffer zone ($A_{Deg_IT, i}$). The diameter of all tree stumps will be measured and conservatively assumed to be the same as the DBH. If the stump is a large buttress, identify several individuals of the same species nearby and determine a ratio of the diameter at DBH to the diameter of buttress at the same height above ground as the measured stumps. This ratio will be applied to the measured stumps to estimate the likely DBH of the cut tree. The above and below ground carbon stock of each harvested tree must be estimated using the same allometric regression equation and root to shoot ratio used in the module for estimating the carbon pool in trees (CP- AB) in the baseline scenario.¹ The mean above and below ground carbon stock of the harvested trees is conservatively estimated to be the total emissions and to all enter the atmosphere. This sampling procedure shall be repeated every 5 years and the results annualized by dividing the total emissions by five.

Where the PRA or the limited sampling indicate no degradation occurring:

¹ If species-specific equations are used in the baseline and species cannot be identified from stumps then it shall be assumed that the harvested species is the species most commonly harvested for the specific degradation purpose (e.g. fuelwood, charcoal or timber). A PRA shall be used to determine the most commonly harvested species.

$$\Delta C_{PRJ,Deg_IT,i,t} = 0$$

Where the PRA and the limited sampling indicate degradation is occurring:

$$\Delta C_{PRJ,Deg_IT,i,t} = A_{Deg_IT,i} * \frac{C_{Deg_IT,i,t}}{AP_i} \quad (5)$$

Where:

$\Delta C_{PRJ,Deg_IT,i,t}$ Net carbon stock change as a result of forest degradation through extraction of trees for illegal timber or fuelwood and charcoal in the project area in the project scenario in stratum i at time t ; tCO₂e

$A_{Deg_IT,i}$ Area potentially impacted by degradation processes in stratum i ; ha

$C_{Deg_IT,i,t}$ Biomass carbon of trees cut and removed through degradation process from plots measured in stratum i at time t ; tCO₂e

AP_i Total area of degradation sample plots in stratum i ; ha

i 1, 2, 3 ... M strata

t 1, 2, 3, ... t^* years elapsed since the start of the REDD project activity

4.3.3 Monitoring forest degradation due to selective logging under FSC

The impact of any small-scale portable sawmilling operation taking place in the production forest area of the Tavolo land use plan area will be monitored by FORCERT as part of their FSC Group certificate monitoring plans. For this monitoring VCS module VMD0015 will be followed.

The calculation procedure for estimating net ex post emissions and removals related to selective logging activities in the project case will be equal to the summed emissions arising from selective logging operations. Emissions resulting from selective logging may be omitted if they are deemed de minimis through the use of the module T-SIG.

The net emissions from small-scale FSC logging in the project case are estimated by combining:

- Emissions arising from logging gap: encompass emissions from felling timber tree and emissions from incidental damage caused by falling timber tree,
- Emissions from infrastructure: from constructing logging infrastructure for removal of timber, such as haul roads, skid trails and logging decks,
- Removals from long term wood products resulting from timber extraction

$$\Delta C_{PRJ,Deg-FSC,i,t} = \sum_{t=1}^{t^*} (C_{LG,i,t} + C_{LR,i,t} - C_{WP,i,t}) \quad (6)$$

Where:

$\Delta C_{PRJ,Deg-F,i,t}$	Net carbon stock change as a result of forest degradation due to selective logging of forest management areas possessing a FSC certificate in the project area in the project scenario in stratum i at time t ; tCO ₂ e
$C_{LG,i,t}$	Actual net project emissions arising in the logging gap in stratum i at time t ; tCO ₂ e
$C_{LR,i,t}$	Actual net project emissions arising from logging infrastructure in stratum i at time t ; tCO ₂ e
$C_{WP,i,t}$	Carbon stock in wood products pool from stratum i at time t ; tCO ₂ e
i	1, 2, 3 ... M strata
t	1, 2, 3, ... t^* years elapsed since the start of the REDD project activity

FORCERT will undertake annual monitoring of the small-scale sawmilling operation in the Tavolo production forest area, to collect information on area, number of trees and timber volume harvested, and m3 of sawn timber produced. At least every five (5) years FORCERT will further monitor the operation to determine its impact through determining the number and size of logging gaps, and the extend of logging infrastructure.

4.3.4 Monitoring leakage

As module VMD0011 does not prescribe a monitoring procedure and market leakage is considered a default occurrence, the project will exclusively monitor potential deforestation leakage due to activity shifting, following the procedures outlined in module VMD009.

Step 1: Monitoring Logging Operations

All future logging operations conducted by the baseline agent of deforestation, Mekar PNG Ltd., and its parent company, Vanimo Jaya Limited, will be monitored and assessed on an annual basis. This assessment will utilize log export information from collected by SGS Papua New Guinea compiled on the PNGi Forest Portal (<https://pngiforests.org/company/vanimo-jaya>) and other relevant operational licenses.

If the data and reports indicate that logging operations by Vanimo Jaya Ltd. have not increased since the project start, activity shifting leakage will be considered negligible and set to zero. This aligns with VMD0009, which states that leakage does not need to be accounted for when it can be demonstrated that the management plans and/or land-use designations of the deforestation agent's other lands (which must be identified by location) have not materially changed as a result of the project.

Step 2: Determining the Cause of Increased Logging

If log export data shows an increase in logging operations by Vanimo Jaya Ltd. since the project start, the project will assess whether this increase is directly attributable to the project or is a result of external factors.

If the increase is unrelated to the project and is instead driven by external factors (e.g., market demand, policy changes), activity shifting leakage will not be considered and set to **zero**.

This determination will be based on verifiable sources, including:

- Official government and industry reports
- Market analyses
- Peer-reviewed literature
- Other relevant data sources

This approach follows VMD0009, which states that leakage does not need to be considered when it can be demonstrated that the increase is unrelated to the project and influenced by external factors beyond the control of project proponents.

Step 3: Estimating Leakage if Attributable to the Project

If assessments in Steps 1 and 2 indicate a clear increase in logging operations by Mekar PNG Ltd. and Vanimo Jaya Ltd. that is directly linked to the project, the project will quantify the resulting leakage. The estimation will follow the procedure outlined in VMD0009 Section 5.1.

$$\Delta C_{LK-AS,planned} = \sum_{t=1}^{t^*} \sum_{i=1}^M (LKA_{planned,i,t} \times \Delta C_{BSL,i}) + GHG_{LK,E,i,t} \quad (7)$$

Where:

$\Delta C_{LK-AS,planned}$	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation up to year t^* ; tCO ₂ e
$LKA_{planned,i,t}$	The area of activity shifting leakage in stratum i in year t ; ha
$\Delta C_{BSL,i}$	Net carbon stock changes in all pre-deforestation pools in baseline stratum i ; tCO ₂ e/ha
$GHG_{LK,E,i,t}$	Greenhouse gas emissions as a result of leakage of avoiding deforestation activities in stratum i in year t ; tCO ₂ e
i	1, 2, 3, ... M strata; unitless
t	1, 2, 3, ... t^* time elapsed since the start of the project activity; years

4.3.5 Baseline revision

The baseline of the Tavolo REDD Project will be revised after every 10 years during the project period. The procedure used to update the baseline will be the same as used for the baseline determination in this PD.

4.3.6 Monitoring Roles and Responsibilities

Here's a summary of the roles and responsibilities outlined in the monitoring plan:

1. FORCERT:

- Responsible for the implementation of all monitoring activities described in the Monitoring Plan.
- Responsible for reporting and data archiving, including maintaining digital versions of original documents.
- Provides assistance during verification audits.

2. Tavolo Community Conservation Association:

- Assists in required field sampling and community data collection.
- Responsible for all community level monitoring activities
- Responsible for community level reporting and data archiving
- Provides assistance during verification audits

3. Face the Future:

- Assists in the implementation and reporting of monitoring activities.
- Provides training to monitoring staff on elements of the Monitoring Plan.
- Reviews the final Monitoring Reports, ensuring quality and accuracy of the data and findings.
- Contributes to capacity building and quality assurance within the project team.

Overall, this distribution of roles ensures that monitoring activities are conducted efficiently and accurately, with each entity contributing its expertise and resources towards the successful implementation of the monitoring plan. Collaboration between FORCERT, the local community, and Face the Future strengthens the project's monitoring framework and fosters accountability and transparency in reporting.

4.3.7 Policies for oversight and Accountability

The policies outlined for oversight and accountability of monitoring activities are as follows:

1. **Utilization of Internal Expertise:** Both FORCERT and Face the Future will utilize their internal expertise to manage the review of documents and data from the monitoring plan. This ensures that the monitoring plan complies with applicable standards and is conducted with a high level of competence and knowledge.
2. **Regular Review Meetings:** Regular review meetings will be held between the project proponents and stakeholders to evaluate the monitoring plan. This provides an opportunity for collaboration, feedback, and alignment between all parties involved in the project, enhancing accountability and ensuring that monitoring activities are on track.

3. **Transparency and Accountability:** To uphold transparency and accountability, the monitoring plan and its results will be made available to Verification and Validation Bodies (VVB) and VCS (Verified Carbon Standard) verifiers at each verification stage. This ensures that external parties responsible for verifying the project's compliance have access to all relevant information, fostering trust and credibility in the project's outcomes.

Overall, these policies emphasize a comprehensive approach to oversight and accountability, involving internal expertise, regular review mechanisms, and transparency measures to ensure the effectiveness and integrity of monitoring activities within the project.

4.3.8 Procedures for handling non-conformances with the validated monitoring plan

The following procedure will be followed to handle non-conformances:

1. **Establishment of Procedures:** The project proponents will create procedures to handle non-conformities. These procedures will be designed to meet the main control levels and ensure compliance with project objectives.
2. **Minimization of Error Risk:** A key goal is to minimize the risk of errors. This will involve developing a quality management system for project information. The aim is to ensure the reliability of data supporting monitoring results, thereby reducing the likelihood of non-conformities.
3. **Quality Management System Development:** A quality management system for project information will be developed. This system will focus on obtaining reliable data to support monitoring results. It will involve training the project team in their respective roles under the Tavolo REDD Project.
4. **Field Review and Monitoring:** Field reviews will be conducted to monitor adherence to methodological guidelines. This ensures that procedures are being followed correctly in the field.
5. **Thorough Review of Information:** Before releasing information to stakeholders such as VVBs (Validation and Verification Bodies), governments, and institutions, all relevant project information will undergo careful review. This review aims to verify the accuracy and reliability of calculations, data, analyses, and conclusions.
6. **Actions by Project Partners:** These actions will be carried out by FORCERT in collaboration with Face the Future, indicating a partnership approach to quality management and monitoring.
7. **Handling Non-Conformities:** If any non-conformities are identified during the processes, the data will be reviewed, and necessary actions will be taken to address them. Any deviations from established procedures will be documented in Section 3.2 of the Monitoring Report.

Overall, these measures underscore a commitment to quality assurance and control within the project, with a focus on ensuring the accuracy and reliability of project information and processes.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As described and elaborated in the VCS PD (version 1.0 paragraph 4.1), the baseline emissions caused by the deforestation planned by Kakuna-Lote LOC are quantified at a total of 2,686,735 tCO₂e for all the baseline carbon pools over the project period of 30 years.

Looking at this monitoring period 2019 - 2022, the total emissions would have been 1,264,055 tCO₂e in the baseline (without-project) scenario mainly caused by biomass loss due to deforestation (see Table 5 below).

Table 5 - Stock change in the baseline carbon pools between 2019 and 2022

Year	Annual deforestation in open forest (ha)	Stock change in AGB (tCO ₂ e)	Stock change in BGB (tCO ₂ e)	Stock change in WP (tCO ₂ e)	Sum of stock change in all baseline carbon pools (tCO ₂ e)
2019	-	-	-	-	-
2020	2,800	641,089	23,720	-44,363	620,446
2021	2,787	638,101	47,330	-41,822	643,610
Total	5,587	1,279,190	71,050	-86,185	1,264,055

5.2 Project Emissions

For the quantification of the carbon stock changes and GHG emissions in the project scenario VCS module VMD0015 is followed.¹

The net greenhouse gas emissions in the project scenario are equal to the sum of stock changes due to deforestation and degradation plus the total greenhouse gas emissions minus any eligible forest carbon stock enhancement:

$$\Delta C_{PRJ} = \sum_{t=1}^{t^*} \sum_{i=1}^M (\Delta C_{PRJ,DefPA,i,t} + \Delta C_{PRJ,Deg-I,i,t} + \Delta C_{PRJ,Deg-FSC,i,t} + \Delta C_{PRJ,DistPA,i,t} + \Delta GHG_{PRJ-E,i,t} - \Delta C_{PRJ,Enh,i,t}) \quad (8)$$

¹ VCS Module VMD0015 REDD Methodological Module: Methods for Monitoring of GHG Emissions and Removals (M-REDD)

Where:

ΔC_{PRJ}	Net greenhouse gas emissions within the project area under the project scenario; tCO ₂ e
$\Delta C_{PRJ,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project scenario in stratum i at time t ; tCO ₂ e
$\Delta C_{PRJ,Deg,i,t}$	Net carbon stock change as a result of forest degradation through extraction of trees for illegal timber or fuelwood and charcoal in the project area in the project scenario in stratum i at time t ; tCO ₂ e
$\Delta C_{PRJ,Deg-FSC,i,t}$	Net carbon stock change as a result of forest degradation due to selective logging of forest management areas possessing a FSC certificate in the project area in the project scenario in stratum i at time t ; tCO ₂ e
$\Delta C_{PRJ,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project scenario in stratum i at time t ; tCO ₂ e
$\Delta GHG_{PRJ-i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project scenario in stratum i in year t ; tCO ₂ e
$\Delta C_{PRJ,Enh,i,t}$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in stratum i at time t ; tCO ₂ e
i	1, 2, 3 ... M strata
t	1, 2, 3, ... t^* years elapsed since the start of the REDD project activity

5.2.1 Carbon stock change as a result of deforestation and natural disturbance

To calculate the carbon stock change as a result of deforestation and natural disturbance in the project case, the procedures described in paragraph 4.3.1 are followed:

Area of recorded deforestation

Landsat 8 and Landsat 9 Images were used to classify the forest cover inside the Tavolo REDD Project Area at the end of this monitoring period. Appendix 1 provides the description of the classification process applied and the results of the QA/QC of the 2022 forest cover map.

The resulting 2022 forest cover map for the Tavolo REDD Project area is presented in Figure 4 below.



Figure 4 – 2022 Forest cover classification of the Tavolo REDD Project Area based on Landsat 8 and Landsat 9 images

The 2022 Forest Cover classification for the Tavolo REDD Project Area is compared with the preceding 2019 Forest Cover Benchmark Map. This comparison resulted in the detection of 15.2 ha of forest cover loss (deforestation) during the monitoring period 2019-2022. The detected deforestation is visualized in red in Table 6 and Figure 5 below.

Table 6 – Recorded deforestation per zone in the Tavolo REDD Project Area between 2019 and 2022

Tavolo Land Use Zone	Recorded Deforestation 2019-2022
	$A_{DefPA,u,i,t}$
Forest Conservation Zone	6.5 ha
Forest Production Zone	1.2 ha
Forest Conversion Zone	7.5 ha
Total recorder deforestation 2019-2022	15.2 ha

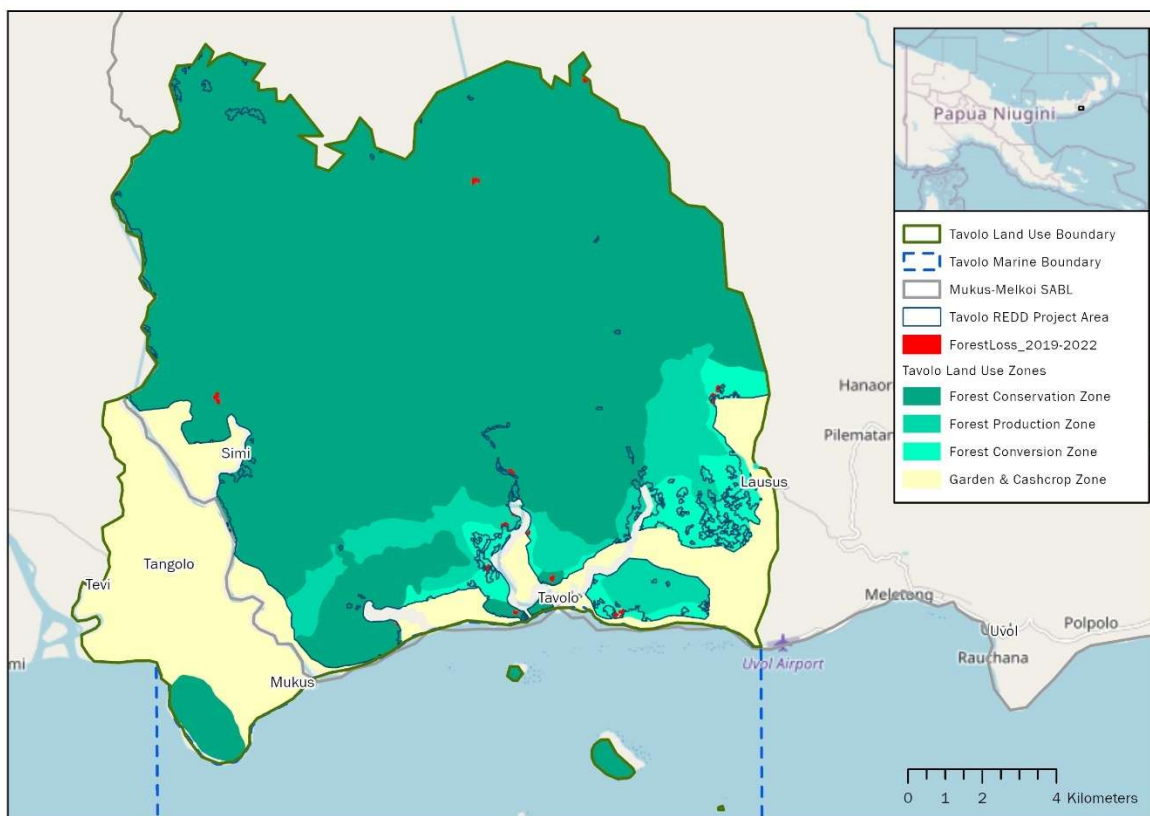


Figure 5 – Recorded deforestation (in red) in the Tavolo REDD Project Area between 2019 and 2022

The total recorded deforestation ($A_{DefPA,u,i,t}$) in the Tavolo REDD Project Area is therefore **15.2 ha** during the 3 years of monitoring between 2019 and 2022. To produce an estimate of area of deforestation per year, the total recorded deforestation is divided by the three years. The resulting area of deforestation per year is presented in Table 7 below.

Table 7 – Recorded deforestation per year in the Tavolo REDD Project Area between 2019 and 2022

Year	Recorded Deforestation 2019-2022 $A_{DefPA,u,i,t}$
2019	3.8 ha
2020	3.8 ha
2021	3.8 ha
Total recorder deforestation 2019-2022	15.2 ha

Area of recorded natural disturbances

During the monitoring period 2019-2022 no events of deforestation caused by natural disturbances were recorded. Therefore, the area of recorded natural disturbances ($A_{DistPA,u,i,t}$) is **0 ha**.

Change in carbon stock due to deforestation

As presented in paragraph 4.3.1, the pre-deforestation (baseline) carbon stock in all pools ($C_{BSL,i}$) is 549.2 tCO₂e ha⁻¹, while the post-deforestation carbon stock ($C_{P,post,i}$) is 106.2 tCO₂e ha⁻¹. Furthermore, the carbon stock sequestered in wood products from harvests in the project area ($C_{WP,i}$) is set at 0 tCO₂e ha⁻¹ since the driver of the detected deforestation is not timber harvest but conversion of forest lands to agriculture.

Therefore the change in carbon stock due to deforestation in the baseline ($\Delta C_{pools,Def,u,i,t}$) is calculated as:

$$\Delta C_{pools,Def,u,i,t} = C_{BSL,i} - C_{P,post,i} - C_{WP,i} = 549.2 - 106.2 - 0 = \mathbf{442.9 \text{ tCO}_2\text{e ha}^{-1}}$$

Net carbon stock change as a result of deforestation and natural disturbances

The net carbon stock change as a result of the recorded deforestation ($\Delta C_{PRJ,DefPA,i,t}$) in the Tavolo REDD Project Area during the monitoring period 2019-2022 is presented in Table 8.

The net carbon stock change as a result of the recorded deforestation due to natural disturbances ($\Delta C_{PRJ,DistPA,i,t}$) in the Tavolo REDD Project Area during the monitoring period 2019-2022 is presented in Table 9.

Table 8 - Stock change in the project carbon pools as a result of deforestation

Year	Annual deforestation area (ha)	Stock change in AGB+BGB (tCO ₂)	Stock change in WP (tCO ₂)	Sum of stock change due to deforestation in the project scenario (tCO ₂) $\Delta C_{PRJ,DefPA,i,t}$
2019	3.8	1,683	-	1,683
2020	3.8	1,683	-	1,683
2021	3.8	1,683	-	1,683
Total	11.4	5,049	-	5,049

Table 9 - Stock change in the project carbon pools as a result of deforestation due to natural disturbances

Year	Annual deforestation area due to natural disturbances (ha)	Stock change in AGB+BGB (tCO ₂)	Stock change in WP (tCO ₂)	Sum of stock change due to deforestation in the project scenario (tCO ₂) $\Delta C_{PRJ,DistPA,i,t}$
2019	-	-	-	-
2020	-	-	-	-
2021	-	-	-	-
Total		-	-	-

5.2.2 Carbon stock change as a result of forest degradation through extraction of trees for illegal timber or fuelwood and charcoal

There have been no reports by the Tavolo Community Conservation Law Committee on illegal harvesting of timber or fuelwood during the monitoring period, there is no production of charcoal practiced in PNG. Therefore the carbon stock change as a result of forest degradation through extraction of trees for illegal timber or fuelwood and charcoal during the monitoring period in the Tavolo REDD Project Area ($\Delta C_{PRJ,Deg_{IT},i,t}$) is **0 tCO₂e**.

5.2.3 Carbon stock change as a result of forest degradation due to selective logging of forest management areas possessing a FSC certificate

Since the FSC operations in Tavolo have not started yet. Therefore the carbon stock change as a result of forest degradation due to selective logging under FSC during the monitoring period in the Tavolo REDD Project Area ($\Delta C_{PRJ,Deg-FSC,i,t}$) is **0 tCO₂e**.

5.2.4 Greenhouse gas emissions as a result of deforestation and degradation activities

The GHG emissions pool due to deforestation and degradation activities is conservatively excluded for the with-project scenario as well as the without-project scenario.

Therefore greenhouse gas emissions as a result of deforestation and degradation activities ($\Delta GHG_{PRJ-E,i,t}$) is set at **0 tCO₂e** for all years.

5.2.5 Carbon stock change as a result of forest growth

Following VCS monitoring module VMD0015, the carbon stock change as a result of forest growth in the project area is conservatively set to **0 tCO₂e** for all years.

Therefore the carbon stock change as a result of forest growth ($\Delta C_{PRJ,Enh,i,t}$) is set at **0 tCO₂e** for all years.

5.2.6 Sum of project carbon stock change in all pools

As described at the beginning of this paragraph 5.2, the total expected carbon stock change in the project scenario is calculated as:

$$\Delta C_{PRJ} = \sum_{t=1}^{t^*} \sum_{i=1}^M (\Delta C_{PRJ,DefPA,i,t} + \Delta C_{PRJ,Deg-IT,i,t} + \Delta C_{PRJ,Deg-FSC,i,t} + \Delta C_{PRJ,DistPA,i,t} + \Delta GHG_{PRJ-E,i,t} - \Delta C_{PRJ,Enh,i,t})$$

The carbon stock changes in the with-project scenario for all years over the project period are given in Table 10 below.

Table 10 - Stock change in the project carbon pools

Year	Stock change due to deforestation (tCO ₂ e)	Stock change due to natural disturbance (tCO ₂ e)	Stock change due to forest degradation through illegal logging or fuelwood and charcoal collection (tCO ₂ e)	Stock change due to forest degradation through selective logging under FSC (tCO ₂ e)	GHG emissions due to deforestation and degradation activities (tCO ₂ e)	Stock change as a result of forest growth (tCO ₂ e)	Sum of stock change in all project carbon pools (tCO ₂ e)
2019	1,683	-	-	-	-	-	1,683
2020	1,683	-	-	-	-	-	1,683
2021	1,683	-	-	-	-	-	1,683
Total	5,049	-	-	-	-	-	5,049

5.3 Leakage

5.3.1 Activity shifting leakage

The baseline agent of deforestation Mekar PNG is operating in PNG under the parent company Vanimo Jaya Limited. Looking at the historical trend of logging operations and log exports in

PNG by Vanimo Jaya Limited as reported by SGS on the PNGi Forest Portal¹, it is clear that the management plans and/or land-use designations of Vanimo Jaya's other lands have not materially changed as a result of the project. What's more, since the start of the project in 2019, the logging operations under Vanimo Jaya decreased (see Figure 6).

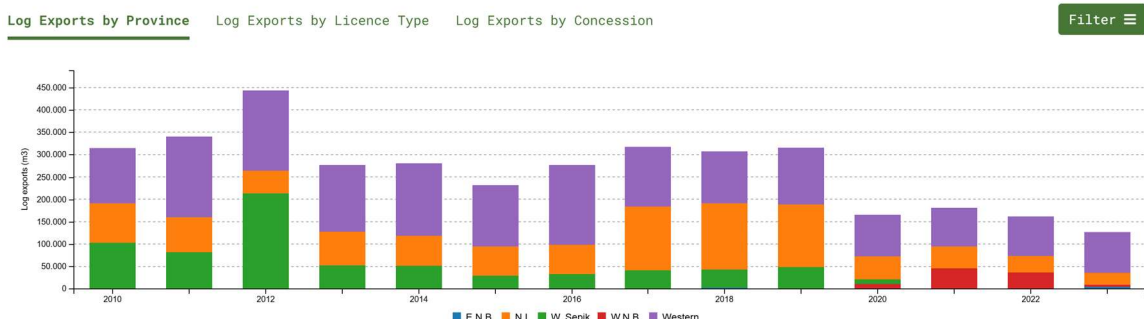


Figure 6 - Log Exports from the logging operations in PNG by Vanimo Jaya Limited as reported by SGS per year on the PNGi Forest Portal

Following the monitoring procedure described in section 4.3.4 of this Monitoring Report and VMD009, which states that where the specific deforestation agent can be identified, leakage does not need to be considered where it can be demonstrated that the management plans and/or land-use designations of the deforestation agent's other lands have not materially changed as a result of the project, the activity shifting leakage ($\Delta C_{LK-A,planned}$) during the monitoring period is therefore **0 tCO₂e**.

5.3.2 Market-effect leakage through decreased timber harvest

Assessing market leakage is required for the Tavolo REDD project since the process of deforestation in the baseline by Kakuna-Lote involves timber harvesting for commercial markets.

Following VCS Module VMD0011, the leakage due to market effects is equal to the baseline emissions from logging multiplied by a leakage factor:

$$\Delta C_{LK-ME} = \sum_{i=1}^M (LF_{ME} * AL_{T,i}) \quad (9)$$

Where:

ΔC_{LK-M} Net GHG emissions due to market- effects leakage through decreased timber harvest; tCO₂e

¹ <https://pngiforests.org/company/vanimo-jaya>

LF_{ME}	Leakage factor for market-effects calculations; dimensionless
$AL_{T,i}$	Summed emissions from timber harvest in stratum i in the baseline case potentially displaced through implementation of carbon project; tCO ₂ e
i	1, 2, 3 ... M strata

Leakage factor

It is expected that the harvesting in the baseline will likely be displaced to similar forest types in PNG with comparable levels of merchantable volumes. Therefore the leakage factor (LF_{ME}) to be applied is **0.4**.

Net emissions due to market- effects leakage

The estimation of the emissions associated with the displaced logging activity is based on the total volume that would have been logged in the baseline in the project area across strata and time periods. The estimated carbon emission has two components, the biomass carbon of the extracted timber and the biomass carbon in the forest damaged in the process of timber extraction:

$$AL_{T,i} = \sum_{t=1}^t ([V_{BSL,XE,i,t} * D_{mn} * CF] + [V_{BSL,XE,i,t} * LDF] + [V_{BSL,XE,i,t} * LIF]) * CO_2F \quad (9)$$

Where:

$AL_{T,i}$	Summed emissions from timber harvest in stratum i in the baseline case potentially displaced through implementation of carbon project; tCO ₂ e
$V_{BSL,XE,i,t}$	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum i at time t ; m ³
D_{mn}	Mean wood density of commercially harvested species; tdm m ⁻³ (the default wood density of 0.59 tdm m ⁻³ is used as provided by the IPCC 2006 Guidelines ¹)
CF	Carbon fraction of biomass for commercially harvested species j ; tC tdm ⁻¹ (default carbon fraction of 0.47 tC per t tdm ⁻¹ is used as given in PNG's FREL)
LDF	Logging damage factor; tC m ⁻³ (default factor of 0.53 tC m ⁻³ for broadleaf and mixed forests is used)
LIF	Logging infrastructure factor; tC m ⁻³ (default factor of 0.29 tC m ⁻³ is used)

¹ 2006 IPCC Guidelines for National Greenhouse Gas Inventories - Chapter 12: Harvested Wood Products

i	1, 2, 3 ... M strata
t	1, 2, 3, ... t^* years elapsed since the start of the REDD project activity
CO_2F	Standard ratio molecular weight of CO_2 to carbon of 44/12; dimensionless

In its project proposal the Kakuna-Lote LOC projects a mean salvageable timber volume of $33.792 \text{ m}^3 \text{ ha}^{-1}$.¹ With harvesting planned by Kakuna-Lote on a total area of 4,779 ha in the first year, the total expected logged volume for the first year is:

$$33.792 \text{ m}^3 \text{ ha}^{-1} * 4,779 \text{ ha} = 161,492 \text{ m}^3$$

Net emissions due to market-effects leakage

With the planned deforestation by Kakuna-Lote, as presented in the VCS PD, the leakage factor of 0.4 and the calculation of the summed emissions from timber harvest, the market-effect leakage for each year is calculated. The results are given for each year of planned deforestation in table below.

Table 11 - Net GHG emissions due to potential market-effects leakage during Monitoring Period

Block	Annual deforestation area inside Tavolo Project Area (ha)	Volume of timber projected to be extracted (m3)	Summed emissions from potentially displaced timber harvest (tCO ₂ e)	Leakage factor	Net GHG emissions due to market- effects leakage (tCO ₂ e)
i, t	$AA_{planned,i,t}$	$V_{BSL,XE,i,t}$	$AL_{T,i}$	LF_{ME}	ΔC_{LK-ME}
PY01 (2020)	2,800	94,618	362,262	0.4	144,905
PY02 (2021)	2,787	94,177	360,574	0.4	144,230
Total Market Leakage (tCO ₂ e)					289,134

5.4 Net GHG Emission Reductions and Removals

5.4.1 Summary of GHG emission reductions and removals

The total net greenhouse gas emissions reductions of the Tavolo REDD Project are calculated as:

$$NER_{REDD} = \Delta C_{BSL,planned} - \Delta C_{PRJ} - \Delta C_{LK} \quad (9)$$

¹ Kakuna-Lote LOC. & Mekar (PNG) LTD. June 2019. Project Proposal: Kakuna-Lote Agroforestry & Reforestation Plantation Development Project Project - Attachment 5 - Paragraph 4.2.2

Where:

NER_{REDD}	Total net GHG emission reductions of the REDD project activity over the project period; tCO ₂ e
$\Delta C_{BSL,planned}$	Net GHG emissions in the baseline from planned deforestation; tCO ₂ e
ΔC_{PRJ}	Net greenhouse gas emissions within the project area under the project scenario; tCO ₂ e
ΔC_{LK}	Net GHG emissions due to leakage from the REDD project activity over the project period; tCO ₂ e

The results for this monitoring period are presented in Table 12 below.

Table 12 - The total net greenhouse gas emissions reductions of the Tavolo REDD Project

Year	Baseline emissions or removals (tCO ₂ e) $\Delta C_{BSL,planned}$	Project emissions or removals (tCO ₂ e) ΔC_{PRJ}	Leakage emissions (tCO ₂ e) ΔC_{LK}	Net GHG emission reductions or removals (tCO ₂ e) NER_{REDD}
2019	-	1,683	-	-1,683
2020	620,446	1,683	144,905	473,858
2021	643,610	1,683	144,230	497,697
Total	1,264,055	5,049	289,134	969,872

5.4.2 Calculation of AFOLU pooled buffer account contribution

Following VM007, the number of credits to be held in the AFOLU pooled buffer account is determined as a percentage of the total carbon stock benefits by the REDD project activity, which is calculated for this project in paragraph 5.4.1. Leakage emissions are not factored into the buffer calculations.

The project analyzed and described the non-permanence risk of the project implementation in its VCS Non-Permanence Risk Report for this monitoring period 2019-2022 (See Appendix 2). Using the VCS Risk Report Calculation Tool, the total non-permanence risk for the project is calculated at **17%**.

Therefore, the number of credits to be held annually by the project in the AFOLU pooled buffer account ($Buffer_{Total}$) is projected to be as presented in the following table.

Table 13 – The Non-Permanence Risk Buffer Withholding for monitoring period 2019-2022

Year	Net GHG emission reductions or removals excluding Leakage (tCO ₂ e)	Non-Permanence Risk Buffer (17%) (tCO ₂ e)
	$\Delta C_{BSL,planned} - \Delta C_{PRJ}$	$Buffer_{Total}$
2019	-1,667	-
2020	469,371	105,190
2021	492,985	109,128
Total	960,689	214,317

5.4.3 Uncertainty analysis

Following VCS Module VMD0017, the rate of uncertainty in REDD project scenario estimates is calculated as follows:

$$Uncertainty_{REDD-WPS,t*} = \sqrt{Uncertainty_{REDD-WPS,RATE,t*}^2 + Uncertainty_{REDD-WPS,SS}^2} \quad (10)$$

Where:

$Uncertainty_{REDD-BSL,t*}$	Cumulative uncertainty in REDD baseline scenario up to time t; %
$Uncertainty_{REDD-BSL,RATE,t*}$	Cumulative uncertainty in the baseline rate of deforestation up to time t; %
$Uncertainty_{REDD-BSL,SS}$	Total uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline case; %
t	1, 2, 3, ... t^* years elapsed since the start of the REDD project activity

Step 1: Uncertainty in the Recorded Rate of Deforestation in the Project Scenario

As reported in Appendix 1, the forest classification of both 2019 and 2022 for the Tavolo REDD Project Area have an accuracy of 90% and above. This is within the limits set by VM0007.

Therefore:

$$Uncertainty_{REDD-WPS,RATE} = 0$$

Step 2: Uncertainty of Emissions and Removals in Project Area in Baseline Scenario

The uncertainty is calculated for each included carbon pools for this project as the 95% confidence interval half width as a percentage of the Mean. The results per carbon pool are as follows:

- Aboveground Biomass (AGB) – the Mean Baseline AGB is estimated based on measurements done on 56 forest inventory plots in 2020. The uncertainty of the plot measurements is calculated at **15.9%** at the 95% confidence interval (see Table 14).
- Belowground Tree Biomass (BGB) – BGB estimated based on AGB values and Root-Soot factor provided in PNG's FREL. Therefore, Uncertainty = 0%
- Wood Products (WP) – The long-term wood products pool is estimated based on an actual deforestation plan. Therefore, Uncertainty = 0%

All other pools are conservatively excluded.

Table 14 - Uncertainty calculation based - Forest Inventory 2020

Uncertainty calculations	
Average AGB (tCO2/ha)	400.8
STDEV	244.1
N	56.0
STE	32.6
tSx	63.9
LOWER LIMIT	336.9
UPPER LIMIT	464.8
UNCERTAINTY (%)	15.9%

Step 3: Total Uncertainty in REDD Project Scenario

The total uncertainty in the REDD baseline scenario for this project is calculated as:

$$Uncertainty_{REDD-WPS,t*} = \sqrt{Uncertainty_{REDD-WPS,RATE,t*}^2 + Uncertainty_{REDD-WPS,SS}^2} = \sqrt{0^2 + 15.9^2} = \mathbf{15.9\%}$$

Step 4: Adjustment of net GHG emission reductions to account for uncertainty

The allowable uncertainty for the used methodology VM0007 is +/- 15% of NER_{REDD} at the 95% confidence level. With a total uncertainty of 15.9% (see calculation in step 3 above), this precision level is not met for this project. Therefore NER_{REDD} shall be adjusted with a deduction

equal to the amount that the uncertainty exceeds the allowable level. The adjusted value for NER_{REDD} to account for uncertainty is calculated as:

$$Adjusted_NER_{REDD} = NER_{REDD} * (100\% - NER_{REDD+ERROR} + 15\%) \quad (11)$$

Where:

$Adjusted_NER_{REDD}$ Total net GHG emission reductions of the REDD+ project activities up to year t^* adjusted to account for uncertainty; tCO₂e

NER_{REDD} Total net GHG emission reductions of the REDD project activity up to year t^* ; tCO₂e

$NER_{REDD+ERROR}$ Cumulative uncertainty for the REDD+ (REDD and WRC) project activities up to year t^* ; %

The adjusted NER_{REDD} is presented for each year in Table 15.

5.4.4 Calculation of Verified Carbon Units

Following VM0007, the number of Verified Carbon Units (VCUs) is calculated for the monitoring period $T = t_2 - t_1$ (2019-2022) using the following equation:

$$VCU_t = (Adjusted_NER_{REDD,t_2} - Adjusted_NER_{REDD,t_1}) - Buffer_{Total} \quad (12)$$

Where:

VCU_t Number of Verified Carbon Units at year $t = t_2 - t_1$; VCU

$Adjusted_NER_{REDD,t_2}$ Total net GHG emission reductions of the REDD+ project activity up to year t_2 (2022) and adjusted to account for uncertainty; tCO₂e

$Adjusted_NER_{REDD,t_1}$ Total net GHG emission reductions of the REDD+ project activity up to year t_1 (2019) and adjusted to account for uncertainty; tCO₂e

$Buffer_{Total}$ Total permanence risk buffer withholding; tCO₂e

Following this calculation, the annual VCU's as a result of the project are presented in Table 15 below.

Table 15 - Number of Verified Carbon Units (VCUs) annually over the Monitoring Period 2019-2022

Year	Net GHG emission reductions or removals adjusted to account for uncertainty (tCO ₂ e)	Non-Permanence Risk Buffer (17%) (tCO ₂ e)	VCUs eligible for issuance (VCUs)
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	<i>Adjusted_NER_{REDD}</i>	Buffer_{Total}	VCU_t
2019	-1,667	-	-1,667
2020	469,371	105,190	364,182
2021	492,985	109,128	383,857
Total	960,689	214,317	746,372

APPENDIX 1 - FOREST CLASSIFICATION

2022 – PROCESS AND QA/QC

Landsat imagery

Landsat 8 and Landsat 9 images were used for the forest cover classification 2022. Landsat 8 and 9 have a resolution of 30 meters, which meets the minimum required resolution of 30 meters in the GOFC-GOLD 2016 guidelines¹. The images were retrieved and aggregated using the SEPAL.io open-source online tooling, developed by the FAO². SEPAL.io uses Google Earth Engine for image processing.

Pre-processing

SEPAL.io generates a mosaic by combining multiple satellite images based on parameters set by the users. Imagery closest to a set target date was collected and gaps created by clouds were corrected by using past or future seasons to get a cloud free mosaic.

Landsat 8 & Landsat 9 2022 mosaic creation parameters	
Target date	2021-12-01
Included past seasons	2
Included future seasons	2

The included imagery was pre-processed by SEPAL using various build-in algorithms. The imagery was corrected for atmospheric surface reflection and for bidirectional reflectance distribution function effects (BRDF). A medoid composing method was used to create the final mosaics, which is a more reliable method than using a median composing method³. Cloud detection was done using an algorithm using the pre-created QA bands included in level-1 Landsat 8 and 9 imagery.

Processing

The Landsat 8/9 mosaics were processed using supervised pixel-based classification. Pixels were grouped according to similarities in band values and assigned to one of the following classes:

- Forest (including primary and secondary/degraded forest)

¹ GOFC-GOLD, 2016, A sourcebook of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals associated with deforestation, gains and losses of carbon stocks in forests remaining forests, and forestation. GOFC-GOLD Report version COP22-1, (GOFC-GOLD Land Cover Project Office, Wageningen University, The Netherlands).

² FAO Open Foris Team, 2022, <https://sepal.io>

³ Flood, N. Seasonal Composite Landsat TM/ETM+ Images Using the Medoid (a Multi-Dimensional Median). Remote Sens. 2013, 5, 6481-6500. <https://doi.org/10.3390/rs5126481>

- Non-forest (including all land use types other than forest)

Conform the national forest definition of PNG1 and the GOFC-GOLD guidelines¹, isolated pixel-groups of less than 1 hectare (11 pixels, 0.99 ha) were dissolved in the surrounding class to get a minimum mapping unit (MMU) of 1 hectare.

Quality Assurance and Quality Control

The accuracy of the classification was assessed by using high resolution NICFI satellite imagery. The SEPAL.io “Stratified area estimator - Design”-tool was used to generate random samples per identified class, with a minimum of 50 sample points per class. Ground-truthing was done by uploading the random samples to Collect Earth Online and assessing them using high-resolution NICFI imagery. The confusion matrix of the accuracy assessment of the 2022 forest cover map in Table 16. The overall accuracy of the 2022 map is 93.33%.

Table 16 – Confusion Matrix forest cover classification - 2022 Forest Cover Map

Land use class as classified	Reference data		Total	User's Accuracy	Error of Commission
	Forest	Non-forest			
Forest (50 samples)	50	0	50	100%	0%
Non-forest (50 samples)	10	40	50	80%	20%
Total	60	40	100		
Producer's Accuracy	83.33%	100%			
Error of Omission	16.67%	0%			

¹ Papua New Guinea, 2017, Papua New Guinea's National REDD+ Forest Reference Level, https://redd.unfccc.int/files/png_frl__submission-15.01.2017.pdf

APPENDIX 2 – NON-PERMANENCE RISK REPORT

<attached as pdf>

APPENDIX 3 – QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS TAVOLO

<attached as Excel file>