



**Verified Carbon
Standard**

MONITORING REPORT 2011- 2024

INFAPRO REHABILITATION OF LOGGED-OVER DIPTEROCARP
FOREST IN SABAH, MALAYSIA



Project title	INFAPRO Rehabilitation of logged-over dipterocarp forest in Sabah, Malaysia
Project ID	672
Monitoring period	01 January 2011 to 30 June 2024
Original date of issue	29 January 2025
Most recent date of issue	15 December 2025
Version	1.5
VCS Standard Version	4.7
Prepared by	Kars Riemer, Face the Future

CONTENTS

1	PROJECT DETAILS.....	4
1.1	Summary Description of the Implementation Status of the Project	4
1.2	Audit History.....	4
1.3	Sectoral Scope and Project Type	5
1.4	Project Proponent	5
1.5	Other Entities Involved in the Project	5
1.6	Project Start Date	6
1.7	Project Crediting Period	6
1.8	Project Location	6
1.9	Title and Reference of Methodology	7
1.10	Double Counting and Participation under Other GHG Programs	8
1.11	Double Claiming, Other Forms of Credit, and Scope 3 Emissions.....	8
1.12	Sustainable Development Contributions	9
1.13	Commercially Sensitive Information.....	13
2	SAFEGUARDS AND STAKEHOLDER ENGAGEMENT	13
2.1	Stakeholder Engagement and Consultation.....	13
2.2	Risks to Stakeholders and the Environment.....	20
2.3	Respect for Human Rights and Equity	23
2.4	Ecosystem Health	26
3	IMPLEMENTATION STATUS	31
3.1	Implementation Status of the Project Activity	31
3.2	Deviations	34
3.3	Grouped Projects	35
3.4	Baseline Reassessment.....	35
4	DATA AND PARAMETERS.....	40
4.1	Data and Parameters Available at Validation	40
4.2	Data and Parameters Monitored.....	46
4.3	Monitoring Plan.....	50
5	QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	68
5.1	Baseline Emissions	69

5.2	Project Emissions	74
5.3	Leakage Emissions	81
5.4	GHG Emission Reductions and Carbon Dioxide Removals	82
APPENDIX 1: MONITORING RESULTS 2024		89
APPENDIX 2: QC RESULTS 2024		90
APPENDIX 3: MAP WITH LOCATION OF INFAPRO PROJECT AREA		91

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

INFAPRO is a forest rehabilitation project in Sabah, Malaysia, aiming at the additional sequestration of CO₂ from the atmosphere, established by Face the Future and Yayasan Sabah. The project rehabilitates 25,000 ha of severely logged-over mixed dipterocarp rainforest in Sabah, Malaysia and prevents relogging of the forest in this area. In the absence of the project activity, the forest would be re-logged and would only slowly recuperate due to the high quantities of vines and climbing bamboos suppressing the remnant trees and the natural regeneration process.

This Monitoring Report is based on the monitoring plan provided in the VCS Project Document (PD) for INFAPRO v1.7. It describes the results of project monitoring carried out from the 1st of January 2011 to the 30th of June 2024 for the purpose of verification of the GHG emission reductions resulting from project implementation. Since the start of the IFM project activities 11,819 hectares have been rehabilitated. However a part of the rehabilitated area is not included for this carbon monitoring campaign since the rehabilitation activities in these areas were done through 3rd party investments without the requirement to issue VERs over their rehabilitation area. Therefore this monitoring campaign includes 10,604 ha of rehabilitation area.

The results of the 2024 carbon monitoring campaign show that the tree growth during the monitoring period, between the 1st of January 2011 to the 30th of June 2024, resulted in a net emission removal of 1,114,295 tCO₂e and, after a buffer subtraction of 12%, 980,580 VCUs are eligible for issuance.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	17 April 2002	SGS	SGS	
Verification	29 June 1992 to 31 December 2006	SGS	SGS	14.5
Validation	19 August 2011	VCS	SCS	
Verification	01 January 2007 to 31 December 2010	VCS	SCS	4

Verification	01 January 2011 to 30 June 2024	VCS	TUV Nord	13.5
Total				32 years

1.3 Sectoral Scope and Project Type

Sectoral scope	14
AFOLU project category ¹	Improved Forest Management (IFM)
Project activity type	Low-Productive to High-Productive Forest (LtHP)

1.4 Project Proponent

Organization name	Face the Future
Contact person	Kars Riemer
Title	Director
Address	Hollandseweg 7H, 6706 KN Wageningen, The Netherlands
Telephone	+31 317 724 102
Email	k.riemer@facethefuture.com

1.5 Other Entities Involved in the Project

Organization name	Yayasan Sabah
Role in the project	Project Implementation Partner
Contact person	Dr. Hamzah Tangki
Title	Senior Manager Conservation Area Management & Forest Rehabilitation Division
Address	Menara Tun Mustapha, Yayasan Sabah Headquarters Complex, P.O.Box 11623, 88817 Kota Kinabalu, Sabah, Malaysia

¹ See Appendix 1 of the VCS Standard

Telephone	+60 88326300
Email	

1.6 Project Start Date

Project start date	29 June 1992
Justification	Start of first forest rehabilitation activities. Start of the Crediting Period under VCS is the 1 st of January 2007

1.7 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☐ Ten years, fixed ☒ Other, 30 years
Start and end date of first or fixed crediting period	1 January 2007 to 31 December 2036

1.8 Project Location

INFAPRO is located in the Malaysian state of Sabah on the island Borneo, about 71 kilometers from the town Lahad Datu. It is situated to the eastern part of the Yayasan Sabah Concession in the Ulu Segama Forest Reserve in the Lahad Datu District (see map 1.5.1). The Project Area is adjacent to Danum Valley Field Centre, about 11 km from the INFAPRO nursery. The coordinates of the INFAPRO nursery and camp are 4°58'55"N and 117°51'25"E. The following coordinates represent the most Northern, Western, Southern and Eastern extremes of the Project Area boundary:

North: 5°11'15"N & 117°49'50"E

South: 4°53'30"N & 117°52'55"E

East: 5°00'20"N & 117°58'10"E

West: 5°01'50"N & 117°41'50"E

The boundaries of the INFAPRO Project Area is also attached to this monitoring as separate KML file.

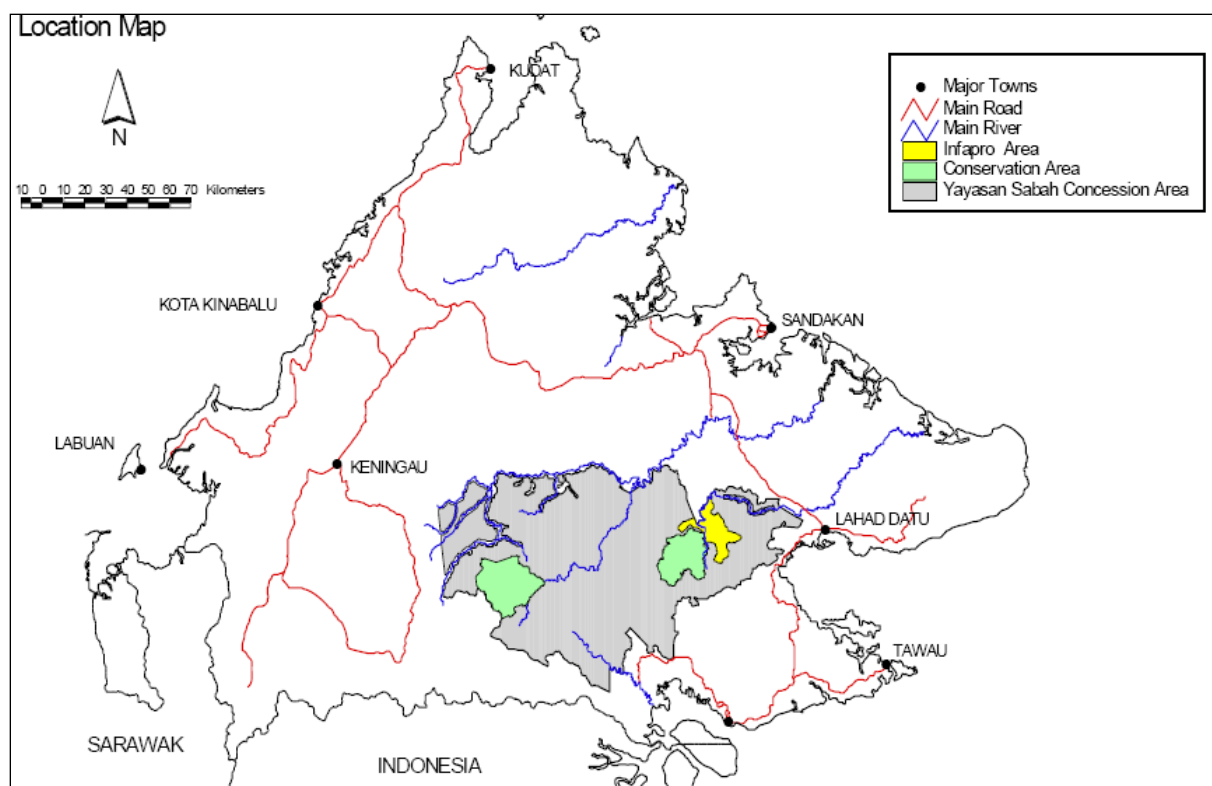


Figure 1 - Location of INAPRO Project Area within the Yayasan Sabah Concession Area and the State Sabah

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0005	VM0005 Methodology for Conversion of Low-Productive Forest to High-Productive Forest	1.2
Tool	VT0002	VT0002 Tool for the Demonstration and Assessment of Additionality in IFM Project Activities	1.0
Tool	VT0003	VT0003 Tool for the Estimation of Uncertainty for IFM Project Activities	1.0

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes

☒ No

1.10.2 Registration in Other GHG Programs

Was the project registered or seeking registration under any other GHG programs?

☐ Yes

☒ No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes

☒ No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes

☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes

☒ No

1.12 Sustainable Development Contributions

Through the rehabilitation of 11,819 hectares of degraded tropical forest in the Ulu Segama–Malua Forest Management Unit in the Malaysian State of Sabah (see also section 3.1), the INFAPRO project implements labor-intensive forest rehabilitation, forest management and capacity-building activities. These activities generate Sustainable Development Contributions by enhancing local skills and employment (SDG 4.4 / 8.2 / 8.5), reducing greenhouse gas emissions (SDG 13), and restoring high-conservation-value rainforest (SDG 15.2 / 15.5). The project aligns with Malaysia’s national priorities for sustainable forestry, environmental conservation, climate mitigation and inclusive socio-economic development.

These Sustainable Development Contributions by the project are outlined in Table 1 below.

Table 1 - Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
------------	------------	---------------	-----------------------------	-------------------------------	-------------------------------------

1)	4.4/8.2	Number of people trained in skill enhancement and capacity building	Implemented activities to increase	Through its scientific research and training program, the project is providing skill enhancement and capacity building to its staff at all staff levels As recorded in INFAPRO's Annual Report 2024, the project trained 25 staff members on different skill. Besides that the Project is organizing also providing opportunities for project staff to participate in events such as seminars, expeditions, conferences etc. In 2024, 24 staff members participated in different events. ⁴	Through its scientific research and training program, the project has been providing skill enhancement and capacity building at all staff levels throughout the project lifetime. On average at least 10 different types of trainings are provided per year to the staff and 10 different events per year for the staff to participate. ⁵
----	---------	---	------------------------------------	---	--

⁴ Section 8.2 - INFAPRO Annual Report 2024.pdf

⁵ INFAPRO Annual Reports

2)	8.5	Number of employment opportunities provided by the project for communities	Implemented activities to increase	At the beginning of the Monitoring period in 2012, a total of 62 people were engaged in the Project, 23 permanent staff and 38 casual staff. ⁸ Currently in 2024 INFAPRO is employing 26 people, 22 permanent staff and 6 casual staff. ⁹	Due to the labor intensive restoration activities in field, the project has been annually providing employment to at least 20-30 people during the project's lifetime. Due to changes in implementation activities, the number of staff is varying from a total of 50 staff in 2005 to a total of 26 in 2024. ¹⁰
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By rehabilitation of 11,819 hectares of degraded tropical forest and preventing a second harvesting round in the total project area of 25,000 ha, the INFAPRO project has achieved at least 980,580 tonnes of emission removals (tCO2) during the Monitoring Period 2011-2024.	By rehabilitation of 11,819 hectares of degraded tropical forest and preventing a second harvesting round in the total project area of 25,000 ha, the INFAPRO project has achieved at least 1,490,120 tonnes of emission reductions and removals (tCO2) during the project lifetime under VCS.

⁸ Section 6.2 - INFAPRO Annual Report 2012

⁹ Section 8.1 - INFAPRO Annual Report 2024

¹⁰ Section 7.7 INFAPRO Annual Report 2005 & Section 8.1 - INFAPRO Annual Report 2024

4)	15.2/ 15.5/	Restoration of native tropical rain forest that supports High Conservation values.	Implemented activities to increase	The project activities have restored 11,819 hectares of tropical rainforest in the Ulu Segama – Malua Forest Management Unit in the Malaysian state of Sabah (see dashboard on our website’s INFAPRO project page) ¹¹ . The Forestry Unit in which the project area is located holds the status of Protected Forest Reserve (Class 1) since 2013. The forests in the project area connects to surrounding forests, such as the well-known Danum Valley Conservation Area. Yearly results and achievement are recorded in annual reports such as the INFAPRO Annual Report 2013 ¹² .	Throughout its lifetime the project has restored 11,819 hectares of tropical rainforest in the Malaysian state of Sabah.
----	----------------	--	------------------------------------	---	--

¹¹ <https://facethefuture.com/projects/sabah-maleisie-bosherstel-en-bescherming>

¹² [Annual report Infapro 2013.pdf](#)

1.13 Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the monitoring report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification

The project is located in the Yayasan Sabah concession area, and therefore no local communities live inside the project area: the nearest villages are located to the East of the Ulu Segama Forest Reserve boundary, along the lower part of the Segama river, at a distance of about 80 kilometers from INFAPRO.

The project stakeholders have not changed during the length of the monitoring period. The core stakeholders from the project are represented in the Steering committee, established in 1992 to provide guidance to the project as well as a platform for ongoing communication. The members of the Steering Committee include:

1. Yayasan Sabah Group (Chair)
2. Sabah Forest Department
3. Forest Research Institute Malaysia (FRIM)
4. Face the Future

Additionally, many experts and organizations have been involved in the establishment and further development of the project, such as FRIM, researchers of Danum Valley Field Centre, WWF Malaysia, Earthwatch, CIRAD-FORET, IKEA, GEF, local and overseas Universities and the Sabah Forestry Department.

There are other project stakeholders which are not part of the Steering Committee but are welcome to attend the

	meetings as observers, such as the Danum Valley Management Committee, The Royal Society (UK) and the INIKEA project.
Legal or customary tenure/access rights	The INFAPRO Development Area is part of the Yayasan Sabah Sustainable Forest Management license area. Yayasan Sabah was allocated a forest concession in 1970, through a License Agreement for Timber between the State of Sabah and the Sabah Foundation (Yayasan Sabah). The concession covers a period of 100 years, starting January 1st, 1970, ending December 31, 2069. The concession area (classified as state land) is defined in the License agreement and contains amongst other the following Forest Reserves: Part of the Ulu Segama Forest Reserve (as constituted by Gazette Notification no. 598 of 1963) having a total area of approximately 423 square miles. Part of the Malua Forest Reserve (as constituted by Gazette Notification no. 572 of 1961) having a total area of approximately 67 square miles. Yayasan Sabah and Rakyat Berjaya Sdn Bhd signed an agreement on January 18, 1971, in which Yayasan Sabah assigns all rights and liabilities under the abovementioned License agreement to Rakyat Berjaya Sdn Bhd. The License Agreement for Timber 1970 was replaced in 1997 by the Sustainable Forest Management Licence Agreement (SFMLA) between Yayasan Sabah and the Sabah State Government. On June 29, 1992, The State Government of Sabah and Face the Future entered into a Memorandum of Understanding in which both agree to join efforts and undertake a project to realise the rehabilitation of logged over forests, and degraded lands, and the afforestation and reforestation of wasteland in Sabah, Malaysia. The project will be implemented by Face the Future and its Malaysian contract partner, being the concession holder or entity duly responsible for the management of the concession.

	Referring to the MoU between Sabah and Face the Future, a project agreement was signed on June 29, 1992 between Face and Rakyat Berjaya. The agreement describes the forest rehabilitation project of an area of 25,000 hectares within the Ulu Segama Forest Reserve. On June 4, 1992 the Director of Forestry of the State government of Sabah approved the agreement. Following the project agreement between Face the Future and Yayasan Sabah, individual Forms of Agreement for CO₂ offsets have been entered by the parties in which specific rehabilitation activities are described. In these contracts, Face the Future is exclusively entitled to the CO₂ sequestered in the Project Area for the entire contract period, being 99 years. Although a Memorandum of Understanding has been signed between Face the Future and the State Government of Sabah, the project is not registered with a Federal Governmental Authority. Face the Future is exclusively entitled to any and all CO₂ sequestration and offset in the contract areas. Since 2009, 10% of the carbon ownership of all newly rehabilitated areas is shared with Yayasan Sabah.
Stakeholder diversity and changes over time	The core stakeholders from the project are represented in the Steering committee, established in 1992 to provide guidance to the project as well as a platform for ongoing communication. The members of the Steering Committee include: 1. Yayasan Sabah Group (Chair) 2. Sabah Forest Department 3. Forest Research Institute Malaysia (FRIM) 4. Face the Future The 4 members of the Steering committee are organizations that intersect in forestry and conservation. However, they differ in their missions and geographic scope. Yayasan Sabah Group is a foundation based in the State of Sabah that aims to improve livelihoods and social-wellbeing among Malaysians in Sabah. Sabah Forest Department constitutes a government body focusing on

	technical aspects of forestry and conservation, and designs and implements sustainable forest management of the State's forest resources. The Forest Research Institute Malaysia is a Statutory Body placed under the Ministry of Natural Resources and Environmental Sustainability, composed by researchers and policymakers. It is considered as one of the leading institutions in tropical forestry research globally and supports the forestry sector and timber industry in Malaysia. Finally, Face the Future is a private company based in the Netherlands that develops certified forestry projects within a wide geographical scope, and engages with local stakeholders to develop and implement those projects.
Expected changes in well-being	Due to the fact that project stakeholders are exclusively conformed by institutions and agencies, there are no expected changes in their well-being under the baseline scenario. Still, the project does have positive social impacts on the local stakeholders and surrounding communities. Restoration of logged-over forests provides significant ecosystem services, including enhancement of environmental health (i.e. decreased pollution in water, soil and air, improved ecosystem functions), climate change resilience, aesthetic and cultural values that ultimately improve social well-being. The project is also building capacity among local organizations to design and implement approaches that sustain both timber and non-timber forest products in perpetuity under sustainable forest management regimes and providing technical assistance on the use of Field-Map technology for conducting forest inventories. Finally, the project provides the concession holder with substantial income from a sustainable source of timber, and employment to 28 staff (22 permanent and 6 seasonal positions).
Location of stakeholders	The settlements identified by the project are K. Tawairyari, Kg. Opak, Kg. Liuk Pulau, represented in the Map included to this Monitoring Report in Appendix 3. These villages are more than 80 km away from the project zone and therefore are not included as project stakeholders.

	The project operates within the hierarchy of the Conservation and Environmental Management Division (CEMD) of Yayasan Sabah Group. Coordination and monitoring functions rest with the Senior Manager Rehabilitation and Plant Improvement (R&PI) are based in Kota Kinabalu, while implementation is carried out by the INFAPRO Project Team based in Faceville Km 58, Main Line West road (MLW), Ulu Segama Forest Reserve of Lahad Datu, East coast of Sabah.
Location of resources	The Ulu Segama Forest Reserve, where the project is implemented, is owned by the State Government of Sabah. The concession holder is in charge of management and timber revenues are a main source of income. Face is exclusively entitled to any and all CO₂ sequestration and offset in the contract areas. Since 2009, 10% of the carbon ownership of all newly rehabilitated areas is shared with Yayasan Sabah.

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	The project put in place the necessary structures to conform a Steering Committee responsible of communicating results and carrying out consultations with project stakeholders throughout the monitoring period. During the Steering Committee meetings, the following points are discussed: Evaluate and recommend technical and scientific progress of the project and contents of Plan of Operation and Annual Work Plan. Provide direction for activities of subsequent Plan of Operation and Annual Work Plan. Identify and provide general guidelines pertaining to research, training and publication under the research component of the project. Ensure that the project activities conform to the current Forest Enactment of the State of Sabah.
----------------------	---

Date(s) of stakeholder consultation	11-11-2011 (11 th meeting); 29-08-2013 (12 th meeting); 08-10-2015 (13 th meeting); 09-01-2026 (Letter to stakeholders with update and outcome of monitoring and verification round)
Communication of monitored results	During the Steering Committee meetings, all project stakeholders and other relevant observers are informed on the results and progress from the monitoring campaigns, and are requested to provide feedback. These meetings are normally conducted every 2 years (see meeting dates above) in Lahad Datu, Sabah, using a PowerPoint presentation in English. However, since 2015, the project's low activity level combined with the postponement of the carbon inventory, have rendered Steering Committee meetings unnecessary. The outcome of the current monitoring and verification round is shared with the stakeholders by sending out an update letter to the stakeholders in January 2026 with the Monitoring Report attached.
Consultation records	The minutes during consultation meetings have been documented by the Steering Committee and are available upon request.
Stakeholder input	The content of consultation with stakeholders is recorded in the minutes in a detailed manner (“who” proposed “what”, details of the discussion, and “who” is responsible to take action), and all stakeholders have access to these documents. During the Steering Committee meetings, the core stakeholders follow-up on the minutes from the previous meeting and discuss any matters arising related to the project. All stakeholders can raise matters during these discussions, and the outcomes of the consultation meetings are considered by the project decision making process. Based on stakeholder consultations, some actions taken by the project include: Restoration and improvement of Lumpandas Bridge, as requested by project stakeholders due to repeated collapses as a result of flash floods

	Suggestions to improve monitoring were taken into account (e.g. increase sample plots, suggestions on selection for treatment areas based on staff input...) Name of employment position changed from “Casual Rangers” to “Contract Rangers” As demonstrated by the examples above, the project takes stakeholder input seriously and addresses matters arising. However, no major matters have been raised during the Monitoring Period and therefore no new project activities have been implemented based on the consultation meetings of this verification round.
--	--

2.1.3 Free, Prior, and Informed Consent

Consent	The FPIC process is not applicable to the project since there are no IPLCs and customary rights holders inside or around the project zone.
Outcome of FPIC	The FPIC process is not applicable to the project since there are no IPLCs and customary rights holders inside or around the project zone.

2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
Not applicable, no grievances received	Not applicable, no grievances received

During this monitoring period, the project did not receive any grievances or complaints related to the project activities. The project has a Grievance Redress Procedure in place to receive, coordinate and take action on all grievances received regarding irregularities, corruption, violation of regulations, power abuses and crimes. Project stakeholders have access to the Grievance Redress Procedure to report any issues related to the project.

2.1.5 Public Comments

Summary of comments received	Actions taken
Not applicable	Not applicable

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

The project is managed by the Conservation & Environmental Management Division of Yayasan Sabah Group together with Face the Future based in the Netherlands. The project is being managed by a significant number of experienced staff:

Yayasan Sabah Group

- Dr. Waidi Sinun: Group Manager, 36 years in Yayasan Sabah Group
- Dr. Hamzah Bin Tangki: Senior Manager, 27 years in Yayasan Sabah Group
- Hairi Khuzairi Bin Hanafiah: Officer, 5 years in Yayasan Sabah Group
- Jarizul Bin Mohd Marmoh: Manager, 13 years in Yayasan Sabah Group
- Auddrey Ambrose: Forest Officer, 5 years in Yayasan Sabah Group
- Riah Binti Maklin: Admonistration and Account Officer, 7 years in Yayasan Sabah Group
- Mohd Herdam B. Tarman: Forest Officer, 7 years in Yayasan Sabah Group
- Asni Bin Bulot: Senior Forest Ranger, 35 years in Yayasan Sabah Group

Yayasan Sabah Group has extensive experience in forest management, conservation, and sustainable development in Malaysia. The organization has been actively involved in forest restoration, social development and biodiversity conservation for decades, managing extensive areas of permanent forest reserves in Sabah. Yayasan Sabah Group has successfully rehabilitated severely degraded forests tropical rainforest, implemented sustainable timber harvesting, and conserved high-biodiversity areas. Their efforts include partnerships with international conservation organizations and research institutions to enhance forest carbon initiatives, biodiversity protection, and ecosystem restoration. The staff members involved in the project have backgrounds in forestry and social development, with educational qualifications ranging from bachelor's degrees to PhDs. They all have a minimum of 5 years of experience in Yayasan Sabah Group, with some members involved in the organization for over 25 years.

Face the Future

- Martijn Snoep
- Kars Riemer
- Wouter van Goor

Face the Future has been developing forest carbon projects internationally since 1990. This has resulted in over 50,000 hectares of newly established forests in 4 continents. It includes two VCS registered projects. The first project was the INFAPRO, started in 1992, resulting in the protection of 25,000 hectares against relogging, of which 11,819 hectares have been rehabilitated by the project. Next to the development of forest projects, Face the Future also

provide consultancy services on development, management, implementation and certification of forest carbon projects. The staff members involved in the project (Martijn Snoep, Kars Riemer and Wouter van Goor) have more than 10 years of experience in working with forest carbon certification standards, including VCS.

Additionally, an intensive training program is continuously implemented to enhance the skill and experience of project staff at all levels. This program covers the core aspects of INFAPRO's activities such as tree identification, survey and mapping, firefighting, GIS and other field operations. Furthermore, staff are encouraged to attend regional and overseas conferences, webinars and workshops in order to stay well informed and be aware of updates regarding the development of similar work elsewhere, allowing for adaptive management as the field moves forward.

2.2.2 Risk assessment

	Risk identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	No risk identified	Due to the fact that project stakeholders are exclusively conformed by institutions and agencies, there are no natural and human-induced risks to their well-being.
Risks to stakeholder participation	No risk identified	Due to the fact that project stakeholders are exclusively conformed by institutions and agencies, and they are all members from the Steering Committee, there are no risks to their participation.
Working conditions	Risk of injury from misuse of equipment	The project acknowledges and is committed to ensure the safety of its employees. The SABAH foundation group has a dedicated Occupational Safety and Health Administration team managing safety-related matters. It ensures that safety and health practices are followed, regulates that all occupational safety and health

		laws in the workplace are complied with, provides a safe and healthy work environment for everyone to prevent injuries and/or property damage in the work environment, develops safe work systems and increases awareness on the importance of safety and health. Additionally, it makes continuous improvements to occupational health and safety management by promoting a prevention and risk-avoidance culture.
Safety of women and girls	No risk identified	No risks to the safety of women and girls were identified at validation. Furthermore, the project has a grievance redress procedure in place which did not result in the identification of new risks to safety of women and girls in the current monitoring period.
Safety of minority and marginalized groups, including children	No risk identified	No risks to the safety of minority and marginalized groups were identified at validation. There are no minority and marginalized groups inside or around the project zone.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	Domestic refuse	To mitigate this risk, the project will separate biodegradable and non-biodegradable waste, recycling the latter as far as possible. Furthermore, domestic refuse disposal will be coordinated and away from watercourses.
	Water treatment – Damming of stream	To mitigate this risk, the project established the two surface-overflow dams only in one river

		that runs across the camp in a severely degraded forest, dominated by pioneer species
	Water treatment – Chemical pollution	To mitigate this risk, residuals from the water treatment plant are flushed into the pioneer dominated forest away from any perennial streams. Furthermore, the project optimizes the use of treated water by restricting its use to consumption only; for washing and other activities, non-treated water is supplied.
	Use of fertilizer and pesticides – Environmental pollution	To mitigate this risk, the project restricts the use of fertilizers and pesticides to specific spots only, away from watercourses.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	No incidences of discrimination have been recorded by the project. The project promotes the integration of minorities since many contract rangers come from local communities. Higher positions offer equal opportunities, since qualifications and experience form the basis for selection independent from status and income levels. Additionally, Yayasan Saba Group Human Resource Manual deals with anti-discrimination measures and points out the code of conduct for staff to avoid discrimination. Within the organization the superiors at each level have to responsibility to act in cases where the code of conduct is not observed.

Sexual harassment	No risk identified	No incidences of sexual harassment have been recorded by the project. Yayasan Saba Group Human Resource Manual deals with measures against sexual harassment and points out the code of conduct to avoid sexual harassment. Within the organization the superiors at each level have to responsibility to act in cases where the code of conduct is not observed.
Gender equity in labor and work	No risk identified	Contract rangers are hired for implementing the project activities. These are positions for which physical strength and fitness are important attributes, and therefore the selection is made based on the physical abilities of applicants. They are also appointed on a probation basis to prove that they have suitable skills for the position before appointments are confirmed. As a result, most casual workers in the project area are men. Nevertheless, when higher level staff such as accountants are appointed, qualifications and experience form the basis for selection. With regards to equal opportunities, both women and men are offered job opportunities as well as people with different levels of status and income.
Forced labor	No risk identified	Yayasan Sabah is a government-linked company and adheres to government laws and regulations against forced labor. The project also abides to these laws and regulations, namely the overarching Labour Ordinance of Sabah (Amendment) Act 2024.
Child labor	No risk identified	Yayasan Sabah is a government-linked company and adheres to government laws and regulations against child labor. The project also abides to these laws and regulations, namely the overarching Labour Ordinance of Sabah (Amendment) Act 2024.
Human trafficking	No risk identified	Yayasan Sabah is a government-linked company and adheres to government laws and regulations against human trafficking. The project also abides to these laws and regulations, namely the overarching Labour Ordinance of Sabah (Amendment) Act 2024.

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The project abides to certain laws and regulations when it comes to labor and human rights. See Section 2.3.1. Furthermore, there are no people living inside or around the project zone since the it is fully located within a Forest Reserve. The land is owned by the State Government of Sabah and managed by the Yayasan Saba Group which is one of the partners in this project.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	This section is not applicable to the project since there are no IPLCs and customary rights holders inside or around the project zone.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
Not applicable	The land is owned by the State Government of Sabah and managed by the Yayasan Saba Group which is one of the partners in this project. Furthermore, there are no people living in the project area since it is fully located within a Forest Reserve in more than 80 km distance.

2.3.5 Benefit Sharing

Summary of the benefit sharing plan	Benefit sharing is not applicable to the project since there are no IPLCs and customary rights holders inside or around the project zone.
-------------------------------------	---

	Since 2009, 10% of the carbon ownership of all newly rehabilitated areas is shared with Yayasan Sabah. During the next Steering Committee meeting, Face the Future and Yayasan Sabah will discuss the management structure of the carbon revenue sharing plan.
Benefit sharing during the monitoring period	Benefit sharing is not applicable to the project since there are no IPLCs and customary rights holders inside or around the project zone.

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure(s) taken during the monitoring period
Impacts on biodiversity and ecosystems	Temporary reduction of food sources and habitats for wildlife due to climber cutting	To mitigate this risk, the project has conducted the planting campaigns exclusively with native species. In the medium term, natural forests will develop and provide food sources and habitats for wildlife of much higher quality than climber-dominated areas
	Possible cutting of desirable species due to renticing and row opening, as well as due to maintenance activities and liberation thinning	The project will tag naturally regenerating native species prior to renticing and row opening activities, in order to ensure that no desirable species are removed
	Alteration of forest species composition during planting activities	To mitigate this risk, the project has conducted a careful study on the ecological conditions and reference composition of each planting site and ensures that the species planted match the specific ecological requirements
	Reduced seed dispersal and food availability to wildlife due to seed collection activities	To mitigate this risk, the project assesses seed availability from collection sites and only collects seeds from areas with sufficient seeds available for dispersal,

		natural regeneration and wildlife consumption requirements
	Reduced original wildlings on forest floor, and temporary reduction of food sources and habitats due to wildling collection	Wildling collection activities will enhance natural regeneration and survival of the remaining wildlings due to reduced competition. As a result, the project is enhancing the development of natural forests, which will provide food sources and habitats for wildlife of much higher quality
	Loss of top soil and ground vegetation from soil collection	To mitigate this risk, soil is collected from soil deposits created through natural landslides. Once the soil is deposited in the planting site, then seedlings are planted quickly to avoid further soil losses
	Environmental pollution due to domestic refuse	To mitigate this risk, the project separates biodegradable from non-biodegradable waste, and recycles the latter one as far as possible. Furthermore, the project coordinates the disposal of domestic refuse and ensures that this is dumped away from water courses
Soil degradation and soil erosion	Environmental pollution due to use of fertilizers and pesticides	The use of fertilizers and pesticides is restricted to small spots in planting sites, to significantly reduce environmental pollution
	Increased soil erosion through road maintenance	The project makes use exclusively of the existing road network in the project area. Furthermore, mitigation measures include maintaining the road sides, cross drains and culverts, and also add a layer of gravel on the surface of the

		soil to protect road sites where the risk of erosion is high
	Soil erosion due to site clearance	To mitigate this risk, clearance activities are limited exclusively to severely degraded sites, and seedlings are planted immediately to avoid soil erosion.
Water consumption and stress	Damming of stream due to water treatment	To mitigate this risk, the project established the two surface-overflow dams only in one river that runs across the camp in a severely degraded forest, dominated by pioneer species
	Chemical pollution due to water treatment	To mitigate this risk, the project flushes residuals from water treatment plants into pioneer-dominated forests away from any perennial streams. Furthermore, the use of water is optimized by restricting it to consumption activities only; water for washing and other uses is supplied from non-treated water

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	In total, 207 rare, threatened and endangered species are present in the project area: 63 mammals, 82 birds, 27 amphibians, 17 reptiles, 18 fish. These species occur almost exclusively in natural forests and have suffered dramatic population declines due to several anthropogenic threats, being habitat loss due to deforestation and forest degradation key drivers. The project is rehabilitating a severely logged-over mixed dipterocarp rainforest which, in absence of the project, would recover at a much slower pace and become re-logged. The target ecosystem of the project is a native forest capable of providing habitats to wildlife, including rare, threatened and endangered species.
--------------------	--

Areas needed for habitat connectivity	The project has not adversely impacted areas needed for habitat connectivity. Contrarily, it is ensuring that natural forests are not re-logged and recover much faster than in absence of any human intervention. Therefore, the project is ultimately increasing forest cover and habitat connectivity.
---------------------------------------	---

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	No risk identified	Rare, threatened, and endangered species in the project zone are dependent on native patches of forest. The project will restore the native vegetation, increase forest cover and health and avoid re-logging, hence providing wildlife habitats.
Areas for habitat connectivity	No risk identified	The high-intensity logging operations in the past caused severe forest degradation and degraded areas for habitat connectivity. By restoring the native vegetation, increasing forest cover and health and avoiding re-logging, the project is also restoring wildlife habitat connectivity in the broad landscape.

2.4.2 Introduction of species

Not applicable for this project, since project activities are exclusively carried with native species.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
N/A	N/A	N/A	N/A

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
<i>Acacia mangium</i> (108 individuals)	This species was planted for research purposes in a controlled environment, with a strong management and monitoring plan to prevent their spread.
<i>Tectona grandis</i> (15 individuals)	This species was planted for research purposes in a controlled environment, with a strong management and monitoring plan to prevent their spread.

	Risks identified	Mitigation or preventative measure(s) taken
<i>Acacia mangium</i>	No risk identified	This species was planted for research purposes in a controlled environment, with a strong management and monitoring plan to prevent any risks and negative effects.
<i>Tectona grandis</i>	No risk identified	This species was planted for research purposes in a controlled environment, with a strong management and monitoring plan to prevent any risks and negative effects.

2.4.3 Ecosystem conversion

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	No risk identified	The main objective of this project is to restore a severely logged-over mixed dipterocarp forest. The project area was highly degraded and has a slow recovery rate due to the presence of high quantities of vines and climbing bamboos suppressing remnant trees and

		natural regeneration, hence hindering the recovery of natural forests. The project aims to accelerate recovery and rehabilitate the natural diversity of Sabah's rainforest by conducting enrichment planting activities exclusively with suitable indigenous species.
--	--	---

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

3.1.1 Forest Rehabilitation Activities

Since the start of the project implementation in 1993, the project rehabilitated a total of 11,819 ha through climber cutting and enrichment planting.

An outline of the forest rehabilitation areas within the project boundary is shown in Figure 2 and Table 2 below. The different planting years are presented in different colors ranging from dark green (1993) to light green (2013).

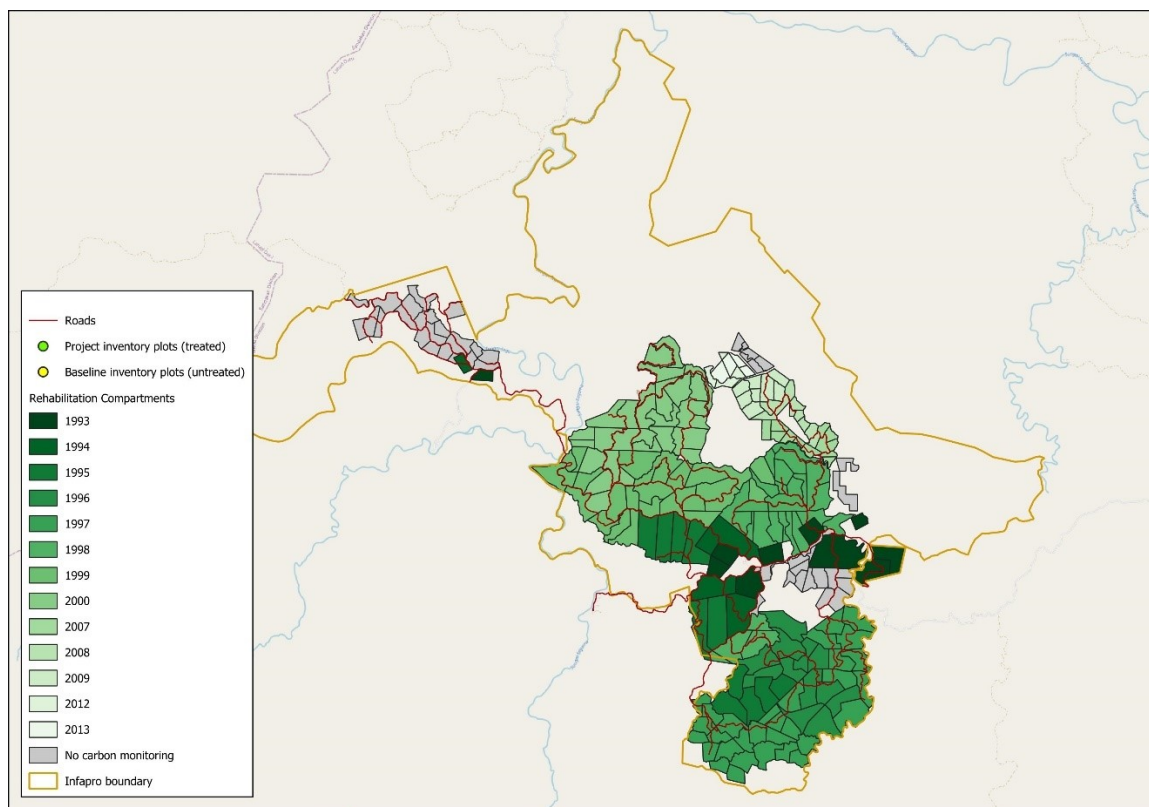


Figure 2 – Map showing the boundaries of the Forest Rehabilitation Compartments since 1993

Table 2 – Forest rehabilitation activities carried out by the project per year since the start of the project

Year	Total Rehabilitation Area (ha)	Rehabilitation Area included in this MR (ha)
1993	786	786
1994	495	495
1995	1,123	1,123
1996	967	967
1997	1,663	1,663
1998	1,400	1,400
1999	1,652	1,652
2000	1,701	1,701
2002	77	-
2003	154	-
2004	855	-
2007	219	219
2008	186	186

2009	249	249
2011	64	-
2012	91	65
2013	99	99
2019	40	-
Total	11,819	10,604

The enrichment planting in INFAPRO, which is achieved exclusively with indigenous species, aims to rehabilitate the natural diversity of Sabah's rainforests. The main species chosen for the project are indigenous dipterocarps mainly of the *Shorea*, *Parashorea*, *Dipterocarpus*, *Vatica*, *Hopea* and *Dryobalanops* genus. These species were chosen due their extensive natural occurrence (hence ease of establishment), good timber properties and their ability to be vegetatively propagated. In addition to the dipterocarps, forest fruit trees are planted. These not only act as suitable pioneer species for the more open and severely degraded areas but in addition provide food for bird and animal species, increasing biodiversity and restoring the natural composition of the forests structure.

Table 3 - Species selected for project activities and enhancement of biodiversity

Dipterocarps / hardwoods		Fruits	Other species
<i>Azadirachta excelsa</i>	<i>Shorea beccariana</i>	<i>Aglaia squamulosa</i>	<i>Agathis borneensis</i>
<i>Dipterocarpus applanatus</i>	<i>Shorea faguetiana</i>	<i>Alangium ebenaceum</i>	<i>Aqualaria malaccensis</i>
<i>Dipterocarpu caudiferus</i>	<i>Shorea falciferoides</i>	<i>Artocarpus integer</i>	<i>Duabanga moluccana</i>
<i>Dipterocarpus acutangulus</i>	<i>Shorea fallax</i>	<i>Baccaure angulata</i>	<i>Koompassia excelsa</i>
<i>Dipterocarpus confertous</i>	<i>Shorea flaviflora</i>	<i>Baccaurea latifolia</i>	<i>Neolamarckia cadamba</i>
<i>Dipterocarpus conformis</i>	<i>Shorea gibbosa</i>	<i>Democarpus longan</i>	<i>Octomelis sumatrana</i>
<i>Dipterocarpus gracilis</i>	<i>Shorea guiso</i>	<i>Diospyrus spp</i>	<i>Palaquium spp</i>
<i>Dipterocarpus lowii</i>	<i>Shorea johorensis</i>	<i>Durio spp</i>	<i>Scaphium macropodum</i>
<i>Dryobalanops beccarii</i>	<i>Shorea laevis</i>	<i>Garcinia parvifolia</i>	
<i>Dryobalanops keithii</i>	<i>Shorea leprosula</i>	<i>Lansium domesticum</i>	
<i>Dryobalanops lanceolata</i>	<i>Shorea leptoderma</i>	<i>Nephelium lappaceum</i>	
<i>Eusideroxylon zwagerii</i>	<i>Shorea macroptera</i>	<i>Nephelium mutabile</i>	
<i>Hopea beccariana</i>	<i>Shorea macropyhilla</i>	<i>Parartocarpus spp</i>	

<i>Hopea dryobalanoidea</i>	<i>Shorea mecistopteryx</i>	<i>Pometia pinnata</i>	
<i>Hopea ferruginea</i>	<i>Shorea ovali</i>	<i>Walsura pinnata</i>	
<i>Hopea nervosa</i>	<i>Shorea parvifolia</i>		
<i>Hopea nutan</i>	<i>Shorea parvistipulata</i>		
<i>Hopea pentanevia</i>	<i>Shorea pauciflora</i>		
<i>Hopea sangal</i>	<i>Shorea pilosa</i>		
<i>Hopia spp</i>	<i>Shorea pinanga</i>		
<i>Instia palembanica</i>	<i>Shorea seminis</i>		
<i>Parashorea malaanonan</i>	<i>Shorea smithiana</i>		
<i>Parashorea smythiesii</i>	<i>Shorea superba</i>		
<i>Parashorea tomentella</i>	<i>Shorea symingtonii</i>		
<i>Shorea acuminatissima</i>	<i>Vatica albiramis</i>		
<i>Shorea agami</i>	<i>Vatica dulitensis</i>		
<i>Shorea argentifolia</i>			

3.1.2 Loss of Forest Carbon Stock during Monitoring Period

No loss of forest carbon stock occurred during the Monitoring Period.

3.2 Deviations

3.2.1 Methodology Deviations

There are no deviations to the methodology.

3.2.2 Project Description Deviations

Section 3.4.2.2 of the VCS PD specifies that forests within 30 meters of project roads are to be excluded from monitoring, in order to avoid potential road-related effects. However, the INFAPRO project includes this road-side zone in its monitoring activities, as 30 out of 382 sample plots are located within 30 meters of a project road. This constitutes a deviation from the sampling framework described in the PD.

This deviation is justified on conservative grounds, as it results in a lower estimate of emission removals. Growth monitoring data over the period 2011–2014 indicate that forests located within 30 meters of roads exhibit slower biomass growth rates compared to forests located farther away. Therefore, including these lower-performing plots in the calculation leads to more conservative estimates of net emission removals.

Table 4 below summarizes the tree biomass growth data (above- and below-ground biomass) across the roadside and non-roadside zones.

Table 4 - Road Effect Assessment 2011-2024 Tree Biomass Growth

Forest Zone	Number of plots of plots (N)	Average Tree Biomass Growth AGB+BGB 2010-2024 (tCO ₂ /ha/yr)
Baseline plots ≤30m from road	2	2.5
Project plots ≤30m from road	28	3.0
All plots ≤30m from road	30	3.0
Baseline plots >30m from road	87	1.0
Project plots >30m from road	265	7.1
All plots >30m from road	352	5.6

The average growth rate for plots within 30 meters of the project roads (3.0 tCO₂/ha/yr) is substantially lower than for those beyond 30 meters (5.6 tCO₂/ha/yr). Hence, the inclusion of these roadside plots reduces the overall emission removal estimate, which is in line with the principle of conservativeness endorsed by the VCS.

Other than the described deviation to the sampling framework described above, there are no further deviations to the Project Description.

3.3 Grouped Projects

The project is not a grouped project activity.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☒ Yes

☐ No

The VCS standard (v4.7, section 3.2.5) requires the project to undergo a baseline reassessment during the current verification round since the original baseline assessment was done more than 10 years ago, during the validation of the project and for the project's first VCS Monitoring Period (starting 1st of January 2007). The sections below provide a summary of the baseline reassessment applied.

3.4.1 Applicability of Methodology.

The used methodology (Methodology for Improved Forest Management: Conversion of Low Productive to High Productive Forest, VCS Methodology VM0005) is still applicable. The latest version is v1.2. The methodology has been developed for this project activity. It is intended for project activities that enhance forest carbon stocks by enrichment planting and silvicultural treatment of degraded forest and / or avoid emissions from further forest degradation from

logging. The project activity aims at both avoiding short-term relogging and rehabilitation of the forest stand.

3.4.2 Updates to Project Description.

As described below, the baseline scenario established in 2007 is still valid. Therefore, no significant sections in the project description were updated. The only sections updated in the PD is section 2.4, to reflect the outcome of the baseline reassessment, and section 3.3, to reflect the changed parameters Carbon Fraction (CF) and Root-Shoot ratio (R_j).

3.4.3 Validity of the Baseline.

As previously noted, the previous baseline assessment was conducted at the start of the prior Monitoring Period on January 1, 2007. Consequently, the first baseline reassessment was scheduled for January 1, 2017. Since the current Monitoring Period spans 2010 to 2024, the reassessment is being carried out now, based on the perspective and conditions of 2017. Nevertheless, as this Monitoring Period runs up until the end of June 2024, developments that have occurred between 2017 and the present are also being considered.

The baseline reassessment was conducted by following the procedure for determining the baseline scenario as outlined in Chapter 6 of the methodology used by the project (VM0005). The methodology states that the baseline scenario must reflect what most likely would have occurred in the absence of the project. It consists of a logged-over natural Evergreen Tropical Rainforest, normally with no or insignificant regrowth that may or may not be relogged. The following information is provided to prove that the project proponent meets the minimum acceptable standards outlined for this baseline scenario:

3.4.3.1 A documented history of the operator

The history of forest management in Sabah up until the first VCS monitoring round is outlined in section 2.4 of the PD.

Before, the Ulu Segama Forest Reserve, to which the project area belongs, was classified as a Class II production forest reserve. However, in 2014, the whole of the Ulu Segama-Malua (USM) Forest Management Unit (FMU) became classified as a Class I Protection Forest Reserve or Class VI Virgin Jungle Reserve. This means that it is protected by law from any form of land conversion, timber exploitation or extraction of any forest products. The only activities permitted are for environmental protection and biodiversity conservation. This does not change the baseline scenario, because absence of further logging since 2008 was already part of the original baseline scenario validated in 2011.

After the creation of the USM FMU in 2006, the first forest management plan (FMP)¹³ on sustainable forest management of the USM Forest Reserves was adopted covering the 2008-2017 period. Subsequently, in 2018 the second FMP on sustainable forest management of the USM Forest Reserves was released covering the 2018-2027 period¹⁴. USM is the second model for sustainable forest management in Sabah.

Since the first USM Forest Management Plan (FMP) (2008–2017), the USM FMU has applied Timber Stand Improvement (TSI)—defined as a low-intensity silvicultural treatment consisting of one round of climber cutting—as part of its management strategy for degraded forest areas. TSI implementation depends on external funding sources, including donations and allocations under the Malaysian National Development Plans. As noted in Section 2.4 of the VCS PD, TSI represents a minimal-intensity intervention, considerably less costly and less comprehensive than the forest rehabilitation activities implemented by the INFAPRO Project. The Forest Rehabilitation Activities implemented by the INFAPRO Project consists of rehabilitation activities that include the combination of the following measures (see also sections 1.8 and 1.9 of the PD for a more detailed description):

- Enrichment planting using indigenous tree species;
- Silvicultural interventions: i.e. 2 rounds of climber cutting and tending of planted seedlings and natural regenerating seedlings through liberation thinning, row slashing and ring weeding.

Within the project's reference area (Malua Forest Reserve), TSI was planned under both the first and second USM FMPs. According to the Sabah Forest Department (SFD) annual reports¹⁷, the implementation of TSI in Malua FR has progressed slightly ahead of schedule, with approximately 25% of compartments treated by the end of 2023. This represents less than half of the total forest area in Malua FR. The spatial distribution of TSI conducted by SFD between 2019 and 2023 demonstrates that TSI has been sporadic and not consistently implemented across the reserve. As such, TSI treatment is considered partially implemented but not applied at a scale or consistency that would change the baseline scenario for the INFAPRO project. See also the map underneath with a visualization of the silvicultural treatments deployed by the Sabah Forestry Department in Malua FR between 2019 and 2023.

¹³ Sabah Forestry Department (2008). Forest Management Plan for Ulu-Segama Malua Sustainable Forest Management Project Area 2008-2017.

¹⁴ Sabah Forestry Department (2018). Forest Management Plan for Ulu-Segama Malua Sustainable Forest Management Project Area 2018-2027.

¹⁷ SFD, 2008. Annual Report. SFD, 2009. Annual Report. SFD, 2010. Annual Report. SFD, 2011. Annual Report. SFD, 2012. Annual Report. SFD, 2013. Annual Report. SFD, 2014. Annual Report. SFD, 2015. Annual Report. SFD, 2016. Annual Report. SFD, 2017. Annual Report. SFD, 2018. Annual Report. SFD, 2019. Annual Report. SFD, 2020. Annual Report. SFD, 2021. Annual Report. SFD, 2022. Annual Report. SFD, 2023.

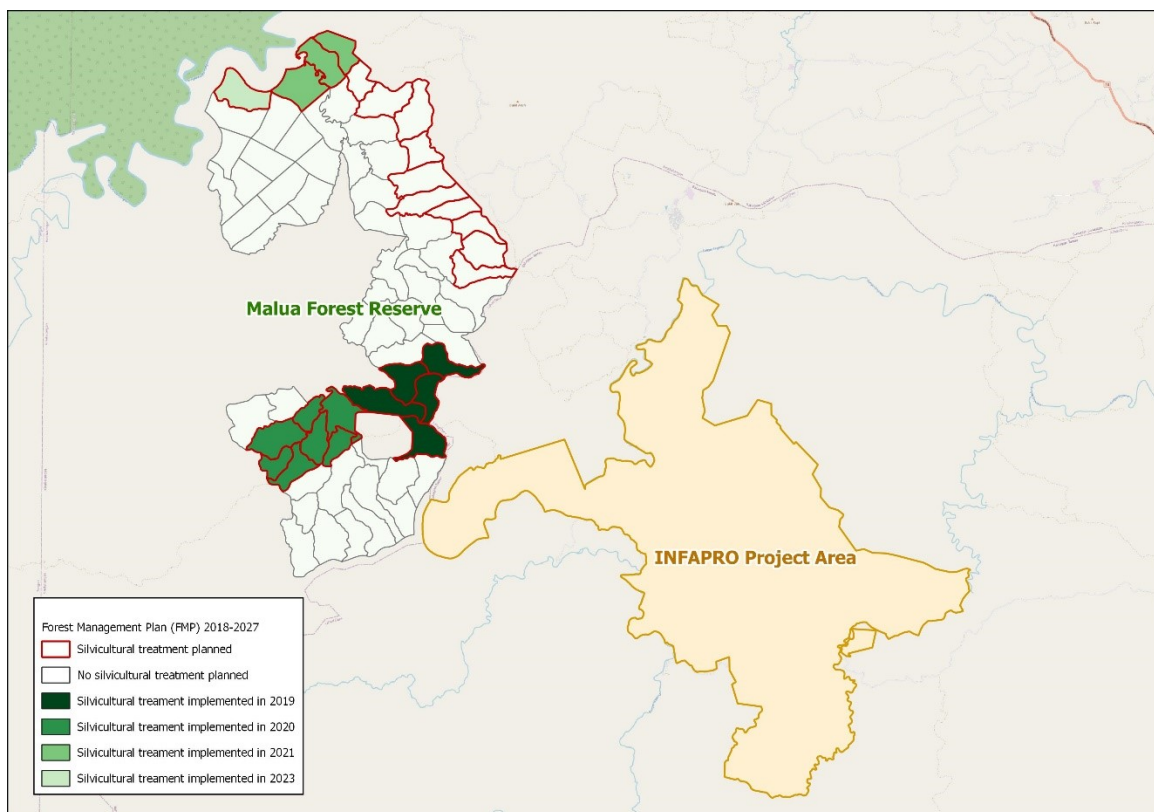


Figure 3 – Implementation of the TSI as part of the Forest Management Plan 2018-2027 in Malua Forest Reserve

The project acknowledges that TSI may become more widely adopted across Malua FR. Therefore, the project plans to update the baseline in the next monitoring round. The methodology does not provide any option of adopting a new baseline during an ongoing monitoring period. Incorporating TSI in the baseline scenario likely requires an update to the methodology. This is because the current monitoring approach, based on the methodology VM0005, compares project plots to baseline plots in the project area that have undergone one cycle of logging and no TSI. The methodology does not provide an option to monitor the baseline in areas with two rounds of logging and undergoing silvicultural treatment, which might be more appropriate for a future monitoring period. After this monitoring round, the project will explore whether the current methodology can be updated, or whether the project must shift to a different methodology (such as VM0045).

3.4.3.2 The legal requirements for forest management and land use in the area

1) Legal requirements for rehabilitation

In 2014, the whole of the USM FMU became classified as a Class I Protection Forest Reserve or Class VI Virgin Jungle Reserve. This means that it is protected by law from any form of land conversion, timber exploitation or extraction of any forest products. The only activities permitted are for environmental protection and biodiversity conservation.

Furthermore, YS has continued to operate under a Sustainable Forest Management Licence Agreement (SFMLA) signed in 1997 between the State Government and YS. The legal requirements for rehabilitation are outlined in section 2.4 of the PD.

2) Legal requirements for logging

As mentioned above, YS has continued to operate under a SFMLA signed in 1997 between the State Government and YS. The legal requirements for logging are outlined in section 2.4 of the PD.

However, since the whole of the USM FMU was reclassified as a Class 1 Protection Forest by 2014, it is protected by law from any form of land conversion, timber exploitation or extraction of any forest products. The only activities permitted are for environmental protection and biodiversity conservation State's Forest Enactment Act (1984).

Since YS continues to operate under the same SFMLA, the baseline remains unchanged.

3.4.3.3 Proof that their environmental practices equal or exceed those commonly considered a minimum standard among similar landowners in the area.

As mentioned above, YS continues to operate under a Sustainable Forest Management Licence Agreement (SFMLA) signed in 1997 between the State Government and Yayasan Sabah. The introduction of the SFMLA's followed the adoption of a Sustainable Forest Management (SFM) policy by the Sabah Forestry Department in 1997, based on experiences with SFM in the Deramakot Forest Reserve in Sabah. On 15 March 2006 the Sabah State Government decided to create one single Forest Management Unit of about 250,000 hectares to be managed under sustainable forest management principles. A forest management plan on sustainable forest management has been adopted covering the period 2008 – 2017. Subsequently, in 2018 the second FMP on sustainable forest management of the USM Forest Reserves was released covering the 2018-2027 period. Similar Forest Management Units like Northern Gunung Rara SFM Project, Trusan Sugut Sustainable Forest Management Project and Ulu Kalumpang-Wullersdorf Sustainable Forest Management Project in Sabah also operate under sustainable forest management principles and implement their own tailored 10-year sustainable forest management plans. Like the USM FMU, these Forest Management Units carry out forest protection, rehabilitation (silvicultural treatment and enrichment planting), and monitoring activities as outlined in their respective sustainable forest management plans (SFD, 2023). This, together with the fact that USM is the second model for sustainable forest management in Sabah, demonstrates that YS is adopting environmental that are at least on par with those of other landowners in the area.

As Yayasan Sabah continues to operate under the SFMLA and adheres to 10-year Sustainable Forest Management Plans, the baseline remains unchanged.

3.4.4 Impact of new relevant national and/or sectoral policies and circumstances on the validity of the baseline scenario

Before, the Ulu Segama Forest Reserve, to which the project area belongs, was classified as a Class II production forest reserve. However, in 2014, the whole of the Ulu Segama-Malua (USM) Forest Management Unit (FMU) became classified as a Class I Protection Forest Reserve or Class VI Virgin Jungle Reserve. This means that it is protected by law from any form of land conversion, timber exploitation or extraction of any forest products. The only activities permitted are for environmental protection and biodiversity conservation. This does not change the baseline scenario, because absence of further logging since 2008 was already part of the original baseline scenario validated in 2011.

3.4.5 Percentage change between the revised baseline emissions and the previous baseline emissions

Not applicable. As described above, the current baseline scenario established in 2007 is still valid. There is no revised baseline scenario.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	T
Data unit	years
Description	Monitoring period
Source of data	
Value applied	13.5 years between 01 Jan 2011 and 30 Jun 2024
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of data	Calculation of project emissions
Comments	Monitoring Period $T = t_3 - t_2$ where: $t_2 = 01-01-2011$ $t_3 = 30-06-2024$

Data / Parameter	T_2
Data unit	date

Description	End of previous Monitoring Period 2007-2010 (See VCS MR 2010)
Source of data	End of previous Monitoring Period 2007-2010 (See VCS MR 2010)
Value applied:	01 January 2011
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	T_3
Data unit	date
Description	Date of verification 2024
Source of data	Start of Carbon monitoring campaign 2024
Value applied:	30 June 2024
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	i
Data unit	dimensionless
Description	Stratum
Source of data	
Value applied:	Open canopy forest; Pioneer dominated forest; Remnant and pioneer forest
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Determination of baseline scenario (AFOLU projects only) Calculation of baseline emissions

	Calculation of project emissions
Comments	See section 4.3.2 for description of stratification applied.

Data / Parameter	A_i
Data unit	ha
Description	Total area monitored for GHG sinks
Source of data	GIS shapefiles of Rehabilitation Compartments
Value applied:	1993-2000 Rehabilitation Period: 9,786 ha; and 2007-2013 Rehabilitation Period: 817 ha (see also section 5.1.2.1)
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Determination of baseline scenario (AFOLU projects only) Calculation of baseline emissions Calculation of project emissions
Comments	Project activity area (rehabilitated areas)

Data / Parameter	$a_{i,p}$
Data unit	m ²
Description	Area of permanent sampling plot p
Source of data	IFER
Value applied:	Plot size to measure trees with DBH 50mm - 100mm: 78.5 m ² Plot size to measure trees with DBH 100mm - 200mm: 500 m ² Plot size to measure trees with DBH > 200mm: 2,000 m ²
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	See section 4.3.4.2 for the specifications of the IFER plot design

Data / Parameter	$\Delta C_{REL,i,t}$
Data unit	tCO ₂ -e
Description	Net carbon stock change due to relogging in the baseline
Source of data	Infapro VCS PD section 4.2
Value applied:	0 tCO ₂ -e
Justification of choice of data or description of measurement methods and procedures applied	This parameter is quantified in PD section 4.2. Relogging in the baseline scenario only occurs once in the Crediting Period, in year 2007. So $\Delta C_{REL,i,t}$ during Monitoring Period 2011-2024 is 0 tCO ₂ -e
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	$GHG_{BSL-E,t}$
Data unit	tCO ₂ -e
Description	Net carbon stock change due to relogging in the baseline
Source of data	Infapro VCS PD section 4.2
Value applied:	0 tCO ₂ -e
Justification of choice of data or description of measurement methods and procedures applied	This parameter is quantified in PD section 4.2 and is only determined once in 2007, as it represents the emissions from relogging. So $GHG_{BSL-E,t}$ during Monitoring Period 2011-2024 is 0 tCO ₂ -e
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	Plot position (permanent sample plots)
Data unit	GPS coordinates
Description	Plot position, GPS coordinates
Source of data	Field measurement
Value applied:	GPS coordinates

Justification of choice of data or description of measurement methods and procedures applied	GPS Coordinates are mapped by the project to allow for the monitoring of forest regrowth in the baseline and project area.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	The GPS coordinates of the plot positions is used to navigate to the sample plots

Data / Parameter	WD
Data unit	kg/m ³
Description	Tree species specific wood densities
Source of data	Burgess (1966), Tree Flora of Sabah & Sarawak (Soepadmo, 1996), unpublished research by Yap, PROSEA (Plant Resources of South-East Asia), Forester's Manual of Dipterocarps (Symington, 1943, revised in 2004)
Value applied:	Multiple (See Appendix 1)
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	

Data / Parameter	BEF
Data unit	Dimensionless
Description	<i>Biomass Expansion Factor</i> , to convert the calculated stem volumes of the trees into total above-ground biomass
Source of data	<i>Pinard, 1995; Brown S. et al 1989</i>
Value applied:	1.895
Justification of choice of data or description of	See section 4.3.4.5

measurement methods and procedures applied	
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	

Data / Parameter	R_f
Data unit	dimensionless
Description	Conversion Factor for calculating below-ground (root) biomass from above-ground biomass in trees
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories - Table 4.4
Value applied:	0.212
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4.5
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	

Data / Parameter	CF_i
Data unit	dimensionless
Description	Conversion factor for conversion of dry weight to carbon stock in above-ground tree biomass
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories Table 4.3
Value applied:	0.47
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4.5
Purpose of the data	Calculation of baseline emissions

	Calculation of project emissions
Comments	
Data / Parameter	$\frac{44}{12}$
Data unit	dimensionless
Description	Ratio of molecular weights of CO ₂ and carbon
Source of data	IPCC
Value applied:	44/12
Justification of choice of data or description of measurement methods and procedures applied	See section 4.3.4.5
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comments	

4.2 Data and Parameters Monitored

Data / Parameter	DBH
Data unit	mm
Description	Diameter at breast height of tree - measured at 1.3m height
Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	DBH was measured for all qualifying trees (equal or greater than 50 mm DBH) in the sample plots using a calliper. Diameter was measured at 1.3m height (breast height).
Frequency of monitoring/recording	DBH is measured in the inventory sample plots during the monitoring campaigns
Value monitored:	Tree DBH vary per tree age and tree species, see Appendix 1 for measured DBH per tree

Monitoring equipment	The DBH was measured in the field using a calliper, measuring tape or laser for large trees. Data was stored in Field-Map.
QA/QC procedures to be applied	See section 4.3.4.8
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method	-
Comments	To qualify for sampling and carbon stock calculation, only trees with dimensions greater or equal to 5 cm in diameter at breast height were considered.

Data / Parameter	<i>Tree species</i>
Data unit	dimensionless
Description	The name of the tree species, identified at both genus and species level.
Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	The name of the tree species are identified by highly skilled botanists in the field.
Frequency of monitoring/recording	The tree names are recorded in the sample plots during the monitoring campaigns
Value monitored:	Tree species, see Appendix 1 for recorded tree species
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3.4.8
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method	-
Comments	The identification of tree species is necessary for the calculation of the amount of carbon stored in the trees

Data / Parameter	$\Delta C_{tree-exist,i,t}$
Data unit	tCO ₂ -e
Description	The carbon stock changes in the existing vegetation in the baseline scenario

Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	Calculation of changes in carbon stocks in above- and below-ground tree biomass in the untreated (baseline) area, measured on permanent sample plots
Frequency of monitoring/recording	Each monitoring campaign
Value monitored:	See Appendix 1 for calculated values
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3.4.8
Purpose of the data	Calculation of baseline emissions
Calculation method	$\Delta C_{tree-exist,i,t} = A_{i,t} \times \sum_{j=1}^S \Delta C_{tree-exist,j,i,t}$
Comments	

Data / Parameter	ΔC_{BSL}
Data unit	tCO ₂ -e
Description	The net emissions in the baseline scenario
Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	Calculation of changes in carbon stocks in above- and below-ground tree biomass in the untreated (baseline) area, measured on permanent sample plots
Frequency of monitoring/recording	Each monitoring campaign
Value monitored:	See Appendix 1 for calculated values
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3.4.8
Purpose of the data	Calculation of baseline emissions
Calculation method	$\Delta C_{BSL} = \sum_{t=1}^{t^*} \sum_{i=1}^{M_{BSL}} (\Delta C_{REL,i,t} + \Delta C_{tree-exist,i,t}) + GHG_{BSL-E,t}$
Comments	

Data / Parameter	$\Delta C_{P,i,t}$
Data unit	tCO ₂ -e
Description	The net carbon stock change due to forest regrowth and silvicultural interventions in the with-project scenario
Source of data	Field measurements in inventory sample plots.
Description of measurement methods and procedures to be applied	Calculation of changes in carbon stocks in above- and below-ground tree biomass in the treated (project) area, measured on permanent sample plots
Frequency of monitoring/recording	Each monitoring campaign
Value monitored:	See Appendix 1 for calculated values
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3.4.8
Purpose of the data	Calculation of project emissions
Calculation method	$\Delta C_{P,i,t} = \Delta C_{AGB,i,t} + \Delta C_{BGB,i,t} + \Delta C_{DW,i,t} + \Delta C_{WP,i,t} - E_{biomassloss,i,t}$
Comments	The parameters $\Delta C_{DW,i,t}$, $\Delta C_{WP,i,t}$ and $E_{biomassloss,i,t}$ are not quantified (see PD section 4.3.1). The parameter $\Delta C_{AGB,i,t}$, representing the net carbon stock changes in above-ground tree biomass, is quantified in section 0. The parameter $\Delta C_{BGB,i,t}$, representing the net carbon stock changes in below-ground tree biomass, is quantified in section the same section.

Data / Parameter	$GHG_{WPS-E,t}$
Data unit	tCO ₂ -e
Description	The GHG emissions relating to project implementation
Source of data	Project records
Description of measurement methods and procedures to be applied	Project records and conversion factors applied to calculate project related emissions
Frequency of monitoring/recording	Each monitoring campaign
Value monitored:	See Appendix 1 for calculated values

Monitoring equipment	-
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	See section 5.2.3

Data / Parameter	ΔC_{WPS}
Data unit	tCO ₂ -e
Description	The net emissions in the with-project scenario
Source of data	Field measurements on inventory sample plots.
Description of measurement methods and procedures to be applied	Calculation of changes in carbon stocks in above- and below-ground tree biomass in the treated (project) area, measured on permanent sample plots
Frequency of monitoring/recording	Each monitoring campaign
Value monitored:	See Appendix 1 for calculated values
Monitoring equipment	Field-Map Technology
QA/QC procedures to be applied	See section 4.3.4.8
Purpose of the data	Calculation of project emissions
Calculation method	$\Delta C_{WPS} = \sum_{t=1}^{t^*} \sum_{i=1}^{M_{WPS}} \Delta C_{P,i,t} + GHG_{WPS-E,t}$
Comments	See section 5.2.1

4.3 Monitoring Plan

The process followed for obtaining, compiling and analyzing the monitored data and parameters set out in section 4.2 above is based on the monitoring plan provided in the VCS Project Document for INFAPRO version 1.7 (VCS PD). This monitoring plan presented in the VCS PD is described again in the sections underneath. This monitoring plan covers the following:

- Monitoring of project boundary
- Stratification of project area
- Monitoring of baseline carbon stock changes and emissions

- Monitoring of project carbon stock changes and emissions
- Monitoring of leakage emissions

4.3.1 Monitoring of the project boundary

As described in the VCS PD in section 3.4.5.1, the boundaries of the rehabilitation areas (compartments) were mapped by the project team on the ground before the implementation of the forest rehabilitation activities.

Since the start of the project implementation in 1993, the project rehabilitated a total of 11,819 ha. However a part of the rehabilitated area is not included for this carbon monitoring campaign since the rehabilitation activities in these areas were done through 3rd party investments with no intention to receive issuance of VCU's. Therefore this monitoring campaign includes 10,604 ha of rehabilitation area, as shown in Figure 4 and Table 5 below.

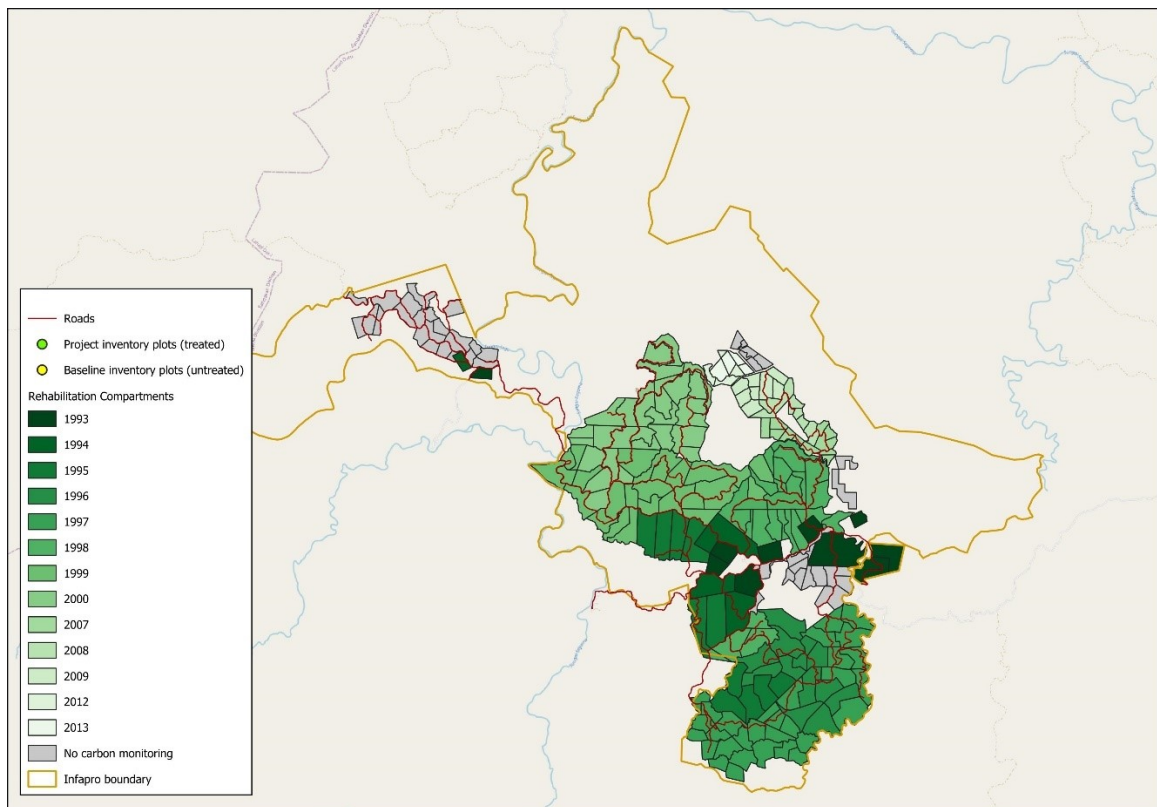


Figure 4 – Map showing the boundaries of the Forest Rehabilitation Compartments since 1993

Table 5 – Rehabilitation Compartment Areas included in this Monitoring Report

Year	Rehabilitation Area (ha)
------	--------------------------

1993	786
1994	495
1995	1,123
1996	967
1997	1,663
1998	1,400
1999	1,652
2000	1,701
2007	219
2008	186
2009	249
2012	65
2013	99
Total	10,604

4.3.2 Stratification

In order to facilitate the sampling of the tree carbon stocks on the sampling plots, the project area is stratified into the following 4 forest classes:

1. Remnant / Pioneer forest
2. Pioneer dominated forest
3. Open Canopy forest
4. Non-forest

Stratification of the project area followed the requirements of VM0005, which specifies in section 8 that baseline stratification must occur only once and remain fixed for the lifetime of the project (unless a separate reference area is used), while the with-project stratification must be updated prior to each monitoring event to reflect recent developments.

Since the baseline is monitored using these internal control plots rather than a separate reference area, the baseline stratification remains fixed throughout the lifetime of the project. Forest growth in the baseline scenario is quantified by calculating the average growth observed in the control plots (established in untreated project area) per stratum, and extrapolating these values to the rehabilitation compartments using the fixed baseline stratification defined at project start. For example, the average growth of all control plots originally classified as "open canopy" is extrapolated to the area of the rehabilitation compartments that was originally stratified as "open canopy." It is critical that this baseline stratification remains unchanged over time to maintain consistency between the baseline measurements and the areas to which they are applied. Updating the stratification would reflect changes in forest condition caused by the project and would therefore bias the estimation of what would have happened in the absence of intervention. The fixed stratification ensures that the baseline reflects only the conditions at the start of the project.

- 4.3.2.1 In contrast, the stratification used for the with-project scenario is updated prior to each monitoring event. This dynamic stratification reflects actual changes in forest condition resulting from project activities and ensures accurate quantification of carbon stock changes over time.
- ### Stratification of the Baseline Scenario

Following the VM0005 methodology section 8, the baseline stratification must occur only once and remain fixed for the lifetime of the project since the INFAPRO project is not monitoring the baseline in a reference area. The baseline stratification procedure applied by the project for the baseline scenario is therefore the same as described in the VCS PD section 4.2.2. and is based on 2002 aerial imagery,

The stratification of the project area in the baseline scenario is presented in the map and table below.

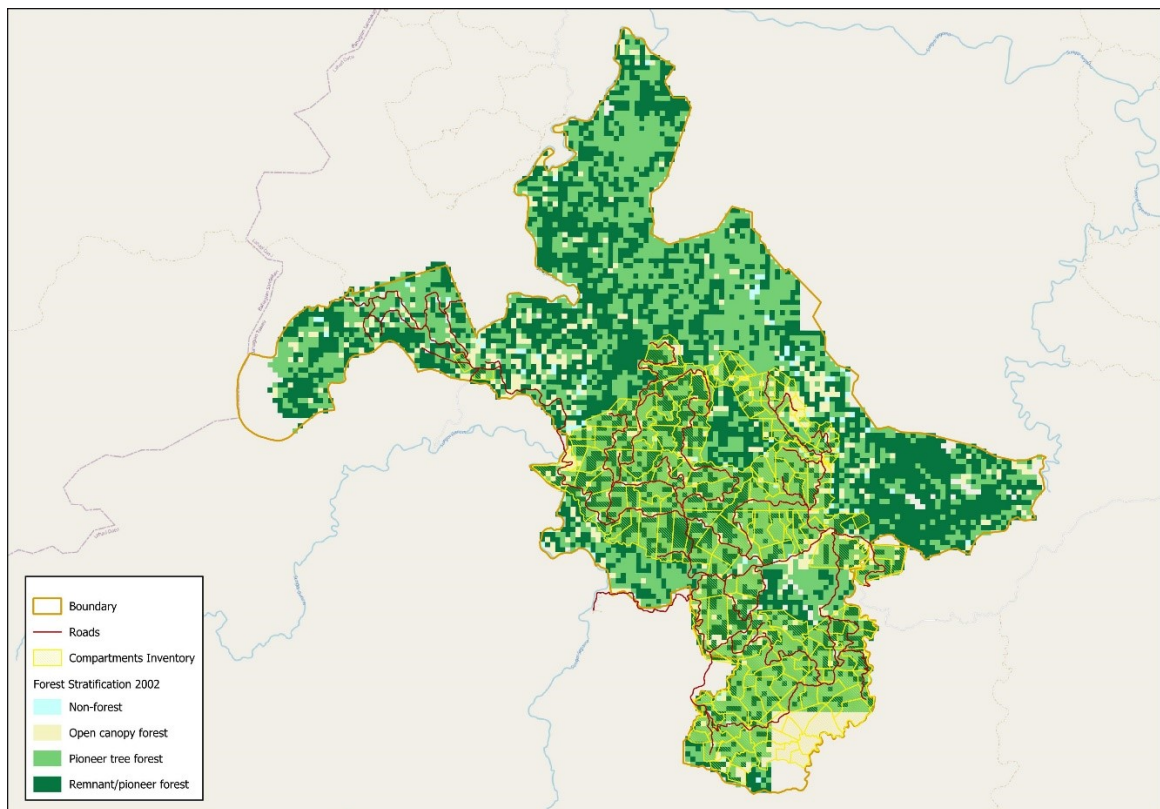


Figure 5 – Baseline Stratification of the entire INFAPRO Project Area (2002 Aerial Imagery)

Table 6 – Baseline Stratification of the Rehabilitated Project Area monitored (Rehabilitation Areas)

Year	Project Area Stratification (points)	Project Area Stratification (%)	Project Area Stratification (ha)
1993-2000 Rehabilitation Period			
Open Canopy Forest	143	6%	597
Pioneer Dominated Forest	1,304	56%	5,442
Remnant or Pioneer Forest	898	38%	3,748
Total 1993-2000 Rehabilitation Period	2,345	100%	9,786
2007-2013 Rehabilitation Period			
Open Canopy Forest	32	16%	128
Pioneer Dominated Forest	111	54%	442
Remnant or Pioneer Forest	62	30%	247
Total 2007-2013 Rehabilitation Period	205	100%	817
Total			10,604 ha

4.3.2.2 Stratification of the Project Scenario

Following VM0005 methodology section 8, the stratification in the with-project scenario must be updated at the time of each and every monitoring campaign prior to verification based on recent developments.

The stratification of the project area in the wit-project scenario was conducted using Sentinel-2 satellite imagery at a 10-meter spatial resolution. Two key indicators were used to characterize land cover: the proportion of sparse vegetation, derived from a combination of the Advanced Vegetation Index (AVI), Bare Soil Index (BI), and a Canopy Height Model (Lang et al., 2023); and the proportion of non-forest, identified using a threshold applied solely to the Bare Soil Index (BI). A 200×200-meter grid was overlaid on the project area to structure the analysis. Within each grid cell, the mean proportion of sparse vegetation and mean proportion of non-forest

were calculated. These two metrics were then used in combination to assign each cell to one of four stratification classes based on the rules presented in Table 7 below.

Table 7 – 2024 Stratification classes

Stratum (forest type)	Sparse vegetation cover (%)	Non-Forest (%)
Remnant / Pioneer Forest	< 3%	< 38 %
Pioneer dominated forest	$\geq 3\%$ and < 45%	< 38 %
Open Canopy Forest	$\geq 3\%$ and < 45%	< 38 %
Non-Forest	$\geq 45\%$	$\geq 38\%$

This classification framework allows for a clear separation between forest and non-forest areas, and further stratification of forest types based on canopy openness and vegetation cover, see also Figure 6 below.



- Remnant/Pioneer Forest
- ▲ Pioneer dominated Forest
- Open Canopy
- ★ Non Forest
- Areas with sparse vegetation
- Non-Forest

Figure 6 - Classification of the Project Area based on Sentinel-2 analysis

In total 7,599 plots have been classified. Based on the percentage of the number of digital plots of a specific forest class relative to the total number of digital plots, the area of the stratum is determined.

The stratification of the project area in the baseline scenario is presented in the map and table below.

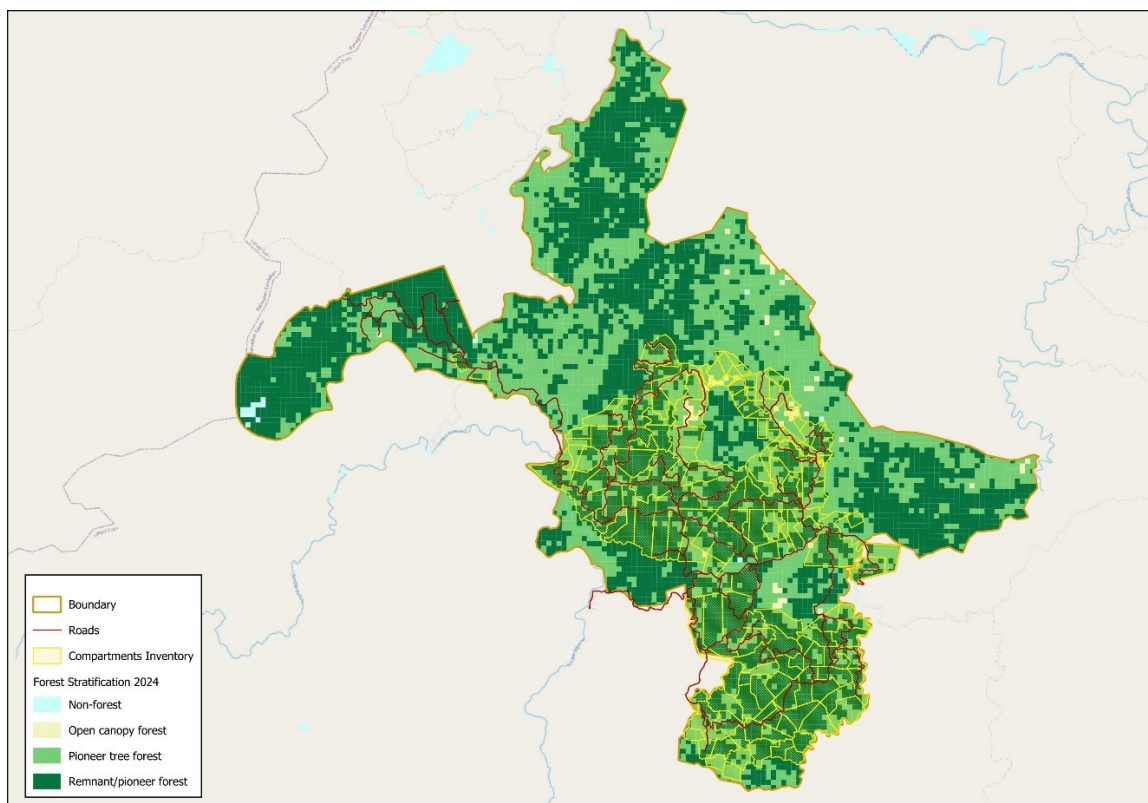


Figure 7 - Project Stratification of the entire INFAPRO Project Area (2024 Sentinel Imagery)

Table 8 – Project Stratification of the Rehabilitated Project Area monitored (Rehabilitation Areas)

Year	Project Area Stratification (points)	Project Area Stratification (%)	Project Area Stratification (ha)
1993-2000 Rehabilitation Period			
Open Canopy Forest	11	0.4%	43
Pioneer Dominated Forest	846	34%	3,321
Remnant or Pioneer Forest	1,636	66%	6,422

Total 1993-2000 Rehabilitation Period	2,493	100%	9,786
2007-2013 Rehabilitation Period			
Open Canopy Forest	13	6%	52
Pioneer Dominated Forest	136	66%	542
Remnant or Pioneer Forest	56	27%	223
Total 2007-2013 Rehabilitation Period	205	100%	817
Total			10,604 ha

4.3.3 Monitoring carbon stock changes and GHG emissions in the baseline scenario

The carbon stock changes in the existing vegetation in the baseline scenario is monitored by the project ($\Delta C_{tree-exist,i,t}$), see also section 4.2.6 of the VCS Project Document. The carbon stock changes in existing vegetation include above-ground ($\Delta C_{tree-exist-AB,j,i,t}$) and below-ground ($\Delta C_{tree-exist-BB,j,i,t}$) tree biomass. Following the methodology in section 4.3.5, these parameters are quantified based on the same approach as for changes in carbons stocks in above- and below-ground tree biomass in the with-project scenario.

The monitoring requirements for the estimation of $\Delta C_{tree-exist,i,t}$ are therefore similar to those provided in the following section 4.3.4 on monitoring of project carbon stock changes.

4.3.4 Monitoring carbon stock changes and GHG emissions in the with-project scenario

Included in the monitoring of the project carbon stock changes are the above-ground tree biomass ($\Delta C_{AGB,i,t}$) and the below-ground tree biomass ($\Delta C_{BGB,i,t}$), while carbon stock changes in wood products ($\Delta C_{WP,i,t}$) and in dead wood ($\Delta C_{DW,i,t}$) are excluded, see also section 4.3.1.1 of the VCS Project Description.

4.3.4.1 Sampling framework

Sampling for the project is done following a stratified sampling approach.

First virtual plots were manually classified into forest types, based on a 200 m x 200 m grid imposed on an aerial photo (see section 4.2.2 of the VCS Project Document where the stratification of the Project Area into forest types is discussed in detail).

Out of these virtual plots a part was selected as permanent inventory sample plots for the project to be measured. Initially this selection was done in a zone along roads in the Project

Area. This zone is a 250 m wide strip along each side of the road. See also section 4.2.2 of the VCS Project Document for justification of this approach. In order to avoid potential biases in the sampling of living tree carbon stocks, extra sample plots have been added in the area beyond the sampling zone along the road (i.e. further than 250 m from the road). These additional plots are part of the sampling framework. The plots in the interior zones are given a different weight factor than the plots in the zone along the road. Statistical weighing of each plot is applied, based on the representative area of the inventory plot. The representative area of the inventory plot is calculated by dividing the area of strata in the road zone and interior zone by the number of inventory plots in the respective zones.

The following statistical approach is applied for calculating the weighted mean and standard error of above-ground carbon stocks:

$$\bar{y}_i = \frac{1}{W_i} \sum_{sp=1}^n y_{sp,i} w_{sp,i}$$

$$W_i = \sum_{sp=1}^n w_{sp,i}$$

$$s_i^2 = \frac{1}{W_i - 1} \sum_{sp=1}^n (y_{sp,i} - \bar{y}_i)^2 w_{sp,i}$$

Where:

$\bar{y}_i$	Weighted mean of above-ground carbon stocks in stratum i
W_i	Sum of plot weights in stratum i
$y_{sp,i}$	Above-ground carbon stock in plot sp and in stratum i
$w_{sp,i}$	Weight of plot sp in stratum i
s_i^2	Variance of mean above-ground carbon stocks in stratum i

The plot coordinates were fixed before the start of the field measurements. The number of plots measured for this monitoring event are 89 plots in the untreated area and 293 plots in the treated area. The map below shows the locations of the carbon inventory plots.

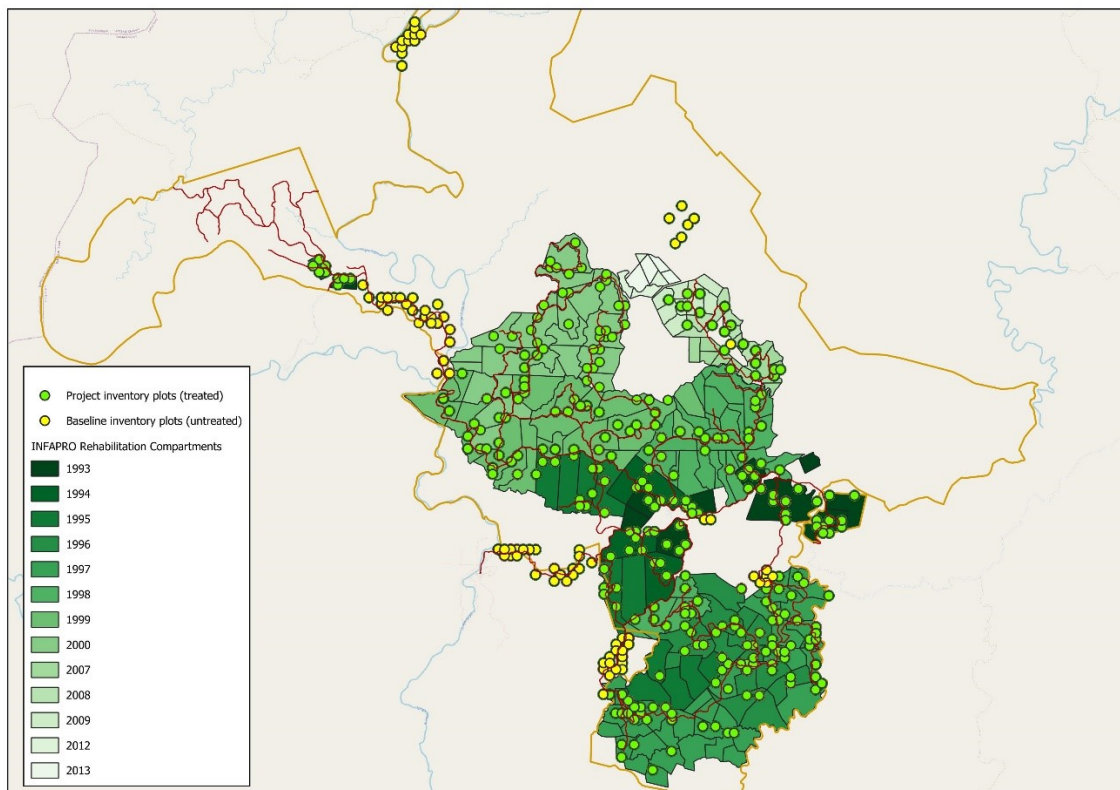


Figure 8 – Map with the locations of the permanent sample plots to measure carbon stock growth in treated area (Project) and untreated area (Baseline)

4.3.4.2 Plot Design

As shown in Figure 9 and Table 9 below, a nested plot approach is applied by the project, where each inventory plot exists out of four circles with an area of 500 m². So the total area of one sample plot is 2,000 m².

The circle in the South-West corner is the key circle. The distance between the circle centers is 28 meter and they are positioned in the form of a square (see Figure 9). The key circle contains a smaller circle with radius of 5 meter where small trees are measured (see Table 9).

Regeneration (i.e. trees larger than 20 cm in height up to 50 mm DBH) is monitored in a circle with a radius of 2 meter within the key circle. The plot can be rotated clockwise around the key circle center in steps of 20 degrees in order to keep a plot within one stratum or to avoid entering slopes that are too steep to walk on.

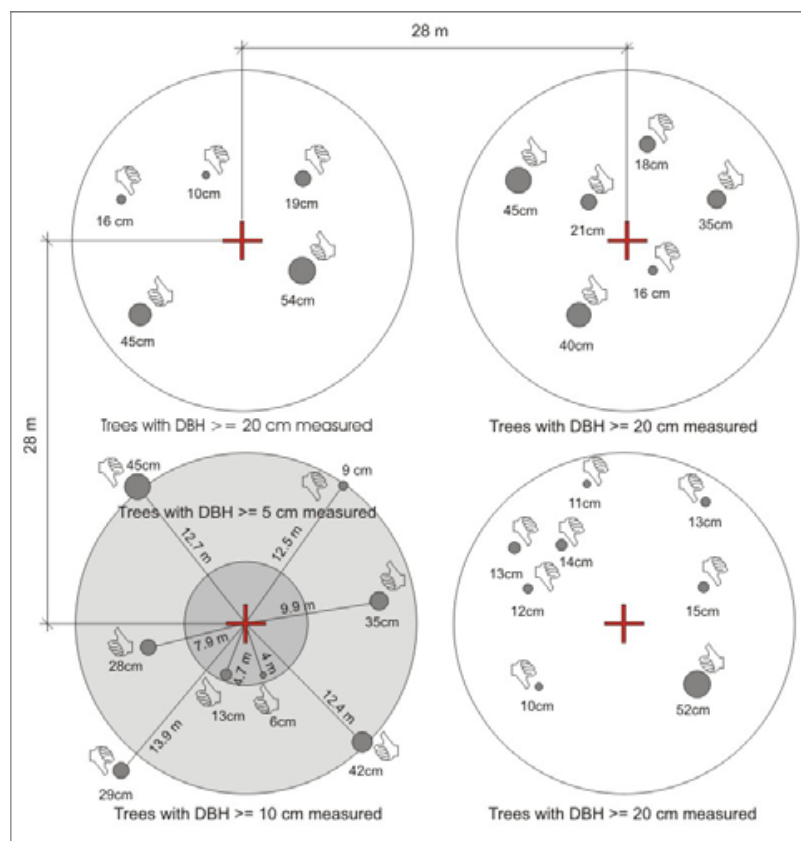


Figure 9 – Plot Layout

Table 9 - DBH classes used in the nested plots

Tree type	Tree dimensions	Sample area (m ²)	Circle radius (m)
Regeneration	>0.2 m of height – 50 mm of DBH	12.56	2 – key circle
Small trees	DBH = 50 mm – 100 mm	78.5	5 – key circle
Medium trees	DBH = 100 mm – 200 mm	500	12.62 – key circle
Large trees	DBH =200 mm and larger	2000	Whole inventory plot

4.3.4.3 Plot Monumentation

All inventory plots were measured using a local coordinate system, with the center located at the middle of the key circle of the inventory plot. The project employs both laser and GPS technologies to locate plot centers. GPS operates in the global coordinate system, while the laser is used in both local and global coordinate systems. The laser is particularly reliable for

navigation under the canopy, providing precise guidance to plot centers and being employed for all measurements conducted within the inventory plot.

To facilitate the future relocation of the permanent sample plots, prominent trees near the center of the inventory plots are marked with tags and paint.

4.3.4.4 Precision Requirements

For monitoring of the carbon stocks the targeted precision level is 10% of the mean at a 95% confidence level. This is reached by stratification of the Project Area and measuring a reasonable amount of sample plots. Where this precision level is not reached, the associated uncertainty is expressed based on the tool VT0003 for uncertainty assessment that is part of the methodology VM0005.

4.3.4.5 Calculation of Carbon Stock held in Trees

Following VM0005, the project is applying the BEF method (as described in section 5.2.2 of the methodology) to estimate the carbon stock changes in above-ground tree biomass. This method includes the following steps:

Step1: The diameter at breast height (DBH) is measured for trees with $DBH \geq 5$ cm in permanent sample plots.

Step 2: The volume of the trees is calculated based on volume equations. All species that occur in INFAPRO are divided in 15 species groups and for each species group is a specific equation for the calculation of height and volume. Height is calculated based on the measured DBH whereas volume is calculated based on measured DBH and calculated height. The Table 10 below provides the equations for all the species groups. The equations are locally developed by Forestal International Ltd. for dipterocarp forest in Sabah (Forestal International Limited, 1973, in: Pinard, 1995). They are based on destructive sampling of trees in the Ulu Segama Forest Reserve, which comprises the INFAPRO Project Area. As the equations are both local and specific to species group, they provide the most suitable method to calculate tree volumes and consequently tree carbon stocks. These equations are not suitable for small trees (DBH category of 5 to 10 centimeters) and therefore a specific equation (locally developed within the same Forest Reserve) by Pinard (1995) is applied:

$$LOGe \text{ (dry weight in kg)} = 0.539 \times DBH - 1.25$$

Table 10 - Height and volume equations for species groups

Species group	Height equation	Volume equation
1	$H = 5.506 + 0.4119 \times D - 0.00162 \times D^2$	$V = 0.038 + 0.0053 \times (D^2 \times H) / 100$

2	$H = 2.614 + 0.5529 \times D - 0.00302 \times D^2$	$V = 0.1532 + 0.005 \times (D^2 \times H) / 100$
3	$H = -0.3622 + 0.6403 \times D - 0.00337 \times D^2$	$V = -0.0362 + 0.005 \times (D^2 \times H) / 100 + 0.00000005 \times ((D^2 \times H) / 100)^2$
4	$H = -0.3152 + 0.7511 \times D - 0.00429 \times D^2$	$V = -0.0364 + 0.005 \times (D^2 \times H) / 100$
5	$H = 2.517 + 0.5997 \times D - 0.00322 \times D^2$	$V = 0.164 + 0.0041 \times (D^2 \times H) / 100 + 0.00000041 \times ((D^2 \times H) / 100)^2$
6	$H = 5.0849 + 0.33498 \times D - 0.00102 \times D^2$	$V = 0.1363 + 0.0046 \times (D^2 \times H) / 100 + 0.00000007 \times ((D^2 \times H) / 100)^2$
7	$H = 3.999 + 0.425 \times D - 0.00195 \times D^2$	$V = 0.1292 + 0.0047 \times (D^2 \times H) / 100 + 0.00000015 \times ((D^2 \times H) / 100)^2$
8	$H = 2.528 + 0.3635 \times D - 0.0019 \times D^2$	$V = 0.0582 + 0.0048 \times (D^2 \times H) / 100$
9	$H = 2.297 + 0.3304 \times D - 0.00144 \times D^2$	$V = -0.0145 + 0.0056 \times (D^2 \times H) / 100$
10	$H = 3.981 + 0.2848 \times D - 0.00119 \times D^2$	$V = 0.0322 + 0.0054 \times (D^2 \times H) / 100$
11	$H = 2.056 + 0.4659 \times D - 0.00221 \times D^2$	$V = -0.0195 + 0.0047 \times (D^2 \times H) / 100$
12	$H = 11.46 + 0.263 \times D - 0.00114 \times D^2$	$V = -0.1918 + 0.0058 \times (D^2 \times H) / 100$
13	$H = 3.497 + 0.238 \times D - 0.00152 \times D^2$	$V = 0.0547 + 0.0053 \times (D^2 \times H) / 100$
14	$H = -3.189 + 0.7358 \times D - 0.00472 \times D^2$	$V = 0.02997 + 0.0039 \times (D^2 \times H) / 100 + 0.00000018 \times ((D^2 \times H) / 100)^2$
15	$H = 3.329 + 0.2638 \times D - 0.00136 \times D^2$	$V = -0.0021 + 0.0051 \times (D^2 \times H) / 100$

Step 3: Selection of the Biomass Expansion Factor (BEF). The BEF is selected from Brown for good tropical hill forest in Malaysia (Pinard, 1995). The study site of Pinard represents the same forest type as INAPRO and is within 5 kilometers from INFAPRO. The value of the BEF is 1.895.

Step 4: The stem volumes of trees are converted into carbon stocks of above-ground tree biomass via the basic wood density, the BEF and the carbon fraction. A carbon fraction (CF_j) of 0.47 is selected (i.e. the IPCC default value). The wood densities are species specific and selected from the following sources: Burgess (1966), Tree Flora of Sabah & Sarawak (Soepadmo, 1996), unpublished research by Yap, PROSEA (Plant Resources of South-East Asia), Forester's Manual of Dipterocarps (Symington, 1943, revised in 2004).

Step 5: The carbon in all trees per species and in all species is summed up to provide one single value per sample plot of the above-ground tree carbon stock.

Step 6: The mean carbon stock in above-ground tree biomass per stratum is calculated. For this step the total area for all sample plots per stratum is required ($A_{sp,i}$) – this parameter is one of the variables to be monitored.

The quantification of carbon stocks in below-ground tree biomass ($\Delta C_{BGB,i,t}$) is based on the $\Delta C_{AGB,i,t}$ multiplied with the root-shoot ratio R_j . The root-shoot ratio R_j selected is 0.212, derived from 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories - Table 4.4

4.3.4.6 Monitoring equipment and technology

Field-Map technology (www.field-mapping.com) was used for data collection and mapping in this monitoring campaign. Field-Map (© IFER-Monitoring and Mapping Solutions, Inc.) is an advanced computer aided field data collection technology based on modern electronic devices and user-friendly software. The complete Field-map solution includes specific features and utilities that are specifically important for the demanding field conditions of tropical regions. They include efficient field navigation, support for concentric sample plot circles, continuous georeferencing, remote diameter measurement allowing measuring trees with buttresses, several height measurement modes etc.

The equipment used for monitoring consists of the following items:

1. A field computer for entering the monitoring data at plot location.
2. A GPS device for navigating to plot centers and to store geographic coordinates of sample plots.
3. A caliper or measurement tape to measure the diameter at breast height (DBH – at 1.3 meter).
4. A laser rangefinder combined with a compass and inclinometer for navigating, height measurements and determining the tree positions.
5. Accessories such as batteries, (telescopic) poles, number cards, ribbons, aluminum tags and rain covers.



Figure 10 - Field-Map set

Equipment is calibrated according to the requirements that are provided by the suppliers of the equipment.

4.3.4.7 Roles and responsibilities for monitoring activities

Monitoring of carbon stocks is done in teams equipped with monitoring tools. The chart in Figure 11 below gives an overview of all the roles in the monitoring campaign.

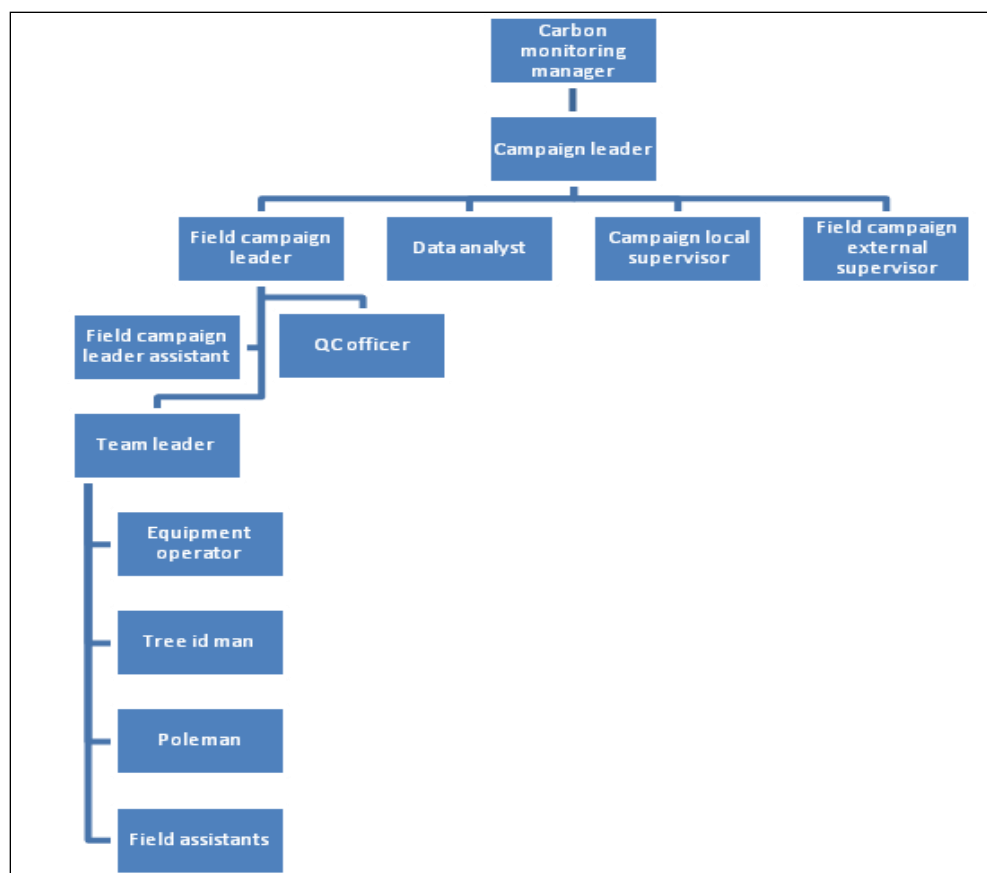


Figure 11 - Organizational chart for monitoring campaigns

A description of the responsibilities for each of the positions in the organizational chart is provided in the Table 11 below.

Table 11 – Description of responsibilities of staff involved in monitoring

Position	Responsibility
Carbon monitoring manager	The carbon monitoring manager is responsible for planning the monitoring campaign and contracting staff for implementing the campaign. The manager is also responsible for writing the Monitoring Report.
Campaign leader	The leader of the campaign is responsible for the methodology of the campaign. He designs the project structure and supervises the data evaluation.
Field campaign leader	Leader is responsible for the operations on the ground. The main tasks of the leader are to select and hire local staff capable of works related to computer aided field data collection, manage

	monitoring teams in the training phase and also later in the field, organize repairs of broken equipment and assigned other responsibilities to team leaders.
Field campaign external supervisor	External supervisor is responsible for teaching the correct methodological approach to the local workers. He is present in the beginning of the campaign to ensure that all problems related to equipment and project database structure are solved and all questions regarding the methodology of data collection are answered. He leads the training of local staff. He is also present at the end of the campaign to check data quality and to check the quality of field work by revisiting random selection of inventory plots and re-measuring them.
Data analyst	Data analyst is responsible for data check and data evaluation. He carries out the statistical computations and produces the final results.
Campaign local supervisor	Local supervisor is responsible for transportation in the field, supply of local workers and for other administrative tasks and logistics.
QC officer	QC officer is responsible for remeasurement of monitoring plots for Quality Control.
Field campaign leader assistant	Assistant takes over responsibilities of field campaign leader when necessary. E.g. when the campaign leader is not available.
Equipment operator	Equipment operator is responsible for the data collection. He is operating the technology in the field and therefore must be familiar with it.
Team leader	Team leader is responsible for managing local workers in the field, on the inventory plots. He is also responsible for daily backup of collected data.
Tree id man	With so many species present in Sabah, tree identification man is crucial for the monitoring team. He is skilled in tree identification and is responsible for correct species data.
Poleman	Poleman is operating measuring pole and measuring DBH. He is familiar with the correct procedures for measuring DBH, positions of the trees and also procedure for navigation to the plot.
Field assistant	A field assistant provides support to the team by carrying monitoring equipment and numbering trees in the plot, amongst others.

The inventory team members are trained on using the monitoring equipment and on the procedures for monitoring. In the selection procedure of the inventory staff the experience with monitoring is a very important criterion. At least half of the supervisory staff (i.e. the managers, leaders and supervisors) is educated in forest monitoring and research and has multiple years of experience in forest inventories.

The position of a field campaign leader assistant is optional. The positions of the carbon monitoring manager, the campaign leader, the data analyst, the field campaign external supervisor and the QC officer can be combined.

4.3.4.8 Quality assurance and quality control procedures

Standard Operation Procedures (SOP) are prepared for the inventory teams. The SOP include procedures for all monitoring steps. Specific procedures are provided for plots that are measured for the first time and for plots that are re-measured. The main items in the SOP are:

- Navigating to the plot center
- Fixing (first measurement) or finding (re-measurement) the plot center
- Measuring and describing trees
- Describing other parameters of the plot
- Checking the database
- Creating data backup

The SOP contains rules for how DBH measurements are taken in specific circumstances, e.g. on steep slopes, for slanted trees and for trees with buttresses. The SOP is written in English and in Bahasa Malaysia to make sure that the inventory team members have a good understanding of the procedures. The procedures are described following a step-wise approach, where steps are accompanied with specific pictures or screenshots. The content of the SOP is in line with the content of the monitoring training sessions.

Other quality assurance measures are:

1. Training of inventory team members. Training is given on-site by an experienced monitoring professional (the field campaign external supervisor). At each new monitoring campaign (taking place at a 3 year interval) the staff is retrained in order to refresh their knowledge and skills.
2. The field campaign external supervisor is present for advice during the first week after the training.
3. The database structure on the field computer is designed to minimize input errors:
 - a. Predefined lookup lists are provided (e.g. for species names).
 - b. Dependency checks are included: conditional lookup lists shorten the choice for subordinate variables.
 - c. The species lookup list only contains species that occur in the Project Area.

- d. A warning is given by the software if a value is out of reasonable bounds. The inventory team member is given the opportunity to check the value and correct it if applicable.
- e. The software gives a warning if a tree is located outside of the plot boundary.
- f. After completion of each plot, an automatic software check is run to see whether any input variables are missing (e.g. DBH or species name).
- g. There is an option to switch on a measurement wizard that guides the operator of the field computer through the measurement steps.

Quality control includes the checking of the database with measurement data. SQL queries are performed for a final check of the database. Quality control also includes the re-measurement of a selection of inventory plots. The leader of the quality control measurements is not involved in the original measurement of the plot. A minimum of 5% and a maximum of 10% of the inventory plots are re-measured. The mean difference in measured carbon stock of a plot between the original measurement and the re-measurement across all plots shall be 5% at maximum. If the difference is larger than 5%, the cause(s) of the difference will be identified and addressed.

4.3.4.9 Data archiving procedures

The database with the monitoring data is stored at several locations:

1. There is a daily backup of the data on the field computer itself and on a computer in the office at the INFAPRO site. The data are transferred via a flash drive and after the transfer the data will also be kept on the flash drive.
2. At least once in two weeks the data are sent to a Google Drive and shared with Face the Future.
3. The processed data are stored on the computer of the data analyst and on the computer of the carbon monitoring manager.
4. The final database is saved on the network server of Face the Future and a copy is saved at the CEMD office in Kota Kinabalu with the field campaign leader.

All data collected are kept at least for two years after the end of the last crediting period.

The spreadsheets used for calculating the net carbon stock changes and GHG emissions and the Monitoring Plans are saved in electronic and paper form at the office of Face the Future in the Netherlands, at the CEMD office in Kota Kinabalu and at the INFAPRO office.

4.3.5 Monitoring of project GHG emissions

The approach to quantify project GHG emissions ($GHG_{WPS-E,t}$) is provided in section 4.3.2 of the VCS Project Document. In order to quantify the project GHG emissions in each Monitoring Report, the following records are kept by the project:

1. The generation of electricity in kWh by the genset at the INFAPRO site. The annual electricity production is provided in the INFAPRO Annual Reports, which are available at

the CEMD office in Kota Kinabalu and at the office of Face the Future in the Netherlands. The Annual Reports are shared with the Steering Committee members.

2. The amount of fuel consumed by project vehicles. The record is available at the INFAPRO site.
3. A record of all flights to INFAPRO by project staff, consultants and auditors. The record is available at the INFAPRO site.
4. A record of areas that have been cleared of forest for the purpose of establishing infrastructure. The record is available at the INFAPRO site.
5. A record of newly established roads or roads that are maintained each year. The record is available at the INFAPRO site.

4.3.6 Monitoring of leakage carbon stock changes and GHG emissions

Leakage carbon stocks changes and related GHG emissions are not monitored. Leakage due to the market effect of avoided harvesting in the Project Area is quantified at validation of the project activity and is not subject to changes in carbon stocks in the baseline scenario that take place after the logging event. Leakage is in the VCS Project Document calculated as the leakage factor (LF_{ME}) times the emissions from relogging ($\Delta C_{REL,i,t}$), see equation (44) in the methodology. The parameter $\Delta C_{REL,i,t}$ is calculated once and is not monitored. In contrast, the parameter C_{BSL} is subject to monitoring because it changes if regrowth in the baseline scenario takes place, expressed by the parameter $\Delta C_{tree-exist,i,t}$. However, this parameter $\Delta C_{tree-exist,i,t}$ does not have an effect on the leakage parameter ΔC_{LK} .

Therefore, leakage is not be monitored.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

The VCS IFM methodology VM0005 version 1.2 for the Conversion of Low Productive to High Productive Forest is applied to the project. This methodology applies to projects that achieve emission reductions and removals through forest rehabilitation and avoidance of relogging. It has been developed for this project activity. The project fulfils all the criteria listed in the methodology (see section 2.2 of the VCS PD).

Relogging in the baseline scenario only occurred once in the Crediting Period, in year 2007. So during the current Monitoring Period no avoidance of relogging have been quantified and reported.

5.1 Baseline Emissions

5.1.1 Net CO₂ equivalent emissions in the baseline scenario (ΔC_{BSL})

The net emissions in the baseline scenario is calculated with equation (2) from the methodology VM0005:

$$\Delta C_{BSL} = \sum_{t=1}^{t^*} \sum_{i=1}^{M_{BSL}} (\Delta C_{REL,i,t} + \Delta C_{tree-exist,i,t}) + GHG_{BSL-E,t}$$

The parameter $\Delta C_{REL,i,t}$ is quantified in the VCS PD section 4.2 as follows: Relogging in the baseline scenario only occurred once in the Crediting Period, in year 2007. So during the current Monitoring Period no relogging in the baseline would have occurred and is therefore not quantified. Therefore $\Delta C_{REL,i,t} = 0$ tCO₂e/yr for the Monitoring Period 2011-2024.

The parameter $GHG_{BSL-E,t}$ is quantified in the VCS PD section 4.2 and is only determined once in 2007, as it represents the emissions from relogging. So during the current Monitoring Period no relogging in the baseline would have occurred and is therefore not quantified. Therefore $GHG_{BSL-E,t} = 0$ tCO₂e/yr for the Monitoring Period 2011-2024.

The parameters $\Delta C_{tree-exist,i,t}$ is monitored, see section 5.1.2.

The table below presents the outcome of equation (2) for the Monitoring Period 2011 – 2014.

Table 12 - Carbon stock changes and GHG emissions in the baseline scenario in 2011-2024

Project year t	$\Delta C_{REL,i,t}$ tCO ₂ -e	$\Delta C_{tree-exist,i,t}$ tCO ₂ -e	$GHG_{BSL-E,t}$ tCO ₂ -e	ΔC_{BSL} tCO ₂ -e
2011	-	12,463	-	12,463
2012	-	12,463	-	12,463
2013	-	12,463	-	12,463
2014	-	12,463	-	12,463
2015	-	12,463	-	12,463
2016	-	12,463	-	12,463
2017	-	12,463	-	12,463
2018	-	12,463	-	12,463
2019	-	12,463	-	12,463
2020	-	12,463	-	12,463
2021	-	12,463	-	12,463
2022	-	12,463	-	12,463
2023	-	12,463	-	12,463
2024	-	6,231	-	6,231

Total 2011-2024	-	168,250	-	168,250
-----------------	---	---------	---	---------

5.1.2 Carbon stock changes in existing vegetation in the baseline ($\Delta C_{tree-exist,i,t}$)

Regrowth of existing tree vegetation in the baseline ($\Delta C_{tree-exist,i,t}$) is conservatively estimated as the regrowth of the pre-relogged residual forest applied to the entire area of the stratum, despite any relogging in the stratum.

As described in the Monitoring Plan in section 4.3 of this Monitoring Report, the quantification of the net carbon stock changes in existing tree vegetation in the baseline scenario is based on sample plots measured in the strata of the untreated Project Area. Following the steps described in section 4.3.4.5 of this Monitoring Report, the carbon stock in tree biomass of the measured trees are being calculated for both the 2010 and 2024 forest inventory campaigns.

Equation (19) of the methodology VM0005 is applied to quantify the carbon stock changes due to regrowth in the baseline:

$$\Delta C_{tree-exist,i,t} = A_{i,t} \times \sum_{j=1}^S \Delta C_{tree-exist,j,i,t}$$

Where:

$\Delta C_{tree-exist,i,t}$	Change in carbon stock in existing tree vegetation in the baseline in stratum i at year t; t CO2-e yr-1
$A_{i,t}$	Area of baseline stratum i at year t; ha
$\Delta C_{tree-exist,j,i,t}$	Change in carbon stock in existing tree vegetation in the baseline in species j in stratum i at year t; t CO2-e ha-1 yr-1
j	1, 2, 3 ... S tree species
i	1, 2, 3 ... MBSL strata in the baseline scenario
t	1, 2, 3, ... t* years elapsed since the project start

Both above-ground and below-ground carbon stocks are included in the calculation of $\Delta C_{tree-exist,i,t}$, as in equation (20) from the VM0005 methodology:

$$\Delta C_{tree-exist,j,i,t} = \Delta C_{tree-exist-AB,j,i,t} + \Delta C_{tree-exist-BB,j,i,t}$$

The parameter $\Delta C_{tree-exist-AB,j,i,t}$, representing the net carbon stock changes in above-ground tree biomass, is quantified in section 5.1.2.2 below.

The parameter $A_{i,t}$, representing the area of Baseline stratum, is quantified in section 5.1.2.1 below.

The parameter $\Delta C_{tree-exist-BB,j,i,t}$, represents the net carbon stock changes in below-ground tree biomass. The net carbon stock change in below-ground tree biomass is based on the above-ground tree biomass multiplied with the root-shoot ratio, as in equation (40) of the methodology:

$$\Delta C_{tree-exist-BB,i,t} = \Delta C_{tree-exist-AB,i,t} \times R_j$$

The root-shoot ratio R_j selected for the INAPRO project is 0.212. See section 4.3.4.5.

Therefore, the results of the carbon stock changes in existing tree vegetation in the baseline, as presented in Table 13, represent the values of parameter $\Delta C_{tree-exist,i,t}$. These results are corrected for uncertainty following the uncertainty calculations presented in section 5.4.2.

Table 13 - Net carbon stock changes in the baseline scenario in 2011-2024, summarized over all forest types of rehabilitation stratum 1993 – 2000 and rehabilitation stratum 2007 – 2013

Project year t	$\Delta C_{tree-exist-AB,i,t}$ tCO2-e	$\Delta C_{tree-exist-BB,i,t}$ tCO2-e	$\Delta C_{tree-exist,i,t}$ tCO2-e
2011	10,283	2,180	12,463
2012	10,283	2,180	12,463
2013	10,283	2,180	12,463
2014	10,283	2,180	12,463
2015	10,283	2,180	12,463
2016	10,283	2,180	12,463
2017	10,283	2,180	12,463
2018	10,283	2,180	12,463
2019	10,283	2,180	12,463
2020	10,283	2,180	12,463
2021	10,283	2,180	12,463
2022	10,283	2,180	12,463
2023	10,283	2,180	12,463
2024	5,141	1,090	6,231
Total 2011-2024	138,820	29,430	168,250

5.1.2.1 Area of baseline strata ($A_{i,t}$)

The area ($A_{i,t}$) in which baseline regrowth takes place, is equal to the cumulative area that has been treated up to that year. This Monitoring Report only includes the stratum rehabilitation period 1993-2000 and rehabilitation period 2007-2013. As indicated in section 4.3.1, a part of the rehabilitated area is not included for this carbon monitoring campaign since the

rehabilitation activities in these areas were done through 3rd party investments with no intention to receive issuance of VCU's.

The area per stratum is shown in Table 14 below. The $A_{i,t}$ is based on the compartments surveyed in the field, which represents the total area across all strata in rehabilitation period 1993 – 2013 for the selected compartments. The strata of the forest types within this area are determined based on classification of an aerial photo from the year 2002. A description of the applied stratification of the baseline scenario is given in section 4.3.2.1 of this Monitoring Report.

Table 14 – Area of Baseline Strata in hectares

Strata <i>i</i>	1993-2000 Rehabilitation Compartments (ha)	2007-2013 Rehabilitation Compartments (ha)	Total Rehabilitation Compartments (ha)
Open Canopy Forest	597	128	724
Pioneer Dominated Forest	5,442	442	5,884
Remnant or Pioneer Forest	3,748	247	3,995
Total	9,786	817	10.604

5.1.2.2 Net carbon stock changes in above-ground tree biomass in existing tree vegetation in the baseline ($\Delta C_{tree-exist-AB,i,t}$)

The parameter $\Delta C_{tree-exist-AB,i,t}$ is determined following the method as for for $\Delta C_{AGB,i,t}$ in section 5.2.2.1 in this Monitoring Report, as follows.

As described in the Monitoring Plan in section 4.3 of this Monitoring Report, the quantification of the net carbon stock changes in above-ground tree biomass in existing tree vegetation in the baseline scenario is based on sample plots measured in the strata of the untreated Project Area.

Following the steps described in section 4.3.4.5 of this Monitoring Report, the carbon stock in tree biomass of the measured trees are being calculated for both the 2010 and 2024 forest inventory campaigns.

The outcome of the measured carbon stock in above ground biomass in the sample plots in the untreated area ($\Delta C_{tree-exist-AB,i,t}$) is presented for both years below. All the data from the inventory plots, including all the calculations, are provided in separate spreadsheets in Appendix 1.

Table 15 - Above-ground carbon stock in trees in the untreated areas in stratum *i* at year *t*

Stratum <i>i</i>	Average C-stock AGB 2010 (tC/ha)	Average C-stock AGB 2024 (tC/ha)	Area 2010 (ha)	Area 2024 (ha)
------------------	--	--	----------------------	----------------------

Based on equation (35) from the methodology the net carbon stock change in above-ground tree biomass per stratum in year 2024 is calculated:

Where:

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

Table 16 - Net carbon stock changes in above-ground biomass of existing tree vegetation in the baseline scenario ($\Delta C_{tree-exist-AB,i,t}$) in 2007 – 2010 of the rehabilitation area 1993 – 2000 and the rehabilitation area 2007-2013

	2010 AGB Carbon Stocks			2024 AGB Carbon Stocks			AGB Growth 2010-2024
	Open Canopy	Pioneer trees	Remnant / Pioneer	Open Canopy	Pioneer trees	Remnant / Pioneer	
	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2

Rehabilitation Area 1993-2000 (Untreated)	82,315	1,533,938	1,493,880	101,072	1,669,469	1,465,270	125,678
Rehabilitation Area 2007-2013 (Untreated)	17,595	124,725	98,521	21,604	135,745	96,634	13,143
Total	3,350,974			3,489,794			138,820

5.2 Project Emissions

5.2.1 Net CO2 equivalent emissions in the with-project scenario (ΔC_{WPS})

The net CO2 equivalent emissions in the with-project scenario is expressed in parameter ΔC_{WPS} and is determined following equation (33) from the VM0005 methodology:

$$\Delta C_{WPS} = \sum_{t=1}^{t^*} \sum_{i=1}^{M_{WPS}} \Delta C_{P,i,t} + GHG_{WPS-E,t}$$

The parameter $\Delta C_{P,i,t}$, representing the net carbon stock changes due to forest regrowth and silvicultural interventions, is quantified in section 5.2.2. These results are corrected for uncertainty following the uncertainty calculations presented in section 5.4.2.

The parameter $GHG_{WPS-E,t}$, representing the GHG emissions relating to project implementation, is quantified in section 5.2.3 of this Monitoring Report.

The strata i included in this Monitoring Report are the forest types Open Canopy, Pioneer dominated and Remnant / Pioneer, combined with the rehabilitation period 1993 – 2000 and the rehabilitation period 2007 - 2013. The rehabilitation periods 2003 – 2004 are excluded from the Monitoring Report.

Table 17 - Net CO2 equivalent emissions in the with-project scenario for 2007 – 2010, summarized over all forest types of rehabilitation stratum 1993 – 2000 and rehabilitation stratum 2007 – 2013

Project year t	$\sum \Delta C_{P,i,t}$ tCO2-e	$GHG_{WPS-E,t}$ tCO2-e	ΔC_{WPS} tCO2-e
2011	98,192	282	97,910
2012	98,192	282	97,910
2013	98,192	282	97,910
2014	98,192	286	97,906
2015	98,192	338	97,854
2016	98,192	346	97,846
2017	98,192	325	97,867
2018	98,192	327	97,865

2019	98,192	322	97,870
2020	98,192	317	97,875
2021	98,192	287	97,905
2022	98,192	304	97,888
2023	98,192	306	97,886
2024	49,096	1,607	47,489
Total 2011-2024	1,325,593	5,610	1,319,983

5.2.2 Net carbon stock changes due to forest regrowth and silvicultural interventions ($\Delta C_{P,i,t}$)

The net carbon stock change due to forest regrowth and silvicultural interventions in the with-project scenario is calculated based on equation (34) from the methodology:

$$\Delta C_{P,i,t} = \Delta C_{AGB,i,t} + \Delta C_{BGB,i,t} + \Delta C_{DW,i,t} + \Delta C_{WP,i,t} - E_{biomassloss,i,t}$$

The parameters $\Delta C_{DW,i,t}$, $\Delta C_{WP,i,t}$ and $E_{biomassloss,i,t}$ are not quantified (see PD section 4.3.1).

The parameter $\Delta C_{AGB,i,t}$, representing the net carbon stock changes in above-ground tree biomass, is quantified in section 5.2.2.1 below.

The parameter $\Delta C_{BGB,i,t}$, represents the net carbon stock changes in below-ground tree biomass. The net carbon stock change in below-ground tree biomass is based on the above-ground tree biomass multiplied with the root-shoot ratio, as in equation (40) of the methodology:

$$\Delta C_{BGB,i,t} = \Delta C_{AGB,i,t} \times R_j$$

The root-shoot ratio R_j selected for the INAPRO project is 0.212. See section 4.3.4.5.

Therefore, the results of the carbon stock changes in the with-project scenario, as presented in Table 18, represent the values of parameter $\Delta C_{P,i,t}$. These results are corrected for uncertainty following the uncertainty calculations presented in section 5.4.2.

Table 18 - Net carbon stock changes in the with-project scenario in 2011-2024, summarized over all forest types of rehabilitation stratum 1993 – 2000 and rehabilitation stratum 2007 – 2013

Project year t	$\Delta C_{AGB,i,t}$ tCO ₂ -e	$\Delta C_{BGB,i,t}$ tCO ₂ -e	$\Delta C_{P,i,t}$ tCO ₂ -e
2011	81,017	17,176	98,192
2012	81,017	17,176	98,192
2013	81,017	17,176	98,192
2014	81,017	17,176	98,192

2015	81,017	17,176	98,192
2016	81,017	17,176	98,192
2017	81,017	17,176	98,192
2018	81,017	17,176	98,192
2019	81,017	17,176	98,192
2020	81,017	17,176	98,192
2021	81,017	17,176	98,192
2022	81,017	17,176	98,192
2023	81,017	17,176	98,192
2024	40,508	8,588	49,096
2011-2024	1,093,723	231,869	1,325,593

5.2.2.1 Net carbon stock changes in above-ground tree biomass ($\Delta C_{AGB,i,t}$)

As described in the Monitoring Plan in section 4.3 of this Monitoring Report, the quantification of the net carbon stock changes in above-ground tree biomass in the with-project scenario is based on sample plots measured in the strata of the treated Project Area.

Following the steps described in section 4.3.4.5 of this Monitoring Report, the carbon stock in tree biomass of the measured trees are being calculated for both the 2010 and 2024 forest inventory campaigns.

The outcome of the measured carbon stock in above ground biomass in the sample plots in the treated area ($\Delta C_{AGB,i,t}$) is presented for both years below. All the data from the inventory plots, including all the calculations, are provided in separate spreadsheets in Appendix 1.

Table 19 - Above-ground carbon stock in trees in the treated areas in stratum i at year t

	Stratum i	Average C-stock AGB 2010 (tC/ha)	Average C-stock AGB 2024 (tC/ha)	Area 2010 (ha)	Area 2024 (ha)
Rehabilitation period 1993- 2000	Open Canopy	60.5	122.5	597	43
	Pioneer trees	117.0	139.9	5,442	3,321
	Remnant or pioneer trees	156.8	168.3	3,748	6,422
Rehabilitation period 2007- 2013	Open Canopy	34.5	42.3	128	52
	Pioneer trees	61.8	89.3	442	542
	Remnant or pioneer trees	137.0	101.3	247	223

Based on equation (35) from the methodology the net carbon stock change in above-ground tree biomass per stratum in year 2024 is calculated:

$$\Delta C_{AGB,i,t} = A_{i,t} \times (C_{AGB,i,t} - C_{AGB,i,t-T}) \times 44/12 / T$$

Where:

$\Delta C_{AGB,i,t}$ Net carbon stock change in above-ground tree biomass in stratum i at year t ; tCO₂-e

$A_{i,t}$ Area of stratum i at year t ; ha

$C_{AGB,i,t}$ Carbon stock in above-ground tree biomass in stratum i at year t ; tC/ha

44/12 Ratio of molecular weights of CO₂ and carbon; tCO₂-e/tC

T Number of years between monitoring times t_m and t_{m-1}

i 1, 2, 3 ... MWPS strata in the with-project scenario

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

The parameters $C_{AGB,i,t}$ and $A_{i,t}$ are provided in Table 19 above. The number of years between the monitoring campaigns in 2011 and 2024 is 13 1/2 years.

The area of strata ($A_{i,t}$) presented in Table 19 above is a result from the stratification of the project area as described in sections 4.3.2.1 and 4.3.2.2 of this Monitoring Report. The 2010 area stratification is described in section 4.3.2.1 and the 2024 area stratification is described in section 4.3.2.2.

The results of equation (35) are provided in the table below.

Table 20 - Net carbon stock changes in above-ground tree biomass ($\Delta C_{AGB,i,t}$) in 2011-2024 for rehabilitation period 1993 – 2000 and rehabilitation period 2007 – 2013

	2010 AGB Carbon Stocks			2024 AGB Carbon Stocks			AGB Growth 2010-2024
	Open Canopy	Pioneer trees	Remnant / Pioneer	Open Canopy	Pioneer trees	Remnant / Pioneer	
	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2	tCO2
Rehabilitation Area1993-2000(Treated)	132,391	2,333,855	2,154,838	19,391	1,703,730	3,963,828	1,065,865
Rehabilitation Area2007-2013(Treated)	16,121	100,280	124,159	8,030	177,460	82,929	27,858
Total	4,861,644			5,955,367			1,093,723

5.2.3 Project GHG emissions ($GHG_{WPS-E,t}$)

The emissions related to project implementation ($GHG_{WPS-E,t}$) involve the following sources:

1. Combustion of fuel for transport and electricity generation;
2. International and domestic flights of project staff, advisors and auditors;
3. Clearing of forest for the establishment of project infrastructure;
4. Felling of trees for road maintenance and associated GHG emissions for the use of machinery.

Table 21 - Project GHG emissions ($GHG_{WPS-E,t}$) for 2011-2024.

Project year t	Trans./Electr.	Flights	$E_{clearing,t}$	$E_{clearing-roads,t}$	$GHG_{WPS-E,t}$
	tCO ₂ -e/yr	tCO ₂ /yr	tCO ₂ -e/yr	tCO ₂ -e/yr	tCO ₂ -e/yr
2011	277	5	-	-	282
2012	277	5	-	-	282
2013	277	5	-	-	282
2014	281	5	-	-	286
2015	333	5	-	-	338
2016	343	3	-	-	346
2017	322	3	-	-	325
2018	324	3	-	-	327
2019	319	3	-	-	322
2020	314	3	-	-	317
2021	284	3	-	-	287
2022	301	3	-	-	304
2023	301	6	-	-	306
2024	150	4	-	1,453	1,607
Total	4,102	55	-	1,453	5,610

5.2.3.1 Combustion of fuel for transport and electricity generating

The annual fuel consumption for transport and electricity generation is multiplied by the emission factor for fuel (EF_{fuel}), which is 2.9 tCO₂-e/kL. The table below presents the annual fuel consumption during the Monitoring Period 2011-2024 and the associated GHG emissions. The annual fuel consumption is based on records from the project. No record were available for the years 2011 and 2012, therefore the fuel consumption amount for the year 2013 was also used for the years 2011 and 2012.

Table 22 - Combustion of fuel for transport and electricity generation for 2011-2024

Project year <i>t</i>	Fuel consumption	Fuel GHG emissions
	L/yr	tCO ₂ /yr
2011	95,421	277
2012	95,421	277
2013	95,421	277
2014	96,837	281
2015	114,844	333
2016	118,334	343
2017	111,085	322
2018	111,634	324
2019	109,853	319
2020	108,377	314
2021	97,939	284
2022	103,923	301
2023	103,644	301
2024	51,712	150
Total	1,414,445	4,102

5.2.3.2 Flights

The emissions from flights related to project implementation are calculated with the help of the online International Civil Aviation Organization (ICAO) Carbon Emissions Calculator. As no records have been maintained for the number of flights for the Monitoring Period 2011-2024, a conservative estimation is made in table below.

Table 23 – Flight emissions for 2011-2024

Project year <i>t</i>	Domestic Flights		International Flights	
	Number (N)	Emissions (tCO ₂ -e/yr)	Number (N)	Emissions (tCO ₂ -e/yr)
2011	24	3.0	4	1.9
2012	24	3.0	4	1.9
2013	24	3.0	4	1.9
2014	24	3.0	4	1.9
2015	24	3.0	4	1.9
2016	24	3.0	-	-
2017	24	3.0	-	-
2018	24	3.0	-	-
2019	24	3.0	-	-
2020	24	3.0	-	-

2021	24	3.0	-	-
2022	24	3.0	-	-
2023	24	3.0	6	2.8
2024	24	3.0	2	0.9
Total	336	42.0	28	13.0

5.2.3.3 Clearing of forest for the establishment of project infrastructure

No forest has been cleared in the Monitoring Period 2011-2024 for the establishment of infrastructure.

5.2.3.4 Road maintenance

During the Monitoring Period 2011-2024 the only road maintenance was done for the measuring of the forest inventory plots in 2024. The total length of roads being opened and maintained are estimated at 60km.

GHG emissions associated with road maintenance are from grading and the occasional felling of trees. Tree felling occurs at parts of roads that remain very wet after rains: trees along the road are felled to allow the sun to reach and dry the road surface. The GHG emissions from road maintenance are calculated with equation (22) of the methodology:

$$E_{clearing,t} = E_{biomass,t} + E_{felling,t} + E_{grading,t}$$

The emissions from road maintenance are presented in table below. The individual parameters of equation (22) are quantified below.

Table 24 - GHG emissions from road maintenance for the period 2011-2024

Project year t	Roads maintained	$E_{biomass,t}$	$E_{felling,t}$	$E_{grading,t}$	$E_{clearing,t}$
	km	tCO ₂ /yr	tCO ₂ -e/yr	tCO ₂ -e/yr	tCO ₂ -e/yr
2011	-	-	-	-	-
2012	-	-	-	-	-
2013	-	-	-	-	-
2014	-	-	-	-	-
2015	-	-	-	-	-
2016	-	-	-	-	-
2017	-	-	-	-	-
2018	-	-	-	-	-
2019	-	-	-	-	-
2020	-	-	-	-	-
2021	-	-	-	-	-
2022	-	-	-	-	-
2023	-	-	-	-	-
2024	75	1,121.9	2.8	328.4	1,453

Total	75	1,121.9	2.8	328.4	1,453
-------	----	---------	-----	-------	-------

$E_{grading,t}$

The parameter $E_{grading,t}$ applies to road maintenance only – not taking into account tree felling. The GHG emissions from road maintenance are based on equation (25) of the methodology:

$$E_{grading,t} = FC_{grader} \times EF_{fuel} \times A_{infrastructure,t}$$

The fuel consumption for grading (FC_{grader}) is 2.52 kL/ha. The fuel emission factor (EF_{fuel}) is 2.9 tCO₂-e/kL. The total length of roads to be maintained is conservatively estimated (i.e. overestimated) at 60,000 meter in 2024, with a width of 6 meter. The $A_{infrastructure,t}$ is then 63 ha. $E_{grading,t}$ is then calculated as 328.4 tCO₂-e for the period 2011–2024.

$E_{biomass,t}$

The parameter $E_{biomass,t}$ applies only to the felling of trees and is calculated based on equation (23) from the methodology:

$$E_{biomass,t} = C_{biomass} \times A_{infrastructure,t} \times (44/12)$$

$C_{biomass}$ is equal to the area weighted $C_{BSL,pre}$, which is 81.7 tC/ha (see section 4.2.3 of the PD). $A_{infrastructure,t}$ is determined based on the following conservative assumptions. Less than 5% of the roads require roadside felling up to 5 meter at each side of the road. As the total length of maintained roads is 74,900 meter in 2024, the $A_{infrastructure,t}$ is equal to 3.0 ha. Therefore, $E_{biomass,t}$ is equal to 1,121.9 tCO₂-e.

$E_{felling,t}$

The parameter $E_{felling,t}$ applies only to the felling of trees and is calculated based on equation (24) from the methodology:

$$E_{felling,t} = FC_{equip} \times EF_{fuel} \times V_{infrastructure,t}$$

EF_{fuel} is 2.9 tCO₂-e/kL and FC_{equip} is 0.00128 kL/m³. The $V_{infrastructure,t}$ is calculated as the average commercial wood volume per hectare of the cleared forest stands, multiplied with the $A_{infrastructure,t}$ of 3.0 ha in 2024. The average commercial wood volume per hectare is 201.5 m³/ha, which is based on the inventory data used for the calculation of $C_{BSL,pre}$. Therefore, $V_{infrastructure,t}$ is 604.5 m³/yr. Then $E_{felling,t}$ is 2.8 tCO₂-e.

5.3 Leakage Emissions

As described in the PD (section 4.3.3), only market leakage associated with the avoided re-logging in the baseline is applicable to the project.

However since no re-logging was expected in the without project scenario in the during the monitoring period 2011-2024, the market leakage is set to zero.

Apart from market leakage, the Project Activity does not result in activity shifting within the project proponent's operations. Therefore this is not monitored and also set to zero.

5.4 GHG Emission Reductions and Carbon Dioxide Removals

5.4.1 Total net GHG emission removals

The total net benefits that result from the project activity is calculated with equation (46) from the methodology:

$$\Delta C_{IFM} = \Delta C_{BSL} - \Delta C_{WPS} - \Delta C_{LK}$$

ΔC_{BSL} and ΔC_{WPS} are quantified in sections 5.1 and 5.2 of this Monitoring Report. ΔC_{LK} is quantified in the PD and presented in section 5.3 of the Monitoring Report.

Table 4.1.1 presents a summary of ΔC_{IFM} for the period 2011 – 2024.

Table 25 – Total net GHG emission removals

Vintage period	ΔC_{BSL} (tCO ₂ e)	ΔC_{WPS} (tCO ₂ e)	ΔC_{LK} (tCO ₂ e)	ΔC_{IFM} (tCO ₂ e)
01-Jan-2011 to 31-Dec-2011	12,463	97,910	-	85,448
01-Jan-2012 to 31-Dec-2012	12,463	97,910	-	85,448
01-Jan-2013 to 31-Dec-2013	12,463	97,910	-	85,448
01-Jan-2014 to 31-Dec-2014	12,463	97,906	-	85,443
01-Jan-2015 to 31-Dec-2015	12,463	97,854	-	85,391
01-Jan-2016 to 31-Dec-2016	12,463	97,846	-	85,383
01-Jan-2017 to 31-Dec-2017	12,463	97,867	-	85,404
01-Jan-2018 to 31-Dec-2018	12,463	97,865	-	85,402
01-Jan-2019 to 31-Dec-2019	12,463	97,870	-	85,408
01-Jan-2020 to 31-Dec-2020	12,463	97,875	-	85,412
01-Jan-2021 to 31-Dec-2021	12,463	97,905	-	85,442
01-Jan-2022 to 31-Dec-2022	12,463	97,888	-	85,425
01-Jan-2023 to 31-Dec-2023	12,463	97,886	-	85,423
01-Jan-2024 to 31-Jun-2024	6,231	47,489	-	41,258
Total	168,250	1,319,983	-	1,151,733

5.4.2 Uncertainty Assessment

The net GHG emissions reductions (DC_{IFM}) are corrected for uncertainty based on equation (47) of the methodology:

$$C_{IFMerror} = \sqrt{Uncertainty_{BSL}^2 + Uncertainty_{WPS}^2}$$

Where $Uncertainty_{BSL}$ represents the total uncertainty in the baseline scenario and $Uncertainty_{WPS}$ represents the total uncertainty in the with-project scenario, which are quantified in the sections below. The result of the uncertainty calculation is as follows, $Uncertainty_{BSL}$ is 12.2% and $Uncertainty_{WPS}$ is 5.1%. Therefore total $C_{IFMerror}$ is **13.2%**.

5.4.2.1 Total uncertainty in the baseline scenario

The uncertainty in the baseline scenario is expressed for parameter $C_{tree-exist,i,t}$. The uncertainty across combined strata for $C_{tree-exist,i,t}$ is calculated with the revised equation (1) from the tool VT0003:

$$Uncertainty_{BSL} = \frac{\sqrt{(U_{BSL,1} \times E_{BSL,1})^2 + (U_{BSL,2} \times E_{BSL,2})^2 + \dots + (U_{BSL,M_{BSL}} \times E_{BSL,M_{BSL}})^2}}{E_{BSL,1} + E_{BSL,2} + \dots + E_{M_{BSL}}}$$

Where:

$Uncertainty_{BSL}$	Total uncertainty in baseline scenario; %
$U_{BSL,i}$	Uncertainty in baseline scenario in stratum i ; %
$E_{BSL,i}$	Sum of combined carbon stocks and GHG sources (e.g. trees, down dead wood, etc.) in stratum i (1,2...n represent different carbon pools and/or GHG sources) multiplied by the area of stratum i (A_i) in the baseline case; t CO ₂ -e
i	1, 2, 3 ... M_{WPS} strata in the baseline scenario

The parameter $E_{BSL,i}$ is calculated as the mean value of $C_{tree-exist,i,t}$ (in tC/plot) multiplied with a factor 5 to convert to a per hectare value, and then multiplied with the area per stratum (A_i). The A_i follows from section 4.3.2. The parameter $U_{BSL,i}$ is calculated per stratum by dividing the 90% confidence interval by the mean value of $C_{tree-exist,i,t}$ (in tC/plot). The corresponding standard deviation is calculated over the measured plot values of $C_{tree-exist,i,t}$. The 90% confidence interval is calculated based on the standard deviation and the t-value for n-1 plots per stratum.

Following this calculation, the total uncertainty in the Baseline Scenario ($Uncertainty_{BSL}$) is calculated at 12.2% based on the inventory data 2024. See Table 26 below and Appendix 1 for the results and calculations.

Table 26 – Uncertainty in the Baseline Scenario for the 2024 Inventory Results

	Stratum <i>i</i>	Average C-stock AGB 2024 (tC/ha)	Number of plots (N)	Standard Error of the Mean (SEM)	Uncertainty (%)
Untreated Area	Open Canopy	46.2	19	6.38	24.0%
	Pioneer trees	83.7	26	9.9	20.3%
	Remnant or pioneer trees	106.6	44	8.8	13.8%
Uncertainty_{BSL}					12.2%

5.4.2.2 Total uncertainty in the with-project scenario

The uncertainty in the with-project scenario is expressed for parameter $C_{AGB,i,t}$ and $C_{BGB,i,t}$. No uncertainty is quantified for $E_{biomassloss,t}$, because the value of this parameter is zero within the Monitoring Period 2011-2024. $C_{BGB,i,t}$ is calculated as $C_{AGB,i,t}$ multiplied with the root:shoot ratio of 0.212, and is a function of $C_{AGB,i,t}$. The uncertainty for $C_{BGB,i,t}$ is therefore equal to the uncertainty for $C_{AGB,i,t}$, and can be omitted from the calculation of the total uncertainty in the with-project scenario ($Uncertainty_{WPS}$). $Uncertainty_{WPS}$ is calculated for $C_{AGB,i,t}$ based on the revised equation (4) from the tool VT0003:

$$Uncertainty_{WPD} = \frac{\sqrt{(U_{WPS,1} \times E_{WPS,1})^2 + (U_{WPS,2} \times E_{WPS,2})^2 + \dots + (U_{WPS,M_{WPS}} \times E_{WPS,M_{WPS}})^2}}{E_{WPS,1} + E_{WPS,2} + \dots + E_{M_{WPS}}}$$

Where:

$Uncertainty_{WPS}$ Total uncertainty in wit-project scenario; %

$U_{WPS,i}$ Uncertainty in with-project scenario in stratum *i*; %

$E_{WPS,i}$ Sum of combined carbon stocks and GHG sources (e.g. trees, down dead wood, etc.) in stratum *i* (1,2...n represent different carbon pools and/or GHG sources) multiplied by the area of stratum *i* (A_i) in the with-project case; t CO₂-e

i 1, 2, 3 ... M_{WPS} strata in the with-project scenario

The parameter $E_{WPS,i}$ is calculated as the mean value of $C_{AGB,i,t}$ (in tC/plot) multiplied with a factor 5 to convert to a per hectare value, and then multiplied with the area per stratum (A_i). The A_i follows from section 4.3.2. The parameter $U_{WPS,i}$ is calculated per stratum by dividing the

90% confidence interval by the mean value of $C_{AGB,i,t}$ (in tC/plot). The corresponding standard deviation is calculated over the measured plot values of $C_{AGB,i,t}$. The 90% confidence interval is calculated based on the standard deviation and the t-value for n-1 plots per stratum.

Following this calculation, the total uncertainty in the with-project Scenario ($Uncertainty_{WPS}$) is calculated at 5.1% based on the inventory data 2024. See Table 26 below and Appendix 1 for the results and calculations.

Table 27 – Uncertainty in the With-Project Scenario for the 2024 Inventory Results

	Stratum <i>i</i>	Average C-stock AGB 2024 (tC/ha)	Number of plots (N)	Standard Error of the Mean (SEM)	Uncertainty (%)
Rehabilitation period 1993-2000	Open Canopy	122.5	4	35.0	67.2%
	Pioneer trees	139.9	110	7.4	8.8%
	Remnant or pioneer trees	168.3	160	6.6	6.5%
Rehabilitation period 2007-2013	Open Canopy	42.3	3	12.3	85.3%
	Pioneer trees	89.3	11	14.0	28.5%
	Remnant or pioneer trees	101.3	5	23.2	48.9%
$Uncertainty_{WPS}$					5.1%

5.4.2.3 Quality Control through plot remeasurement

Quality Control (QC) was done in 2025 through a remeasurement of 24 plots on random appointed locations in the project area. 18 project plots and 6 baseline plots. The results of this QC is presented in Table 28 below.

The difference between data collected by field teams and checking teams expressed in tons of carbon per hectare ranges from -4.3% up to +25.9%, where the initial measurements are considered to be at 100%. The mean absolute difference is 9.0 tC/ha and mean relative difference is 5.7%. The total QC results are presented in the Excel file attached to this report as Appendix 2.

Table 28 - QC results Plot Remeasurements 2024

QC Results	Project plots (treated)	Baseline plots (untreated)	Total QC plots
------------	-------------------------	----------------------------	----------------

Number of plots remeasured (n)	18	6	24
Average plot measurement AGB (tC/ha)	147.2	181.0	155.7
QC plot measurement AGB (tC/ha)	158.2	184.2	164.7
Mean absolute difference (tC/ha)	11.0	3.1	9.0
Mean relative difference (%)	7.0%	1.9%	5.7%
Minimum difference (%)	-4.3%	-3.5%	-4.3%
Maximum difference (%)	25.9%	6.5%	25.9%

As reported, the mean relative difference observed during the QC re-measurements is 5.7%, so on the conservative side, slightly exceeding the standard threshold of 5% (see section 3.4.2.6 of the VCS PD). This minor deviation is attributed to a combination of factors, including:

1. Highly dynamic forest conditions, where growth and mortality rates fluctuate rapidly, and
2. Extended measurement duration, caused by logistical challenges and limited accessibility to certain plots in the field.

To mitigate this in future monitoring periods, the project will implement corrective measures to:

1. Improve logistical planning and field access for the next monitoring campaign, and
2. Ensure all sample plots are measured within a shorter and more consistent timeframe.

5.4.3 Total VCU's

The VCU's is calculated for the Monitoring Period 1 January 2011 up to and including 30 June 2024 with the following equation (49) from the VM0005 Methodology:

$$VCU_{t3} = (\Delta C_{IFM,t3} - \Delta C_{IFM,t2}) \times \left(100 - \frac{C_{IFMerror}}{100} \right) - Bufferwithholding_{t3}$$

$C_{IFMerror}$ is only included in the equation if it is larger than 10% at a confidence level of 90%. In this Monitoring Report $C_{IFMerror}$ is calculated at 13.2% (see section 5.4.2). Therefore the results are corrected for uncertainty with 3,2% which is above the 10% acceptable error.

The parameter $Bufferwithholding_{t3}$ is calculated as the buffer percentage times the net change in the project's carbon stocks (corrected for uncertainty). The $Bufferwithholding_{t3}$ is determined at 3.5% in the report 'Non-Permanence Risk Assessment INFAPRO_2025'. Therefore the minimum bufferwithholding of 12% is applied to the project for the current Monitoring Period.

The results for the net change in GHG emission removals over for the Monitoring Period $T = t3 - t2$ (2011-2024) are presented in Table 29. A detailed elaboration of these results can also be found in the excel spreadsheets attached as separate file (Appendix 1).

Table 29 - Results of the Non-Permanence Risk Assessment 2024 for the INFAPRO Project

State the non-permanence risk rating (%)	12%
--	-----

Has the non-permanence risk report been attached as either an appendix or a separate document?	Yes
For ARR and IFM projects with harvesting, state, in tCO ₂ e, the Long-term Average (LTA).	Not applicable
Has the LTA been updated based on monitored data, if applicable?	Not applicable
State, in tCO ₂ e, the expected total GHG benefit to date.	1,490,120 tCO ₂ -e
If a loss occurred (including a loss event or reversal), state the amount of tCO ₂ e lost:	No loss events occurred during the project lifetime

Table 30 - The net change in GHG emission removals for Monitoring Period T (2011-2024)

Vintage period	ΔC_{IFM} (tCO ₂ e)	ΔC_{IFM} corrected for Uncertainty (tCO ₂ e)	12% Buffer Pool Allocation (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
01-Jan-2011 to 31-Dec-2011	85,448	82,670	9,920	-	72,750	72,750
01-Jan-2012 to 31-Dec-2012	85,448	82,670	9,920	-	72,750	72,750
01-Jan-2013 to 31-Dec-2013	85,448	82,670	9,920	-	72,750	72,750
01-Jan-2014 to 31-Dec-2014	85,443	82,666	9,920	-	72,746	72,746
01-Jan-2015 to 31-Dec-2015	85,391	82,616	9,914	-	72,702	72,702
01-Jan-2016 to 31-Dec-2016	85,383	82,608	9,913	-	72,695	72,695
01-Jan-2017 to 31-Dec-2017	85,404	82,628	9,915	-	72,713	72,713
01-Jan-2018 to 31-Dec-2018	85,402	82,626	9,915	-	72,711	72,711

01-Jan-2019 to 31-Dec-2019	85,408	82,631	9,916	-	72,716	72,716
01-Jan-2020 to 31-Dec-2020	85,412	82,635	9,916	-	72,719	72,719
01-Jan-2021 to 31-Dec-2021	85,442	82,665	9,920	-	72,745	72,745
01-Jan-2022 to 31-Dec-2022	85,425	82,648	9,918	-	72,730	72,730
01-Jan-2023 to 31-Dec-2023	85,423	82,646	9,918	-	72,729	72,729
01-Jan-2024 to 31-Jun-2024	41,258	39,916	4,790	-	35,126	35,126
Total	1,151,733	1,114,295	133,715	-	980,580	980,580

As presented in the table above, the Net GHG emission removals by the INFAPRO Project over the Monitoring Period $T = t_3 - t_2$ (2011-2024) is:

$$\Delta C_{IFM,t_3-t_2} = 1,114,295 \text{ tCO}_2\text{e}$$

The percentage of VCU's to be deposited in the AFOLU Pooled buffer account is $12\% = 133,715 \text{ tCO}_2\text{e}$.

Therefore NET VCUs after buffer subtraction = 980,580 VCUs

5.4.4 Difference with estimated ex-ante GHG emission reductions and/or removals

The difference between the estimated ex-ante GHG emission reductions and carbon dioxide removals and the achieved reductions and removals for the Monitoring Period is presented in table below.

Table 31 – Difference with estimated ex-ante GHG emission reductions and/or removals

Vintage period	Ex-ante estimated removals	Achieved removals	Percent difference	Explanation for the difference
01-Jan-2011 to 31-Dec-2011	38,483	82,670	115%	Additional forest regrowth in the treated area (project scenario) compared to the untreated area (baseline scenario) is higher than
01-Jan-2012 to 31-Dec-2012	36,667	82,670	125%	

01-Jan-2013 to 31-Dec-2013	42,151	82,670	96%	expected, mainly due to higher tree mortality in the untreated areas. In later years, however, the achieved carbon removals are lower than expected ex-ante, as the implementation of rehabilitation activities by the project did not proceed as planned.
01-Jan-2014 to 31-Dec-2014	48,329	82,666	71%	
01-Jan-2015 to 31-Dec-2015	95,136	82,616	-13%	
01-Jan-2016 to 31-Dec-2016	110,984	82,608	-26%	
01-Jan-2017 to 31-Dec-2017	123,883	82,628	-33%	
01-Jan-2018 to 31-Dec-2018	138,480	82,626	-40%	
01-Jan-2019 to 31-Dec-2019	150,150	82,631	-45%	
01-Jan-2020 to 31-Dec-2020	110,722	82,635	-25%	
01-Jan-2021 to 31-Dec-2021	111,167	82,665	-26%	
01-Jan-2022 to 31-Dec-2022	112,854	82,648	-27%	
01-Jan-2023 to 31-Dec-2023	113,740	82,646	-27%	
01-Jan-2024 to 31-Jun-2024	117,120	39,916	-66%	
Total	1,349,866	1,114,295	17%	

APPENDIX 1: MONITORING RESULTS 2024

<Attached as excel spreadsheet in separate file>

APPENDIX 2: QC RESULTS 2024

<Attached as excel spreadsheet in separate file>

ULU SEGAMA - MALUA SUSTAINABLE FOREST MANAGEMENT (SFM) 2 CONSERVATION PROJECT AREA

Map showing the Ulu Segama - Malua Sustainable Forest Management (SFM) 2 Conservation Project Area. The map displays a large area divided into numerous small plots, each numbered. Key features include the 'Johore Forestry Centre' in the center, 'Sg. Puri Camp' to the west, and 'Operation Raleigh Cabin' to the south. A legend in the top right corner identifies symbols for 'Kampung', 'Basic Camp/Other Infrastructure', 'DFO/SM Base Camp', 'Compartment boundary', 'River', 'Access road', and 'Project'. The project areas are color-coded: yellow for 'DFO/SM Base Camp', orange for 'Basic Camp/Other Infrastructure', red for 'Johore Forestry Centre', and green for 'Operation Raleigh Cabin'. A scale bar and north arrow are also present.

Figure 2.15 : Projects within USM SFM Project Area