



MARUDI FOREST CONSERVATION AND RESTORATION PROJECT

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	<i>Verra Project ID 4814</i>
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Glossary

Carbon Project	Marudi Forest Conservation And Restoration Project
Carbon Study Permit	The permit issued by the Director under rule 4 authorizing a carbon study
Forest Carbon Area	See Project Area
License for Planted Forests (LPF)	Permits to develop forest plantations on gazetted State Land.
LPF Area	The geographic area covered by the LPF.
Project Boundary	The specification of GHG sources, sinks, and reservoirs associated with the project and baseline scenarios
Project Area	The geographic area in which the project activities are implemented. In the Malaysian regulations, this is the equivalent of a “Forest Carbon Area” which is defined as the area in which a “Forest Carbon Activity” has been approved to be undertaken in pursuant to a carbon license.
Project Activity	The specific set of technologies, measures, and/or outcomes, specified in a methodology applied to the project, that alter the conditions identified in the baseline scenario and which result in GHG emission reductions or removals. In the Malaysian regulations, this is the equivalent of Forest Carbon Activity which is defined as activities which increase the actual net greenhouse gases (GHGs) removals or reductions.
Project Activity Area	This is the area within the Project Area in which Project Activities occur.
Project Proponent	SaraCarbon Sdn. Bhd

1 PROJECT DETAILS

1.1 Summary Description of the Project

Samling Reforestation (Bintulu) Sdn Bhd (hereinafter referred to as “Samling”) is in possession of a License for Planted Forest (LPF) called Marudi LPF/0008. (Sarawak Malaysia).

The concession is approximately 55,818 ha in area. An estimated 26,321 ha of the area has peatland soil. To date, approximately 9,189 ha of the concession has been converted to plantation species as of March 2023.

Samling’s management’s current plan for Marudi LPF/0008 is the development of fast-growing timber plantations mostly based on Acacia and Eucalyptus species as a future supply of raw materials for its existing and plywood plants, sawmills, and fiber mills in Sarawak.

Samling has been following the growing global concern regarding Climate change and the need to address this global issue by avoidance and reduction of greenhouse gas emissions Samling has decided to implement a forest and wetland conservation project inside of Marudi LPF/0008. The Marudi Forest Conservation and Restoration Project (hereinafter called the “Project”) aims to protect and restore the natural forest and peatland areas in the Marudi LPF/0008.

Samling has formed a new company called SaraCarbon SDN. BHD. This is the project company in whose name the new Forest Carbon License will be granted and SaraCarbon will be the operator of the Forest Carbon Project for the lifetime of the project.

The Project will cease all future forest land clearing, and implement reforestation, and forest restoration as well as programs for forest monitoring and preservation, biodiversity protection and enhancement, community engagement, and sustainable development.

The Project will implement a series of programs that will allow it to achieve its aims and emissions reduction activities, including:

1. **Forest preservation program:** The Project will establish a team and infrastructure for land use monitoring and security and cooperation with enforcement authorities.
2. **Forest fire control program:** The Project will establish a team and infrastructure to provide fire protection.
3. **Reforestation of Degraded Forest Areas.** The project will replant degraded forest areas aiming to return the degraded areas to high diversity and high biomass natural forest.
4. **Preservation of Wetland Areas:** The Project will seek to protect existing wetlands and will remove any drainage to restore wetlands to their original hydrological condition.
5. **Community Engagement and Community Sustainable Development Program (Community Program):** The Project will implement a community engagement program to manage all interactions with communities that will support good community relations, resolve claims and disputes, and coordinate community involvement with the project.

The successful implementation of the project over the planned 60-year lifecycle shall result in total removals and reductions in CO₂E of approximately 99,009,535 tonnes and generate approximately 87,128,391 Verified Carbon Units (VCUs). This will generate average annual reductions in CO₂E of 1,650,159 tonnes CO₂E per year and an average annual production of 1,452,140 VCUs per year.

1.2 Audit History

This is the first PDD submission and there are no audits to record.

Audit type	Period	Program	Validation/verification body name	Number of years
Validation/verification	N/A			
	...			

1.3 Sectoral Scope and Project Type

:

Sectoral scope ¹	N/A
Project activity type	N/A

:

Sectoral scope	VCS Scope 14 Agriculture Forestry and Other Land Use (AFOLU)
AFOLU project category ²	APDef, CIW
Project activity type	Avoided Planned Deforestation & Degradation (APDef) - Activities that reduce net GHG emissions by stopping or reducing deforestation or degradation on forest lands that are legally authorized and documented for conversion. Conservation of Intact Wetlands (CIW) - Activities that reduce GHG emissions by avoiding degradation and/or the conversion of wetlands that are intact or partially altered while still maintaining their natural functions.

¹ Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>

² See Appendix 1 of the VCS Standard

1.4 Project Eligibility

1.4.1 General eligibility

The proposed Marudi Forest Conservation and Restoration Project (the “Project”) is eligible under the scope of the VCS program. The project conforms with the VCS Standard and the AFOLU requirements of § 3.1 and § 3.2.

The project utilizes the following VCS methodologies and modules and their associated tools and guidance:

No.	Doc ID	Version	Issue Date	Documents Name	Abbrev.
METHODOLOGIES					
1	VM0007	1.8	4-Jun-24	REDD+ Methodology Framework	REDD+ MF
CARBON POOLS					
3	VMD0001	1.1	11-Oct-13	Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools	CP-AB
BASELINE					
4	VMD0006	1.4	27-Nov-23	Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation	BL-PL
6	VMD0042	1.1	8-Sep-20	Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities	BL-PEAT
LEAKAGE					
7	VMD0009	1.3	8-Sep-20	Estimation of emissions from activity shifting to avoid planned deforestation/forest degradation and avoiding planned wetland degradation	LK-ASP
8	VMD0044	1.1	8-Sep-20	Estimation of emissions from ecological leakage	LK-ECO
EMISSIONS					
9	VMD0013	1.3	8-Sep-20	Estimation of greenhouse gas emissions from biomass and peat burning	E-BPB
MONITORING					
10	VMD0015	2.3	27-Nov-23	Methods for monitoring GHG emissions and removals in REDD and CIW projects	M-REDD
12	VMD0046	1.1	8-Sep-20	Methods for monitoring soil carbon stock changes and greenhouse gas emissions and removals in	M-PEAT

				peatland rewetting and conservation project activities	
MISCELLANEOUS					
13	VMD0016	1.3	27-Nov-23	Methods for Stratification of the Project Area	X-STR
14	VMD0017	2.2	8-Sep-20	Estimation of Uncertainty for REDD+ Project Activities	X-UNC
15	VMD0019	1.0	16-Nov-12	Methods to project future conditions	

Table 1-1 VCS methodologies and modules used in the Project

1.4.2 AFOLU project eligibility

The activities qualify as AFOLU REDD with Avoided Planned Deforestation (APDef). The project will permanently protect the remaining natural forest areas from planned conversion to plantations and reduce net GHG emissions by reducing deforestation of forests. All areas classified as forest were forests 10 years prior to the project start date. The forest is classified according to the Malaysian Forest Definition, being areas greater than 0.5 hectares containing trees higher than 5 meters, with a canopy cover over 10%.

The activities also qualify as AFOLU WRC with Conservation of Intact Wetlands (CIW) under Avoiding Planned Wetland Degradation (APWD) activities. The project will permanently protect the peatland soil areas from planned development into plantations and from the resultant peatland drainage implemented during plantation development. The project will retain the existing intact wetlands and maintain and improve the natural wetland functions of hydrology, sediment supply, salinity characteristics, water quality, and native plant communities. The protected wetlands are classified as peatlands according to the Malaysian soil definition of having a high organic content (>65%) in a soil layer greater than 50cm. A small area of peatland (64 ha) was deforested within 10 years prior to the project start date and these areas were removed from the Project Area.

1.4.3 Transfer project eligibility

The project is not a transfer project or a CPA seeking registration. The SaraCarbon Project has not been registered under any emissions trading programs.

1.5 Project Design

Indicate if the project has been designed as:

- ☐ Single location or installation
- ☒ Multiple locations or project activity instances (but not a grouped project)
- ☐ Grouped project

1.5.1 Grouped project design

Not a Grouped Project.

1.6 Project Proponent.

Organization name	SaraCarbon Sdn. Bhd
Contact person	Francois Blignaut
Title	Project Leader
Address	Wisma Samling Lot 296, Jalan Temenggong Datuk Oyong Lawai Jau, 98000 Miri, Sarawak, Malaysia
Telephone	+60 85 413099
Email	blignautf@samling.com.my

1.7 Other Entities Involved in the Project

Organization name	Ata Marie Group Ltd
Role in the project	Forestry Survey, Carbon Modelling, and Project Document Preparation
Contact person	George Kuru
Title	Director
Address	Ruko Darmawangsa Square Unit 5, 4th Floor. Jl Darmawangsa 6 Kebayoran Baru. Jakarta Selatan 12160. Indonesia
Telephone	+62 21 72789411
Email	george.kuru@ata-marie.com

Organization name	ECOSOL Consultancy Sdn Bhd
Role in the project	Environmental Impact Studies including HCV study
Dr. Tie Yu Liong	Dr. Tie Yu Liong
Title	Director
Address	No. 58, 1st Floor, (Suite 58.1), Kueh Hock Kui Commercial Centre, Lorong 18, Jalan Tun Ahmad Zaidi Adruce, 93150 Kuching, Sarawak
Telephone	+60 82-248 919
Email	tie_tze@yahoo.com

Organization name	Universiti Malaysia Sarawak (UNIMAS)
Role in the project	Community Studies
Contact person	Dr. Poline Bala
Title	Director
Address	UNIMAS Holdings Sdn. Bhd Level 6, UNIMAS City Campus, Lot 77, Section 22, KTLD Jalan Tun Ahmad Zaidi Adruce 93150 Kuching, Sarawak, Malaysia
Telephone	+60 82 22 2000
Email	bpoline@unimas.my

Organization name	The Sarawak Tropical Peat Research Institute (STROPI)
Role in the project	Peat soil sampling, laboratory testing, and measurement
Contact person	Dr Lulie Melling
Title	Director
Address	Sarawak Tropical Peat Research Institute Lot 6035, Kuching – Kota Samarahan Expressway, 94300, Kota Samarahan, Sarawak, MALAYSIA.
Telephone	+60 82 662491
Email	luliem@sarawak.gov.my

1.8 Ownership

The project is owned by SaraCarbon Sdn Bhd, the developer of the Carbon Project. SaraCarbon is a subsidiary of the Samling Group of Companies. The Samling Group was granted the right to develop and operate a Licensed Planted Forest (LPF) by the Sarawak Government. The LPF license was issued to the Samling subsidiary Samling Reforestation (Bintulu) Sdn Bhd. The license was issued on the 8th of December 1998 and is valid until the 7th of December 2058. The Samling Group is currently operating the concession as a Planted Forest. However, following the management decision in 2021 no new land clearance or planting is taking place while the Group is converting the remainder of the area designated for planted forest into a carbon project. On the 22nd of December 2022, the Sarawak State Government issued a new regulation to govern the conversion of land use in Sarawak to a Forest Carbon Area (Forest Carbon Activity Rules). The Samling Group through its subsidiary SaraCarbon successfully completed the registration process and was awarded the first forest Carbon Study Permit under the new Forest Carbon Activity Rules on March 14, 2023. The Carbon Study Permit is the first stage in the process of converting the Marudi LPF/0008 License into a fully validated and verified Carbon sink.

1.9 Project Start Date

Project start date	15 December 2021
Justification	The start date provides the date from which all land clearing in the Marudi LPF/0008 was stopped except for small planting areas and replanting in existing plantation areas in Batu Belah block. The cessation of planned logging was at the written directive of the Chief Executive Officer of Samling Group for the express purpose of establishing a carbon project.

1.10 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☐ Ten years, fixed ☒ The Project Crediting Period is 15 th December 2021 to 14 th December 2081, a period of sixty (60) years. Under the new Forest Carbon Activity Rules, parts of Marudi LPF/0008 will be converted into a Forest Carbon Area. The initial License period will be for 30 years, which can be extended to another 30 years.
Start and end date of first or fixed crediting period	15 th December 2021 to 14 th December 2081

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

☐ < 300,000 tCO₂e/year (project)

☒ ≥ 300,000 tCO₂e/year (large project)

Calendar year of crediting period starting 15 th December	Estimated GHG emission reductions or removals (tCO ₂ e)
2021	0
2022	0
2023	706,059
2024	779,882
2025	1,344,964
2026	2,183,486
2027	1,829,397
2028	1,829,397
2029	1,829,397
2030	1,829,397
2031	1,829,397
2032	1,829,397
2033	1,822,868
2034	1,819,496
2035	1,813,356
2036	1,804,076
2037	1,802,221
2038	1,800,327
2039	1,798,433
2040	1,796,540
2041	1,794,646
2042	1,792,752
2043	1,790,859
2044	1,788,965
2045	1,786,418
2046	1,783,777
2047	1,780,877
2048	1,777,607
2049	1,774,307
2050	1,771,008
2051	1,767,709
2052	1,764,409
2053	1,761,110
2054	1,757,810
2055	1,754,158
2056	1,749,882
2057	1,745,274
2058	1,740,077
2059	1,734,555
2060	1,729,034
2061	1,723,512
2062	1,717,991
2063	1,712,469
2064	1,706,948

2065	1,701,426
2066	1,695,095
2067	1,688,386
2068	1,681,476
2069	1,673,971
2070	1,666,362
2071	1,658,753
2072	1,651,144
2073	1,643,535
2074	1,635,926
2075	1,628,317
2076	1,620,879
2077	1,613,792
2078	1,606,540
2079	1,598,907
2080	1,590,782
Total estimated ERRs during the first or fixed crediting period	99,009,535
Total number of years	60
Average annual ERRs	1,650,159

1.12 Description of the Project Activity

The Project will undertake the following activities with the projected results.

Outcome or Impact Estimated by the End of Project Lifetime	
1. Preservation of existing forests and restoration of degraded areas, achieved through:	a. Avoidance of 21,410 ha of deforestation for plantations.
2. Preservation of wetland areas, achieved through:	a. Avoidance of 20,374 ha of plantation development on wetland forest areas. b. Avoidance of 3,806 conservation areas in wetland areas that will be drained by plantation development on adjacent lands. c. Note that there is potential reforestation of non-forest areas on peatland, but these areas have been classified as CIW for this project.
3. Elimination of illegal logging and natural forest land clearing in the Project Area, achieved through:	a. Establishment of a forest preservation team responsible for the detection of illegal logging, natural forest land clearing, and enforcement of the rules. b. Establishment of a community monitoring and preservation program to report the commencement of any illegal logging activities and natural forest land clearing to the forest preservation team. c. Establishment of relationships with regulatory authorities to enforce forest protection programs.
4. Fire prevention and fire threat reduction, achieved through:	a. Reduction of human activity in the Project Area. b. Establishment of fire detection capability in the Project Area c. Community-based program to improve agricultural practices (non-fire practices) to reduce fire risks. d. Establishment of trained and equipped fire-fighting teams in the project as an extension of the company' plantation firefighting capability.
5. Preservation of Biodiversity and rare terrestrial species through	a. the preservation of the wetlands & Biodiversity habitat b. Increasing biodiversity habitats through the reforestation program c. Increasing animal numbers through improved access and specific programs that will be planned during project implementation such as wildlife corridors. d. Enhanced transboundary biodiversity protection with neighboring Brunei
6. Increased economic welfare through	a. Employment Opportunities directly in the project or through the improving economic climate related to project activities.

- b. Improved livelihoods through Improved Yields from fishing, hunting, and farming endeavors due to the program activities

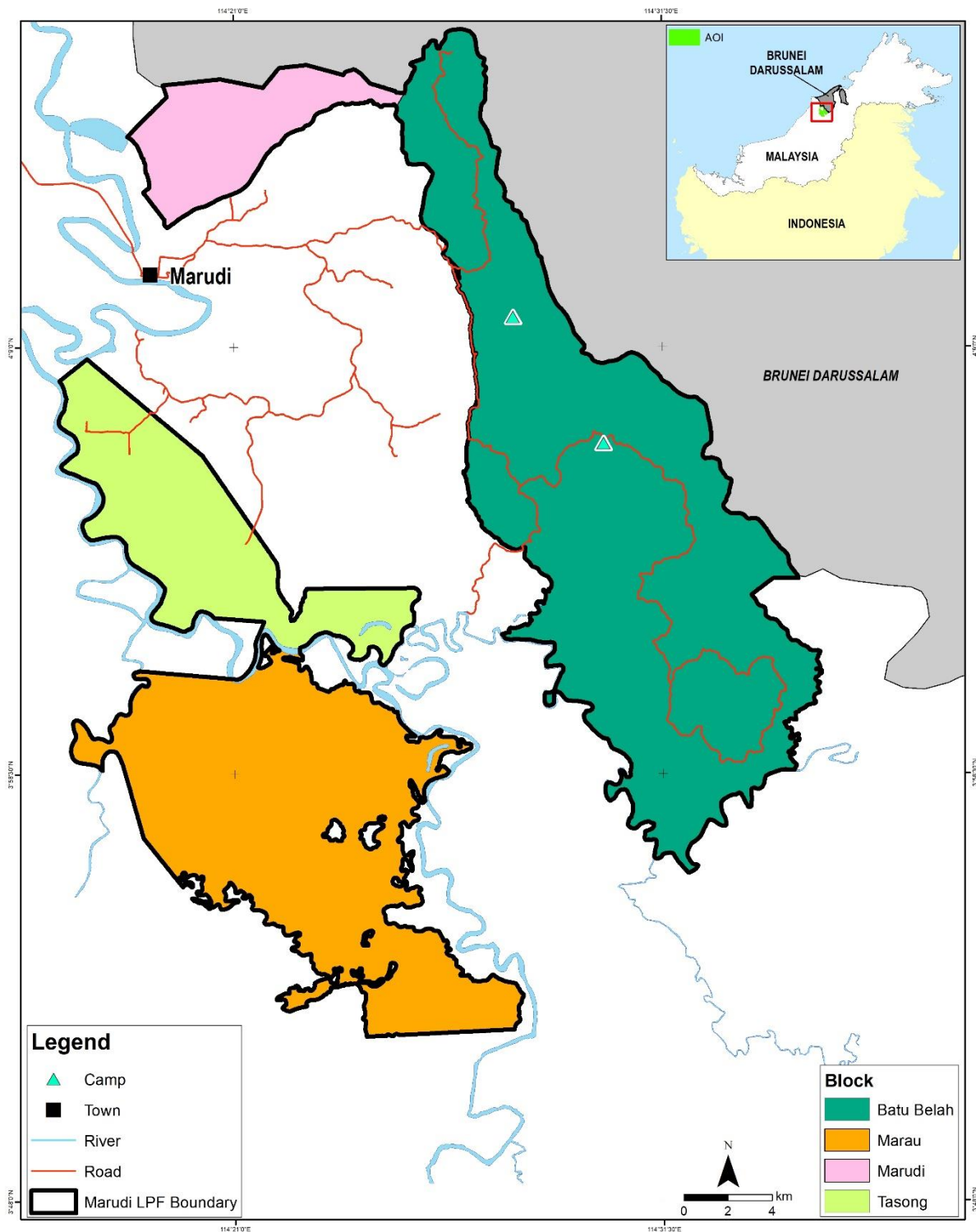
1.13 Project Location

The project is located within the boundaries of Marudi LPF/0008. The concession is in the Malaysian state of Sarawak and is within the division of Miri. The concession is bisected by the Baram River and the nearest large town is Marudi with a population of 90,100 (2010).

The total area of the Marudi LPF/0008 is 55,818 ha. It comprises 4 blocks, Marudi, Batu Belah, Tasong, and Marau. It borders with Brunei Darussalam of northern and eastern boundaries of Marudi and Batu Belah blocks.

Block	Area (ha)
Batu Belah	27,265
Marau	16,790
Marudi	4,035
Tasong	7,728
Total	55,818

Table 1-2 Area of Marudi LPF/0008 by block



Map 1-1 Marudi LPF/0008

The carbon project is located within the License for Planted Forests called “Marudi LPF/0008”. The area within the boundaries of Marudi LPF/0008 are referred to as the LPF Area.

The Project Area is the area for which a Carbon License has been issued, For the Marudi Forest Conservation And Restoration Project this includes the land within the boundaries of Marudi LPF/0008, excluding:

1. The Batu Belah block
2. All Native Customary Rights (NCR) lands
3. International Buffer Zone (IBZ) between Malaysia and Brunei
4. Cut off areas where there are contested titles with neighbors

The Project Activity Area are those areas within the Project Area where carbon activities occur. The Project Activity Area includes areas that will generate verified carbon units (VCUs):

1. All areas with natural forest cover are designated for plantation development under the tree planting plan.
2. All non-forest areas designated for plantation development on peatland soils under the tree planting plan.
3. Conservation areas have been included in the CIW activity areas because draining the surrounding areas will also lead to these areas being drained.

The areas inside the Project Area but which do not have carbon activities include:

1. Areas already designated for conservation prior to the commencement of the project except for those conservation areas which will be affected by drainage and the baseline and classified as CIW areas.
2. Settlements
3. Water bodies

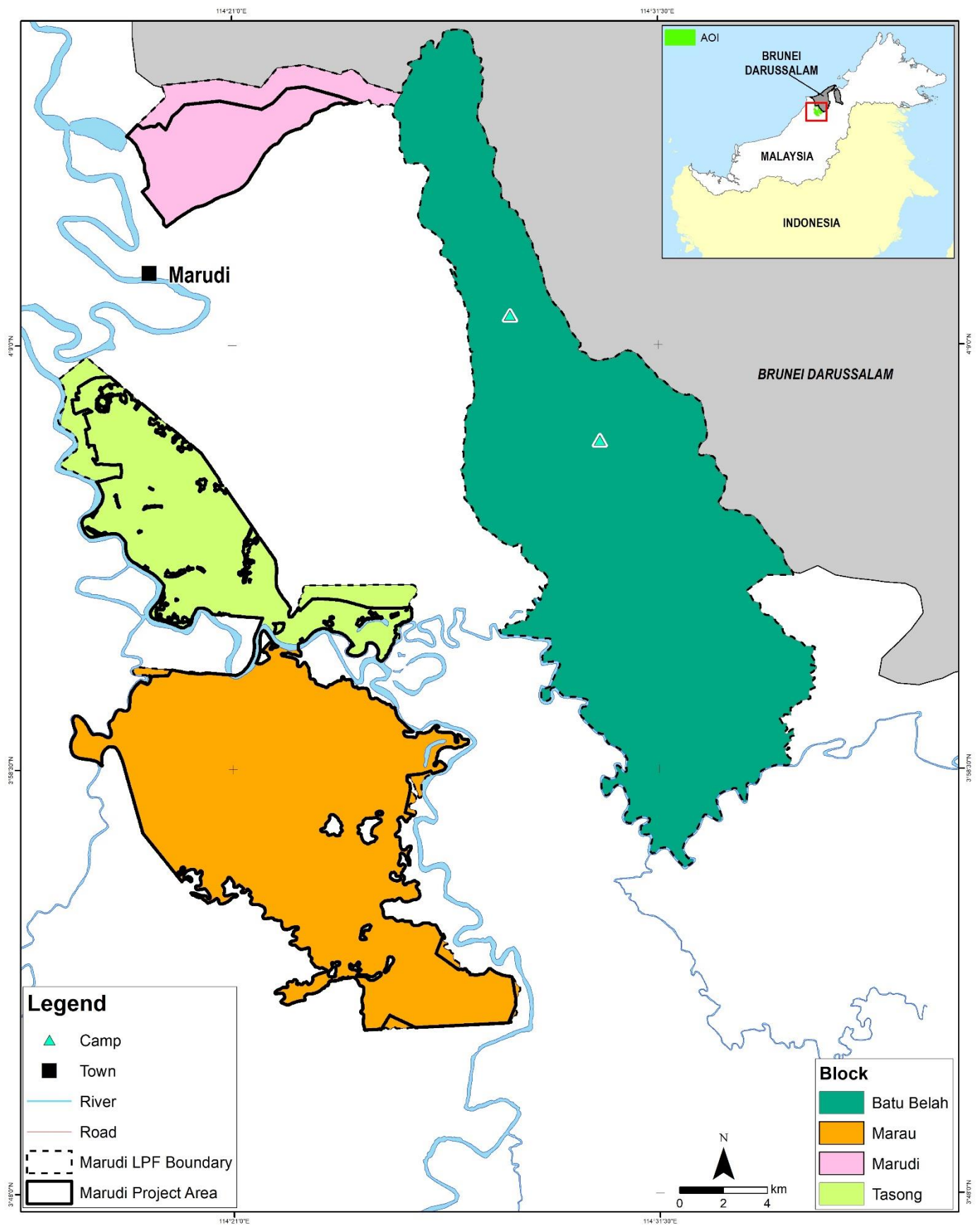
Note that where communities have established crops and plantations on non-Native Customary Rights lands, these shall be included by default in the project but left in their current land use. These areas will then be subjected to the land claims process to determine the legality of the land use by communities and the resolution of its status. Where legitimate property rights are established, the areas will be removed from the project area.

The areas within the Project Area boundaries which are eligible for carbon crediting, and which are not eligible for carbon reduction activities, are described in the table below.

Block	Project Status				
	Inside Project Boundary			Outside Project	Total
	Carbon Activity	No Carbon Activity	Total		
Batu Belah	0	0	0	27,265	27,265
Marau	16,329	189	16,518	272	16,790
Marudi	2,817	7	2,824	1,211	4,035
Tasong	6,069	264	6,333	1,395	7,728
Total	25,215	460	25,675	30,143	55,818

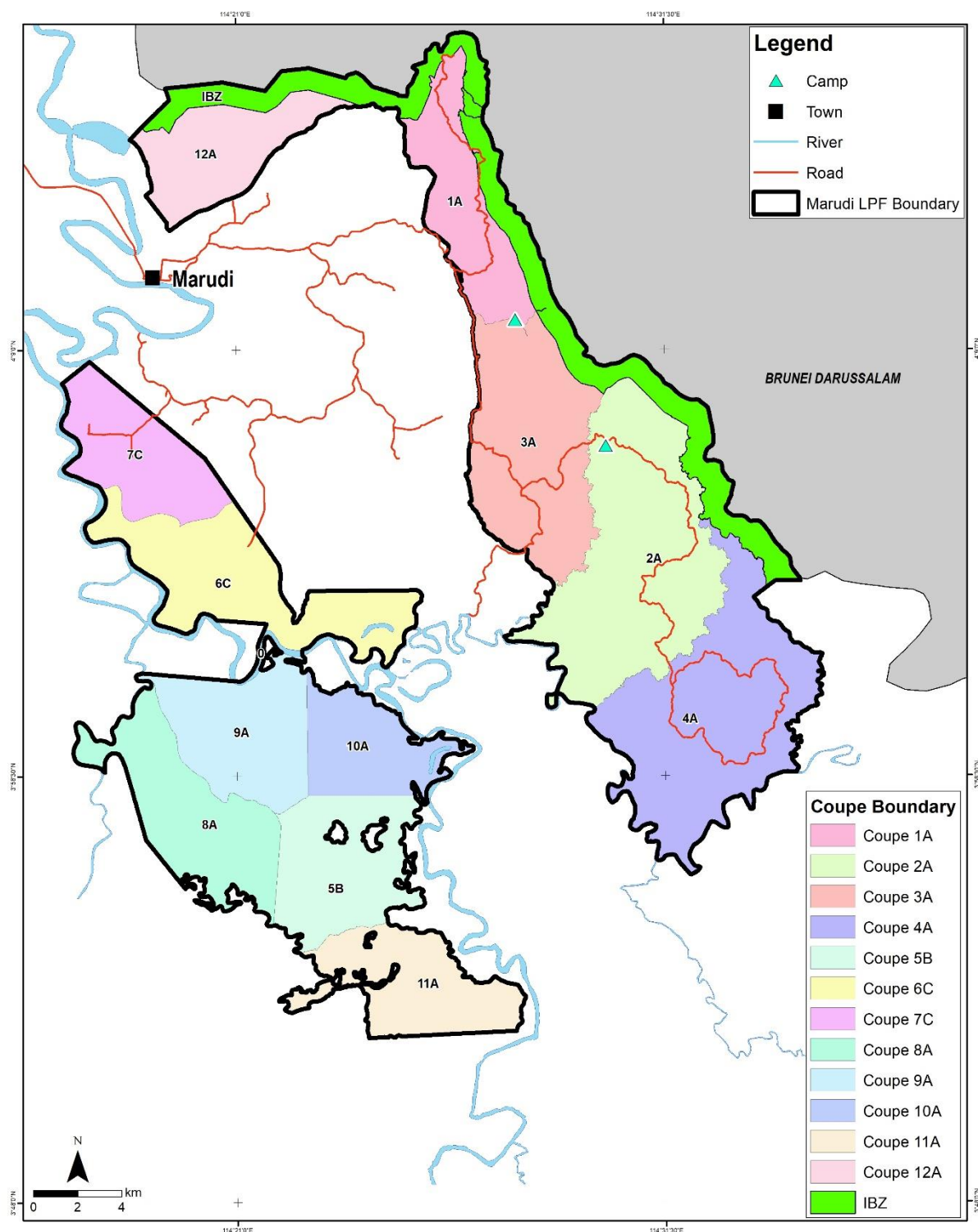
Table 1-3 Areas that are eligible and ineligible for carbon activities

The actual boundaries of the project were explicitly mapped by the Forestry Department of Sarawak (FDS) in line with the exclusion requirements described above. There may be some very minor discrepancies between the actual Project Area boundaries and the exclusion requirements, but these can be considered insignificant. Importantly, the FDS was careful to exclude all Native Customary Rights (NCR) lands from the project area.



Map 1-2 Boundaries of LPF Area and Project Area

Samling divided Marudi LPF/0008 into 12 coupes in relation to the establishment of timber plantations. A river reserve and Greenbelt are outside of the carbon Project Area. The figure below illustrates the breakdown of LPF/0008 by Coupes. The table below shows the area breakdown of the Coupes by Project Land Classification.



Block	Area (ha)	COUPE	Area (ha)	
			LPF008	Project Area
Batu Belah	27,265	1A	3,047	0
		2A	7,604	0
		3A	5,380	0
		4A	7,495	0
		IBZ	3,739	0
Marau	16,790	10A	2,509	2,463
		11A	3,268	3,140
		5B	3,510	3,480
		8A	3,957	3,951
		9A	3,546	3,484
Marudi	4,035	12A	2,824	2,824
		IBZ	1,211	0
Tasong	7,728	6C	4,716	4,087
		7C	3,012	2,246
Total			55,818	25,675

1-4 Areas by block for Marudi LPF/0008 and project area

1.14 Conditions Prior to Project Initiation

The conditions of the Project Area prior to the start of the project can be described as a natural forest ranging from degraded to heavily degraded in condition. The Marudi, Marau, and Tasong blocks are predominantly peatlands and would have been converted to forest plantations under the Tree Planting Plan before the decision to implement the carbon project. The condition of the Project Area was not a result of actions by the project or related parties to purposely create GHG emission potential for subsequent reduction.

We demonstrate that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal, or destruction in Section 3.1.4 and the project's baseline scenario and additionality are justified by using "VT0001 – T-ADD - Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities".

As described in Section 3.1.4 the most likely land-use in the absence of the project is the establishment of an industrial tree plantation. In fact, under the latest revised Tree Planting Plan, it was the only permitted land use up until the carbon study license was issued. The Environmental Impact Assessment for tree planting development in the Marudi LPF/0008 was prepared by ECOSOL and approved by the Natural Resources and Environment Board Sarawak on 13th December 2007.

The development activities started in 2009. Commencing with the Batu Belah Block, approximately 9,189 ha were cleared and planted with *Acacia* spp., *Eucalyptus pellita*, *Falcataria moluccana*, *Gmelina arborea*, *Melaleuca leucadendra*, *Melia dubia*, *Neolamarckia cadamba*, *Pinus caribaea* and *Hevea brasiliensis* for the first cropping cycle.

In 2020/2021, the Licensee planned to replant the Batu Belah Block for the second cycle. An Environment Management Plan (EMP) for the entire Batu Belah Block (ECOSOL, 2021) with a total gross area of about 23,550 ha was submitted and approved by the NREB on 27th September 2021, Ref: (11)NREB/6-3/2H/53]. To date, the Licensee has harvested the first crop of *Acacia spp.* and *Eucalyptus pellita*, with yields of approximately 102.6 tonnes.

In the Project Area, the revised Tree Planting Plan identifies 25,215 ha that can be planted between 2023 and 2026. This would have resulted in the clearing of approximately 21,410 ha of natural forest with approximately 24,180 ha of the plantation development being located on peatlands.

The Marudi LPF/0008 is currently producing timber which is shipped as logs to the group mills in Sarawak. Samling management has an ongoing planting plan revised since 2021 to replace harvested logs to develop the remaining natural forest and drain the wetlands to allow for planting. Given the possibility of converting the concession to a Carbon project, Samling management has suspended new planting. The management of the Project Area as a forest protection and restoration project will now transfer to SaraCarbon.

1.14.1 Geography

The Marudi Block covers part of the floodplain with a large peat swamp along the eastern side of lower Batang (Btg) Baram, downstream of its small tributary, Sungai (Sg) Ridan. The peat swamp is essentially flat, though the level survey (ECOSOL 2007) did reveal that the ground rose gradually by about 4 m from Sg Ridan and Btg Baram to the center of the swamp.

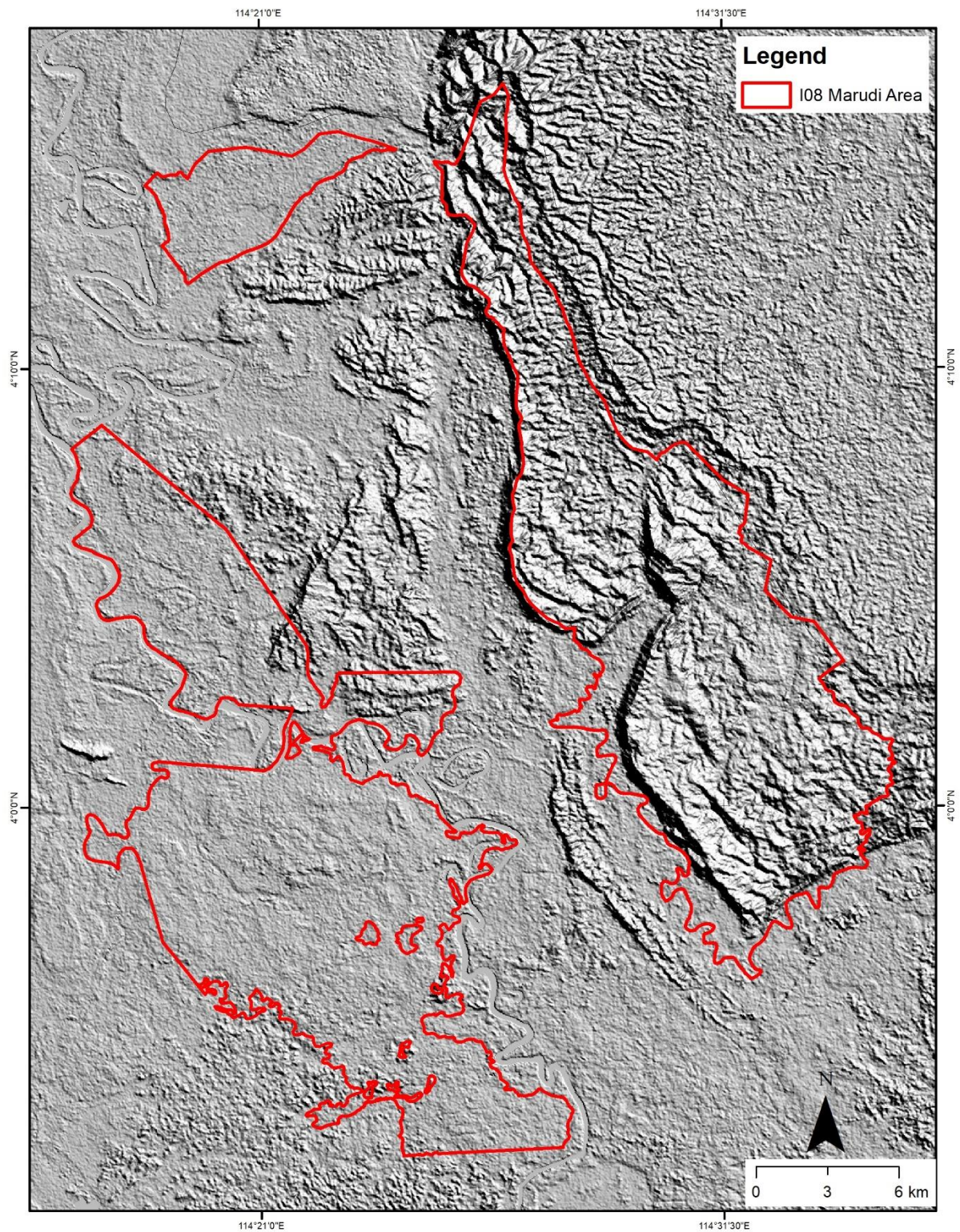
The western part of the Tasong Block has a large area of peat swamp, which is enclosed by the alluvial belt fringing Btg Baram, and the low hills found to the south of the Marudi-Lubok Nibong Road. The alluvial and peat swamp areas are basically flat, with the ground levels ranging from 2 to 8 m above mean sea level (amsl). Along the eastern margin, the more prominent hills are found between Sg Muam and Sg Tebaweng, and the area just north of Loagan Tebaboi. The hill south of Sg Muam rises over 150 m amsl. To the north of Loagan Tebaboi, the land is mostly below 45 m amsl.

The Marau block is largely made up of a flat peat swamp, fringed by the riparian belts along Btg Baram, Btg Tinjar, and Sg Peking-Sg Sebuoh. Scattered pockets of small low hills are strewn around the Sg Marau and Sg Sebuoh areas. The ground level is mainly between 2 - 15 m amsl.

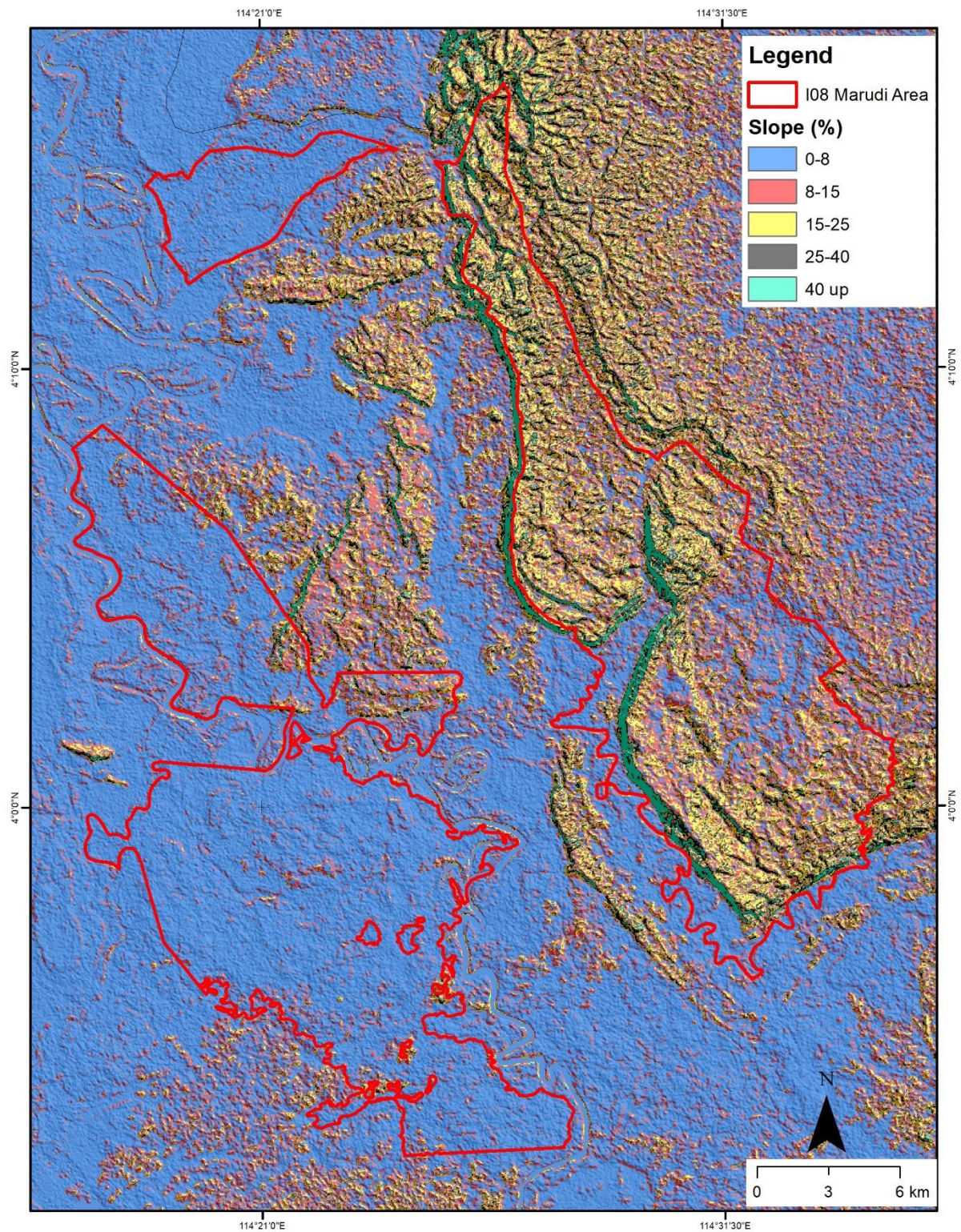
The Batu Belah Block embraces mainly undulating hills with some steep hills and alluvial plains. The general elevations range from a few meters amsl in the floodplains and the peat swamps to more than 305 m (1,000 ft) amsl. The highest peaks are found along a series of ridges that form the western frontier of the Block, at Bukit Dabei (305 m) and Bukit Kamunting (270 m). The area bordering Brunei, stretching from Ulu Sg Ridan and Ulu Sg Dabei all the way southward to Linei, is dominated by undulating hills varying between 30 and 300 meters above mean sea level (amsl). Between the ridges and the Sarawak-Brunei Darussalam border, the hills are lower, averaging about 180-220 m amsl.

Most of the low hill areas have rolling terrain with slopes mainly in the 12-25° range, though some parts with Kapit soils may have slopes steeper than 35°. These hills slope down to heights of 15 m (50 feet) or less and flatten out into the valleys and alluvial plains formed by Btg Baram, Sg Tutoh, and their tributaries. Some relatively flat to undulating areas with slopes of less than 6° may also be found merging into the peat swamps.

According to the Tree Planting Plan and in agreement with the soil information (see below), all the Project Area is located on relatively flat peat swamps and riverine floodplains (Terrain Class I). Map 1-4 shows the outline of Marudi LPF/0008 on a Satellite Topography of the area and Map 1-5 shows the outline of Marudi LPF/0008 on a Satellite Slope map of the area.



Map 1-4 Outline of Marudi LPF/0008 Overlay on Satellite Topography Map



Map 1-5 Marudi LPF/0008 overlay on Satellite Slope Map

1.14.2 Soils

Marudi LPF/0008 comprises of mineral soils in the Batu Belah block, and predominantly peatland soils in the Marudi, Marau, and Tasong blocks. The establishment of plantations on peat swamp areas will require that the water level be lowered by 1-2 meters using an extensive series of canals to drain the area. In the baseline, the peat soils will be drained to develop timber plantations. The soil types in Marudi LPF/0008 are shown in the map below.

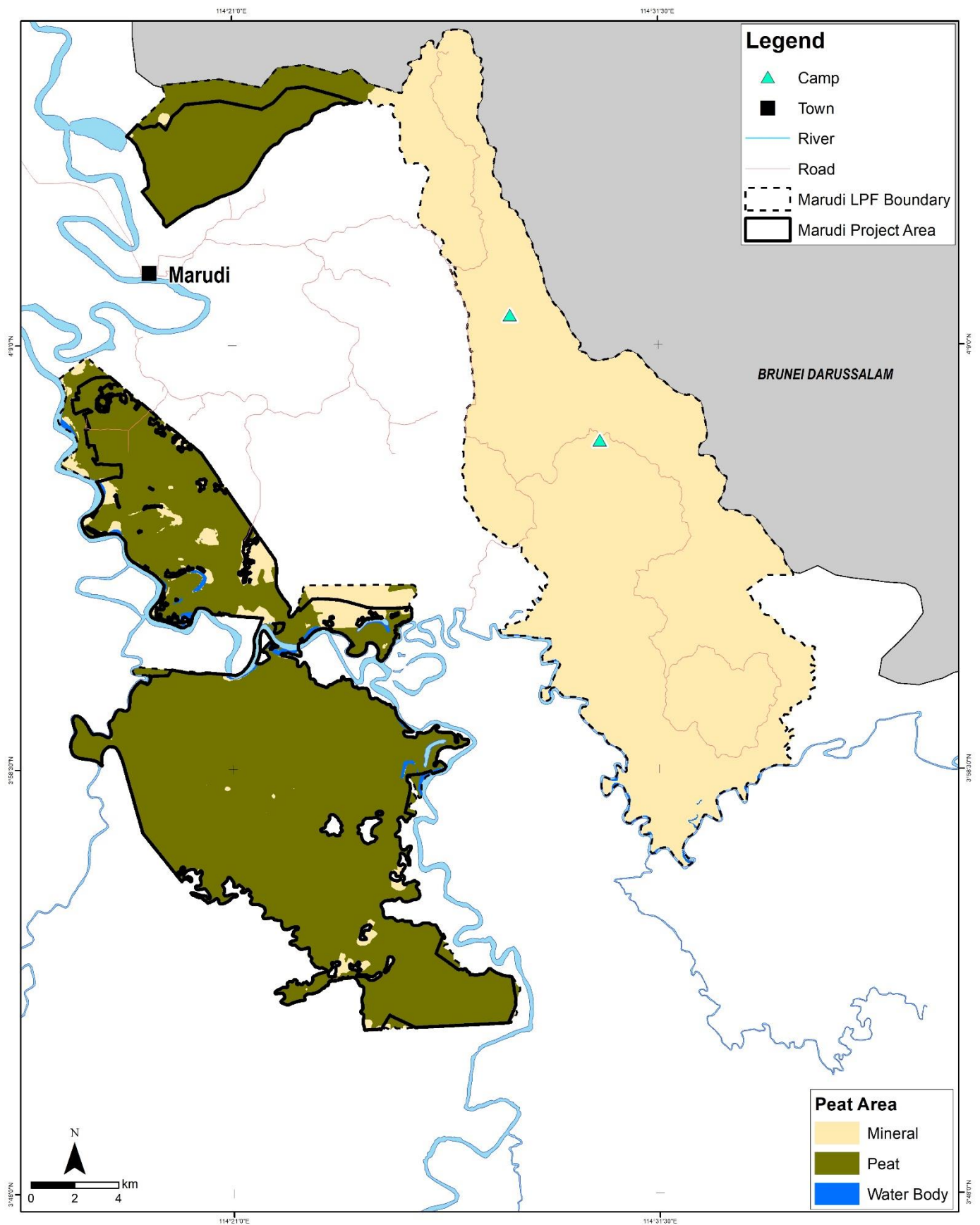
A peatland soil survey was conducted to determine the extent of peatland soils. The stratification of the peatland soil is presented later in the report. The estimates of areas by soil type are shown in the tables and maps below.

Block	Soil Type			Total
	Mineral	Peat	Water Body	
Batu Belah	27,190	0	75	27,265
Marau	230	16,407	153	16,790
Marudi	122	3,914	0	4,035
Tasong	1,534	6,001	193	7,728
Total	29,075	26,321	421	55,818

Table 1-5 Marudi Soil Types by Block in Marudi LPF / 0008

Block	Soil Type			Total
	Mineral	Peat	Water Body	
Batu Belah	0	0	0	0
Marau	214	16,172	133	16,518
Marudi	5	2,819	0	2,824
Tasong	916	5,253	164	6,333
Total	1,135	24,244	297	25,675

Table 1-6 Soil types within Project Area Boundaries



Map 1-6 Soil Map for Marudi LPF/0008 and Project Area

1.14.3 Vegetation cover

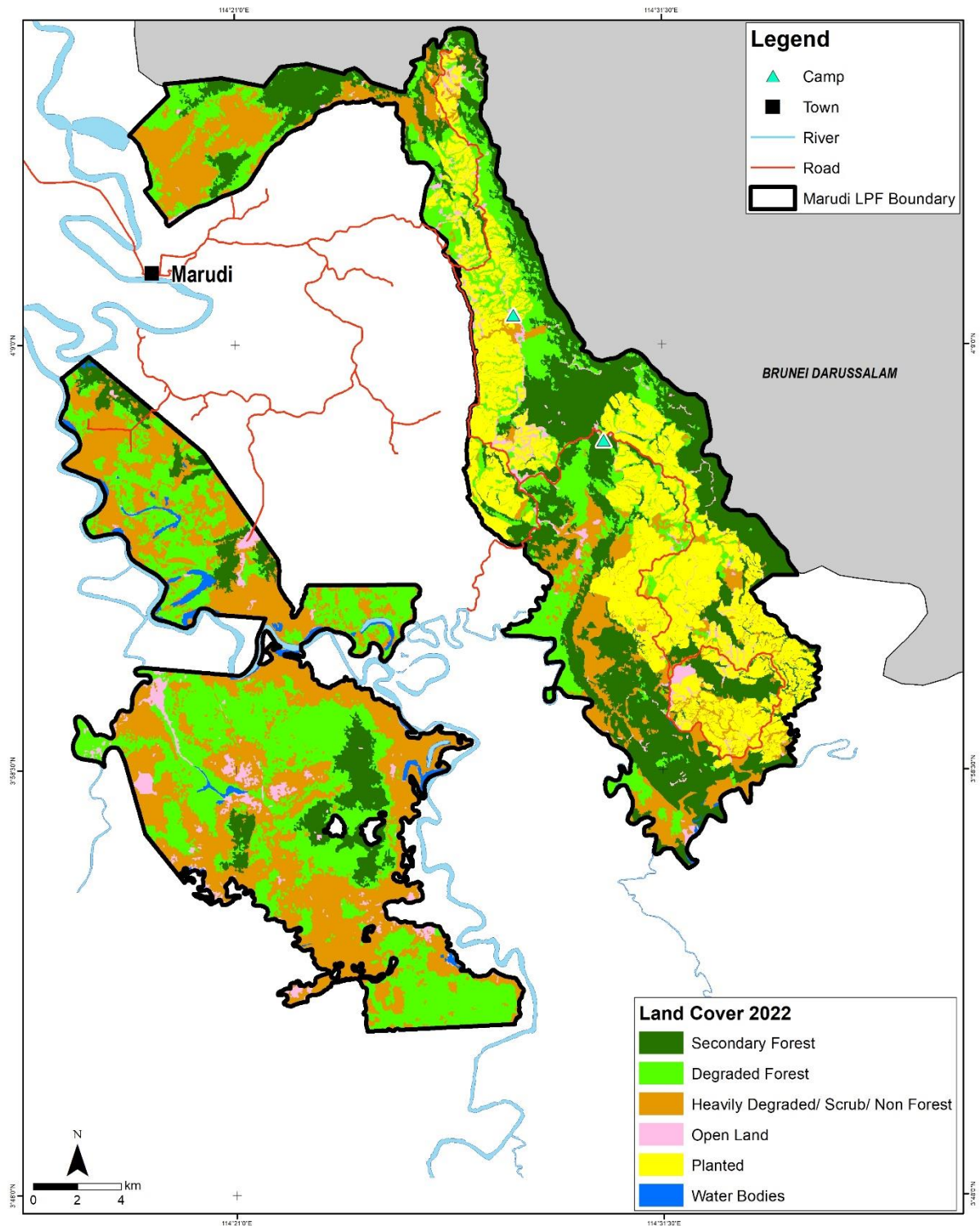
The current vegetation of the Project Area predominantly consists of Peat Swamp Forest (which is made up of 5 different forest types, namely Mixed Swamp Forest in the fringe, followed by Alan Batu, Alan Bunga in the intermediate, Padang Alan and Padang Forests in the core) in the Marudi and Marau Blocks; Mixed Dipterocarp and Kerangas Forests in the Batu Belah Block. Most of the area has been logged previously and thus is considered a secondary forest.

Block	Natural Forest			Non-Forest			Total
	Secondary Forest	Degraded Forest	Heavily Degraded	Open Land	Plantation	Water body	
Batu Belah	9,133	4,432	3,217	1,220	9,189	75	27,265
Marau	1,286	6,878	7,500	973	0	153	16,790
Marudi	1,079	1,086	1,835	35	0	0	4,035
Tasong	763	2,953	3,408	410	0	193	7,728
Sub-Total	12,260	15,349	15,960	2,638	9,189	421	55,818
Total	43,569			12,248			

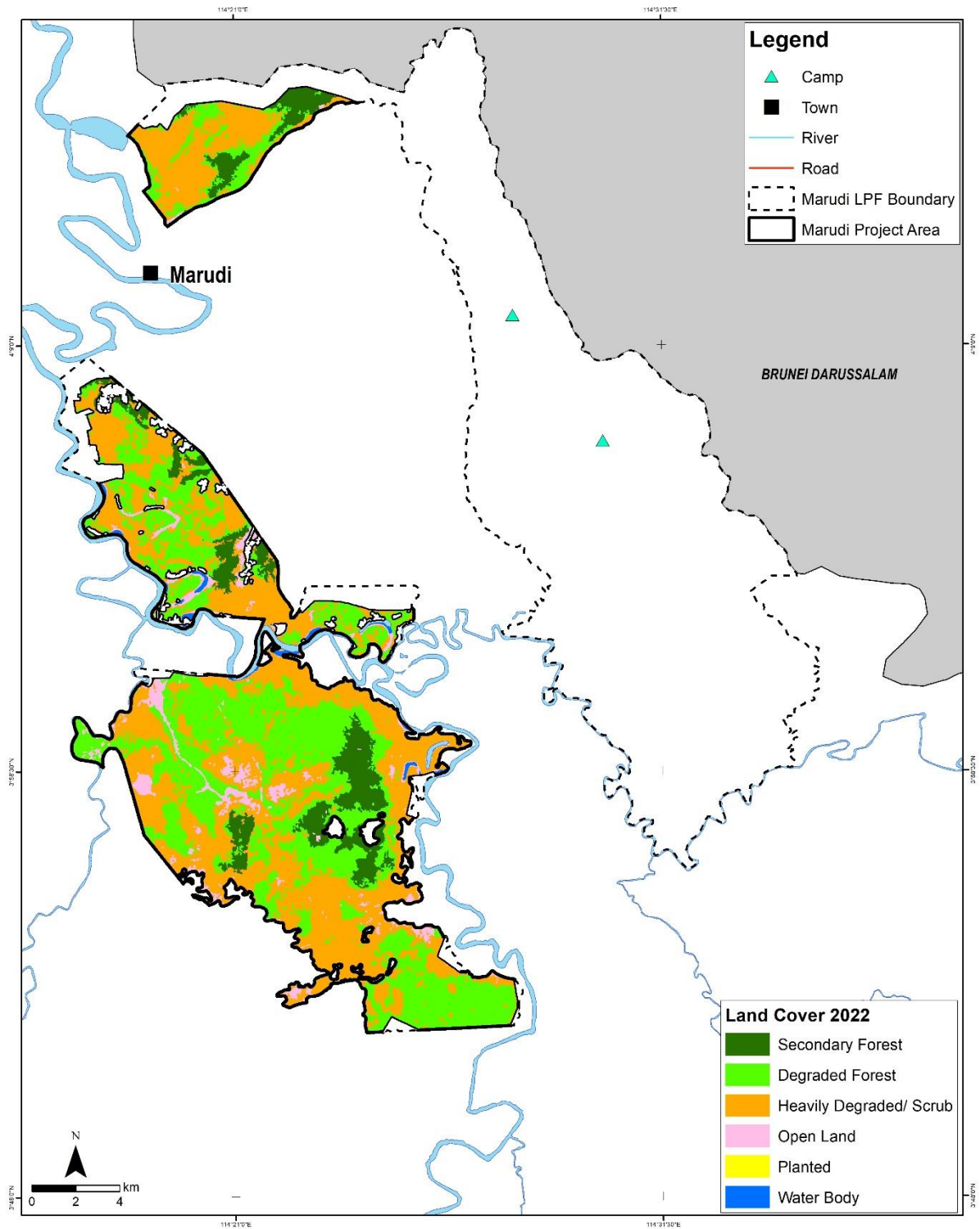
Table 1-7 Vegetation Cover by Block in Marudi LPF/0008

Block	Natural Forest			Non-Forest			Total
	Secondary Forest	Degraded Forest	Heavily Degraded	Open Land	Plantation	Water body	
Batu Belah	0	0	0	0	0	0	0
Marau	1,286	6,810	7,375	915	0	133	16,518
Marudi	505	690	1,611	18	0	0	2,824
Tasong	605	2,322	2,905	336	0	164	6,333
Sub-Total	2,396	9,822	11,891	1,269	0	297	25,675
Total	24,109			1,566			

Table 1-8 Vegetation Cover by Block in Project Areas



Map 1-7 Marudi LPF / 0008 Land Cover 2022



Map 1-8 Project Area Land Cover

1.14.4 Climate overview

The regional climatic characteristics are those of the tropical/equatorial lowland climate affected by the monsoon seasons. The climate is generally hot, wet, and humid throughout the year. The following description of the climate of the region in and around the Project Area is based on data collected by the Department of Irrigation and Drainage (DID) and *Jabatan Perkhidmatan Kajicuaa Malaysia (JPKM)*.

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	25.4 °C (77.7) °F	25.6 °C (78.1) °F	25.9 °C (78.7) °F	26.2 °C (79.2) °F	26.5 °C (79.7) °F	26.3 °C (79.4) °F	26.3 °C (79.3) °F	26.3 °C (79.4) °F	26.1 °C (79) °F	25.8 °C (78.4) °F	25.6 °C (78) °F	25.5 °C (77.8) °F
Min. Temperature °C (°F)	22.9 °C (73.2) °F	23 °C (73.3) °F	23.2 °C (73.7) °F	23.5 °C (74.3) °F	23.8 °C (74.8) °F	23.5 °C (74.4) °F	23.4 °C (74.1) °F	23.4 °C (74.1) °F	23.3 °C (73.9) °F	23.1 °C (73.6) °F	23.1 °C (73.6) °F	23.1 °C (73.5) °F
Max. Temperature °C (°F)	29.8 °C (85.7) °F	30.2 °C (86.4) °F	30.7 °C (87.3) °F	30.9 °C (87.7) °F	30.9 °C (87.7) °F	30.6 °C (87.1) °F	30.7 °C (87.2) °F	30.8 °C (87.4) °F	30.8 °C (87.4) °F	30.3 °C (86.5) °F	30 °C (86.1) °F	29.8 °C (85.6) °F
Precipitation / Rainfall mm (in)	276 (10)	212 (8)	215 (8)	249 (9)	244 (9)	217 (8)	205 (8)	225 (8)	228 (8)	297 (11)	319 (12)	315 (12)
Humidity(%)	89%	87%	87%	88%	88%	88%	87%	86%	87%	89%	90%	90%
Rainy days (d)	19	17	19	19	18	16	16	17	17	20	20	20
avg. Sun hours (hours)	6.9	7.0	7.6	8.0	8.7	9.0	9.1	9.0	8.6	8.0	7.4	6.8

Table 1-9 Marudi Area Weather Statistics

The climate data for Marudi town was sourced from Climate-Data.org > Malaysia > Marudi. Data periods: 1991 - 2021 Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days. Data: 1999 - 2019: Avg. Sun hours

1.14.5 Rainfall and evaporation

The regional rainfall of the study region is analyzed based on the data recorded for Marudi (DID Station No. 4143004) from 2010 to 2021. Based on this data set, the mean annual rainfall of the region was 2,814 mm. The actual annual rainfall could however vary from 1,717 mm (Year 2019) to 3,566 mm (Year 2021).

The regional rainfall was moderately low but well-distributed throughout the year. The month of December received the highest mean monthly rainfall (324 mm). Conversely, the lowest monthly rainfall was recorded in March with a mean of 174 mm. This is consistent with a monsoonal type of climate. The monthly rainfall data also indicates that the onset of the wet season (*aka* “Landas” season) during the Northeast Monsoon in Marudi is one to two months earlier than in West and Central Sarawak. The period under the influence of the Northeast Monsoon from October to January (wet season) was comparatively wetter than the Southwest Monsoon season from April to September. The precipitation during the wet season averaged 301.8 mm per month while it was only 200.9 mm per month during the rest of the year. The precipitation during the transitional months could be rather unpredictable, varying with the timing of the onset and recess of the monsoons. However, there was no real dry season since the mean monthly rainfall was consistently higher than the mean monthly evaporation of 123 mm.

Generally, a day is considered a rainy day if the amount of rainfall for that day equals or exceeds 0.1 mm. The total number of rain days during the Northeast Monsoon at the Marudi Station was higher

and ranged from 22.0 days per month, while the rain-days during the drier season at this station were around 17.1 days per month.

In the examination of evaporation in the region, the data from the Miri Airport Station (DID Station No. 4339305) are reviewed. An annual pan evaporation of 1,476 mm was experienced. The mean monthly evaporation rate was less variable, fluctuating between 106 and 140 mm with the highest mean evaporation rate occurring in August. The wet season from October to January had lower evaporation rates. The monthly evaporation was in the range of 123 to 140 mm in the drier months (May to August) while it was in the range of 106 to 125 mm in the wetter.

Month	Marudi		Mean Monthly Evaporation (mm) at Miri Airport ²
	Mean Monthly Rainfall (mm) ¹	Total Number of Rain-Days ¹	
January	321	21	106
February	175	15	111
March	174	16	131
April	198	17	129
May	276	20	131
June	184	16	123
July	202	17	131
August	198	17	140
September	200	19	129
October	265	21	125
November	297	24	113
December	324	22	107
Total	2,814	225	1,476
Average (per month)	234	19	123

Table 1-10 Mean Monthly Rainfall (mm), Total Number of rain days at Marudi, and mean monthly evaporation at Miri Airport, 2010 to 2021

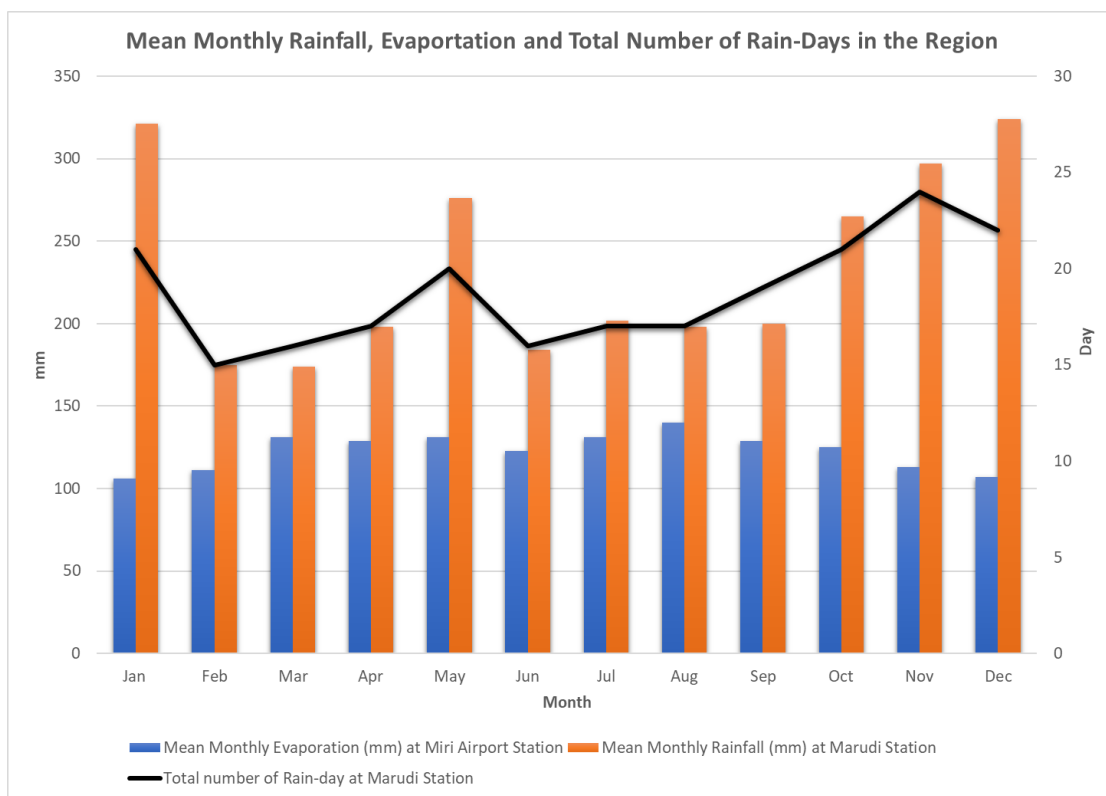


Figure 1-1 Marudi Rainfall and Evaporation Statistics

1.14.6 Temperature and relative humidity

The surface air temperature is in the range of 21.0°C to 35.2°C with a mean ranging from 24.0°C to 31.7°C. There are little seasonal variations in temperatures and the main fluctuation is diurnal in nature. However, it is generally true that the warmest month usually coincides with the driest, and the coolest month with the wettest.

A moderately high mean relative humidity reading at 1400 local time of about 70.6% is recorded by JPKM at Miri Station. The mean relative humidity is observed to fluctuate between 70.2% and 71.4%. Generally, the wetter months are slightly more humid than the drier months.

Year	Surface Air Temperature (°C)				Mean Relative Humidity at 1400 Local Time (%)
	Mean		Highest Maximum	Lowest Minimum	
	Maximum	Minimum			
2015	31.6	24.2	35.0	21.7	70.3
2016	31.7	24.7	35.2	21.6	70.2
2017	31.6	24.2	35.5	20.6	71.0
2018	31.5	24.0	33.5	22.5	70.1
2019	31.7	24.0	35.1	21.0	71.4
Average	31.6	24.2	34.9	21.5	70.6

Table 1-11 Temperature and Relative Humidity Recorded at Miri Station Sunshine hours.

Sunshine hours denote the cumulative time in a day when the sunshine is bright enough to burn a trail on a specially designed tape after it is focused through a spherical glass lens (sunshine recorder). It is a measure of bright sunshine versus cloudy, overcast skies. Based on the 2-year data (2010 to 2011) from the Kebuloh Station, the annual mean daily sunshine hour was close to 6 hours. At noon, the percentage of bright sunshine was about 50%.

Month	Mean Sunshine (Hours)	Month	Mean Sunshine (Hours)
January	4.86	July	7.50
February	5.90	August	6.15
March	6.01	September	5.86
April	5.76	October	5.33
May	7.05	November	5.92
June	5.75	December	4.80
Sub-total	35.33	Sub-total	35.56
Total		70.89	
Average		5.91	

Table 1-12 Mean Sunshine Hour at Kebuloh Station

* Annual Report of the Research Branch Department of Agriculture from Year 2010-2011

1.14.7 Winds

The summary of the annual wind rose measurement at Miri Airport (Year 2012-2013) is shown in the Figure below. The predominant winds are southwest-westerly, northwest- westerly and westerly in direction. Stronger winds can be expected during the onslaught of the monsoons in May-August and October-January, when wind speeds of over 20 m/s (72 km/hr) are not unusual, blowing from the direction of the prevailing monsoons. The inter-monsoonal periods are normally calmer. Wind speed is significant in the sense that wind-throw damage can occur under strong wind conditions.

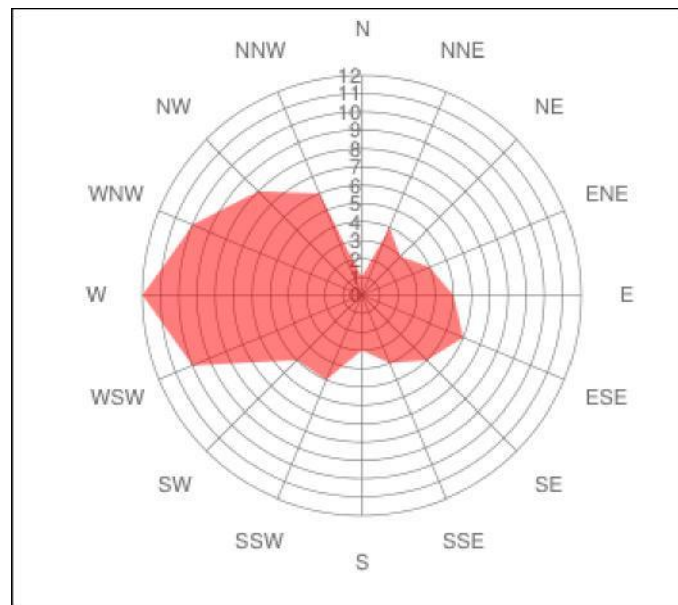


Figure 1-2 Annual Wind Rose Summary

1.14.8 Hydrology

1.14.8.1 River systems and water supply catchment - Major rivers

The major waterways in and around the Project Area are Btg Baram and two of its major tributaries, Btg Tinjar and Sg Tutoh. The Marudi Block, the Batu Belah Block, and the Tasong Block are found to the east of Btg Baram, while the Marau Block is situated to the west of this river.

Btg Baram is featured by a lot of meanders as it approaches its lower stretches. The river has cut through some of the meanders resulting in the formation of numerous ox-bow lakes. The larger ones that are found in the Project region include Loagan Terikan, located downstream of Marudi; Loagan Baram Tahor at Kuala Tinjar; and Loagan Punguk and Loagan Tebaboi at Kuala Tutoh.

1.14.8.2 Marudi and Batu Belah Blocks

The peat swamp in the Project Area mainly drains into Sg Ridan. To the south of Sg Ridan, the hilly lands between the ridges and the Sarawak-Brunei Darussalam border are carved by rivers that drain through the area in a dendritic pattern. The main rivers here are Sg Dabai and Sg Linei. Sg Ridan and Sg Dabai drain westwards into Btg Baram in the southern section of the Marudi Block and the northern section of the Batu Belah Block, respectively. Sg Ridan is joined by the smaller Sg Merah and Sg Labi at its upper stretches, and this system flows into Btg Baram below the raw water intake point (WIP) for the Marudi Waterworks. The branch of Sg Dabai that cuts across the western ridge of the Batu Belah Block is called Sg Buaya. Sg Dabai itself joins Btg Baram midway between Marudi and Lubok Nibong, not far upstream of the Marudi WIP. Sg Linei drains by far the largest part of the Batu Belah Block southwards into Sg Tutoh.

1.14.8.3 Tasong Block

Besides Btg Baram and Sg Tutoh which form the western and the southern boundaries, Sg Tasong is perhaps the most significant river that penetrates the Tasong Block. Most of the waterways are peat streams running from the peat swamp to join Btg Baram directly. A few oxbow lakes such as Loagan Tebaboi, Loagan Tasan, and Loagan Tanah Timbol scar the floodplain in the Tasong Block.

1.14.8.4 Marau Block

The most significant waterway that runs through the north-western part of the Marau Block is Sg Marau, a tributary of Btg Tinjar. The waterways draining the southwestern part of the Marau Block are tributaries of Sg Peking and Sg Sebuoh, namely Sg Puntol and Sg Bala. The eastern part of the Marau Block drains directly into Btg Baram. The alluvial area along Btg Baram at the eastern edge of this block is featured by several ox-bow lakes, the largest of which is Loagan Punguk, behind Kuala Tutoh. The other oxbow lakes are Loagan Pa, Loagan Sibong, and Loagan Payau.

1.14.8.5 Tidal Effects and Flooding Hazard

Being located far from the sea, tides and saline water intrusion are not an issue in and around the Project Area. However, the flooding hazard is an important factor to be considered. The hills within the Project Area are not susceptible to flooding. Concern about flooding is directed only at the low-lying alluvial and peat swamp areas, particularly during the Landas season.

The riverine alluvial plains occur in narrow strips along Btg Baram, Btg Tinjar, and their tributaries. The plains are low-lying, and they are subject to varying degrees of flooding. The major soils found in the alluvial floodplains are classified in Sarawak under the Alluvial Soil and the Gley Soil Groups.

Flooding may occur a few times every year after heavy rainfall events. The flood usually recedes in a few days' time after the rain. In view of such occurrences, the fluctuations in the river water level are often substantial. Based on the Miri Town Drainage Master Plan Study (KTA, 1996), the 100-year ARI (Average Recurrence Interval) flood level of Btg Baram near Kuala Baram is estimated at 2.3 meters above mean sea level (amsl). Nevertheless, at Marudi (DID Station No. 4143406; year 2003), the maximum and the minimum water levels of Batang Baram were recorded at 4.48 amsl and 1.08 m amsl, respectively.

Under natural conditions, the peat is waterlogged all the time. The convex nature of the swamp surface and the high-water retaining capacity of the peat mass give rise to a stilted water table. The water table does fluctuate in response to the rainfall and there is radial drainage from the center to the fringes of the peat swamp via sub-surface through-flow. As the peat mass is very permeable, there is no surface runoff. Flooding is confined to narrow zones at the periphery of the peat domes.

1.14.9 Community

1.14.9.1 Community Engagement Program

The project proponent conducted a thorough assessment of the communities impacted by the project activities.

To identify communities impacted by the project for community engagement, the following processes were taken:

1. The Project Proponent initially contacted the District Officers (DO of Maruid, Beluru, and Telang Usan) of the Sarawak Administrative Service of the Government of Sarawak. The DO heads the district office and is the principal officer responsible for the administration of lands, land titles, and community socio-economic development in the district. The DO has a comprehensive knowledge and understanding of communities in their district and is responsible for administrative issues with communities. The DO provided a comprehensive list of communities that would be impacted by the Project, and this was used as an authoritative starting point for the identification of communities impacted by the project.
2. In addition, the Project Proponents identified communities with Native Customary Rights within or adjacent to the Marudi LPF/0008 boundaries as having authoritative evidence of legal or customary tenure/access rights to territories and resources in the locality of the project.
3. The Project Proponents then retained the Universiti Malaysia Sarawak (UNIMAS) to undertake community identification and community engagements.³ The UNIMAS team is headed by Dr. Poline Bala a Professor of Anthropology at the Faculty of Social Science and Humanities and the Director of the Institute of Borneo Studies.

UNIMAS undertook widespread interaction with all neighboring communities that could possibly be impacted by the project and held meetings open to all-comers, to generally advise communities of the project and further refine the identification of impacted communities. Once impacted communities were identified, UNIMAS conducted baseline assessments and detailed household surveys in 100% of the identified communities.

UNIMAS implemented a 5-step plan:

Stage 1: Start Date 1 July 2022 RECCE.

Purpose: This activity had the following objectives

- Conducted direct inspection of the proposed project area with a team consisting of Local people and Technical Experts
- Familiarize the team with the physical environment and begin to identify issues of importance to the communities
- Information gathering to facilitate the next stages of the community engagement process

³ Summary of Community Engagement Process for Marudi Conservation Process

Stage 2-Start Date 26th July 2022 Community Profiling

Purpose: Understand Community Dynamics through village profiling. Identify Native Customary Land rights and rights to access the forests and which communities participate in shifting cultivation.

Stage 3 Start Date 3 October 2022 Focused Discussion Groups

Purpose: Adopted the FPIC principles of the UN Declaration of the Rights of Indigenous People. This was used as a guideline to assess the responses of the local communities to the potential impact of the VCS Project. The aims of the FDG were to gauge the communities understanding of climate change. Understand local strategies to minimize the impact of climate. To explore and understand the communities' perceptions about conservation activities and to gauge the acceptable economic development activities.

Stage 4: Start Date 10 March 2023

Purpose: Presentation of findings to the Project Proponents on the stage 1 stage 2 and stage 3 activities

Stage 5: Start Date 26th July 2023

Purpose: Baseline Household Survey for all the communities in the Project Area

The community identification and engagement program implemented by UNIMAS has identified all communities who are significantly impacted by the Project and engaged with 100% of these identified communities.

1.14.9.2 Clustering of Communities

During 2022, the consultants held several workshops with the local communities adjacent to the Project Area using a Geographical Territorial Approach to cluster the 75 villages into 4 distinct clusters.⁴ The villages include 38 principal villages and, in some cases, sub-villages. The actual village structure is dynamic, and villages can split off and merge over time.

Cluster 1: Riverine-based (Benawa-Tinjar)

Cluster 2: Riverine - Road based (Lama-Peking)

Cluster 3: Road - Riverine based (Batu Belah-Panai)

Cluster 4: Marudi Proper (Marudi-Linei)

The geographical Territorial Approach (GTA) is an approach that focuses on the specific characteristics of a region and therefore a more localized approach to development. The territorial approach proposes a systematic method that maps the diversity of the local socioeconomic dynamics, its history, and cultural resources. This is because each geographic area is unique therefore the outcome of a program implemented in one area will not be the same as the outcome in another area. Moreover, the territorial approach stresses the importance of negotiation, consensus-building, and conflict resolution, through a focus on a region's characteristics and its intangible human capital such as knowledge and networks.

Most significant is settlement patterns, which are two basic types: river based and land-based settlements. Inevitably this has great implications on access, livelihood strategies, and socio-economic patterns of targeted communities. Besides the Geographical Territorial Approach (GTA), the history of the communities, especially their settlement practices and patterns determine spaces that have led to localized external economies.

With the clustering method based on the Geographical Territorial Approach and the exclusion of the Batu Belah block, the number of longhouses/villages has been reduced from 75 to 50 locations. This is because there are scenarios where 5-7 villages are in the same territory and in fact of the same family or household but split or move away to set up a separate village within the same territorial domain. Therefore, there are overlaps in kinship and family history, as well as access to facilities and schools. This is particularly so amongst the Iban ethnic group. Villages do expand from a single village to become 3 different villages and at times, a few villages merge to become one single village, leading to "disappearing villages" in a list.

Secondly, is the land-river interface. There are two main types of river-based settlements.

- Settlements that are located along the banks of the two major river systems in the area.
- Another type is the land-based settlements.

For those located on the banks of rivers and streams. The village landscape is defined and determined using the river. These communities are more dependent on the rivers and streams to sustain their livelihood. Meanwhile, land-based communities are more dependent on the land for

⁴ The number of villages is dynamic and increases when communities split and decreases when communities combine.

their livelihood. Inevitably location determines the accessibility of the villages either by road or by river.

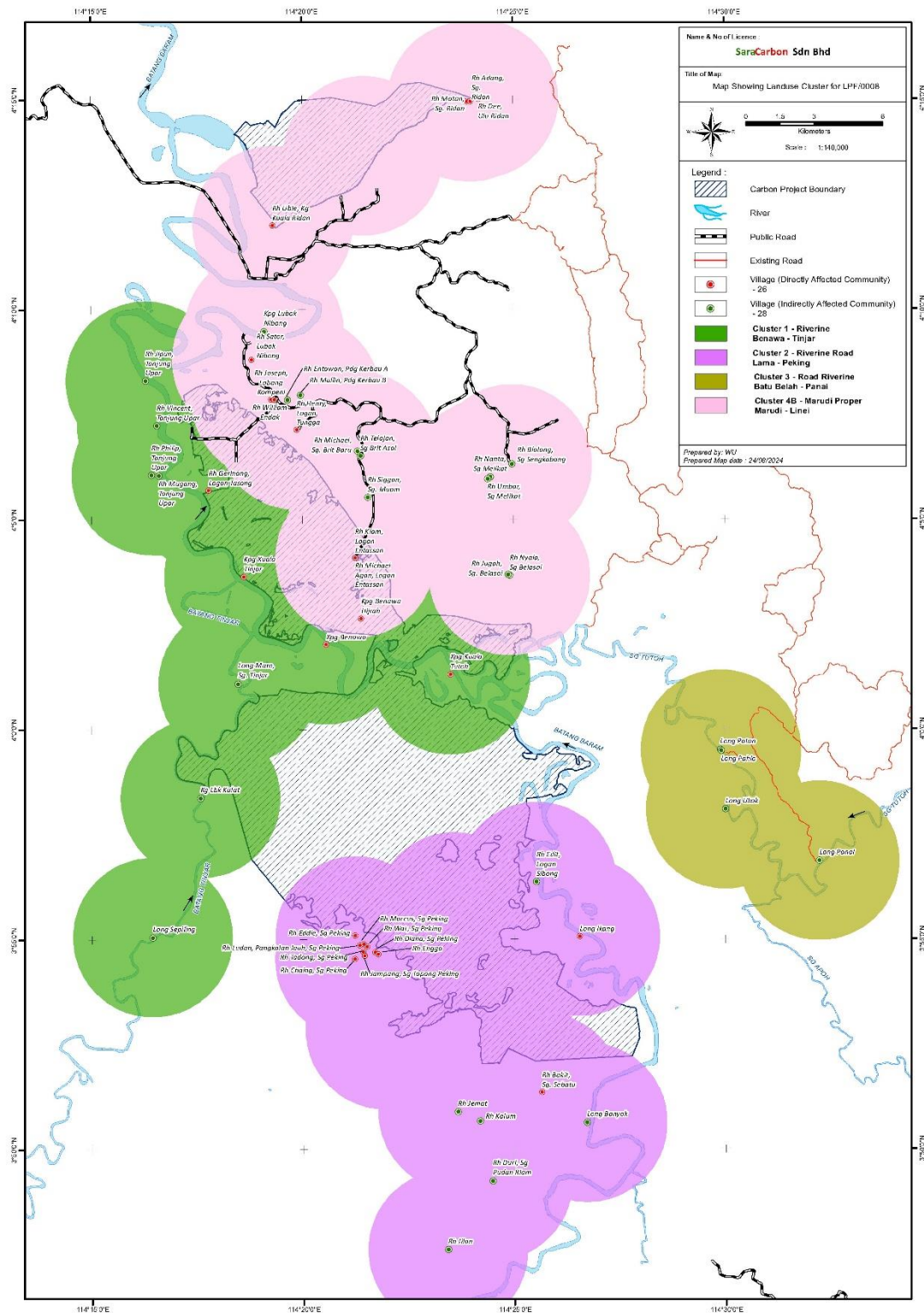


Figure 1-3 Location of Community Clusters in the Carbon Project Area

As the project boundary was defined the project area no longer includes Batu Belah block and as such no longer impacts the communities in Cluster 3. The table below shows the villages located in Clusters 1,2,4

The table below shows the list of Villages with a relationship with the Project by Cluster.

Key:

CLUSTER 1	Benawa-Tinjar
CLUSTER 2	Lama-Peking
CLUSTER 3	Excluded as Batu Belah block is no longer part of the Project Area.
CLUSTER 4	Marudi Proper
DAC	Directly Affected Community. These Villages have been highlighted in the Table below.
IAC	Indirectly Affect Communities

List of Stakeholder of LPF/0008 (Local Community of SaraCarbon Project Area)

Cluster	No	Village/Longhouse	Area	Ethnicity	TR/KK	Total Household	Coupe		Coupe No.	DAC	IAC
							Within LPF/0008	Adjacent LPF/0008			
1 (Benawa-Tinjar)	1	Rh Vincent	Tanjung Upar	Iban	Vincent Anak Kiew	33		✓	07C	✓	✓
	2	Rh Jipun		Iban	Jipun Anak Jantan	17		✓		✓	✓
	3	Rh Gerinang (Logan Tasong)		Iban	Gerinang Anak Kam	11	✓			✓	✓
	4	Rh Philip		Iban	Philip Anak Bayu	17		✓		✓	✓
	5	Rh Mugang		Iban	(included under Rh Philip)					✓	✓
	6	Kampung Kuala Tutoh	Kuala Tutoh	Kiput	Moses Belulok	74		✓	06C	✓	✓
	7	Kampung Kuala Tinjar		Kiput	(included under Kpg Benawa)	56		✓		✓	✓
	8	Kampung Benawa		Kiput	Hasbi Bin Sulaiman					✓	✓
	9	Long Maro	Sungai Tinjar	Kayan	Tugang Ngau	50		✓	09A	✓	✓
	10	Lubok Kulat		Kayan	Francis Laing Engan	4		✓	08A	✓	✓
	11	Long Sepiling		Kayan	Seman Anyi	82		✓		✓	✓
2 (Lama-Peking)	12	Rh Chaing	Sungai Peking	Iban	Chaing Anak Ugam	25		✓	05B	✓	✓
	13	Rh Marcus		Iban	Marcus Minggu Anak Bala	25		✓	08A	✓	✓
	14	Rh Eddie		Iban	Eddie Anak Ambat	29		✓		✓	✓
	15	Rh Wat		Iban	Wat Anak Ukat	34		✓		✓	✓
	16	Rh Tadong		Iban	Tadong Anak Besi	35		✓		✓	✓
	17	Rh Diana		Iban	Diana Anak Edehis Santas	21		✓		✓	✓
	18	Rh Jampang		Iban	Jampang Anak Kantan	25		✓	11A	✓	✓
	19	Rh Ludan		Iban	Ludan Rateah	34		✓	08A	✓	✓
	20	Rh Engga		Iban	Engga Bajeng	27		✓		✓	✓
	21	Rh Jemat	Sungai Sebatu	Iban	Jemat Anak Antau	22		✓	011A	✓	✓
	22	Rh Kalum		Iban	Kalum Anak Jugah	12		✓		✓	✓
	23	Rh Jilan		Iban	Jilan Anak Chaong	27		✓		✓	✓
	24	Rh Duri		Iban	Duri Anak Atek	24		✓		✓	✓
	25	Rh Bakit	Sungai Sebatu	Iban	Bakit Anak Janang	50		✓		✓	✓
	26	Logan Sibong		Kenyah	Edit Bilong	21		✓		✓	✓
	27	Long Ikang		Kenyah	Catharina Madang	74		✓		✓	✓
	28	Long Banyok		Morek	Mathew Balan Jalong	107		✓		✓	✓
4B (Marudi Proper)	29	Rh Adang	Ulu Ridan	Iban	Adang Anak Abang	32		✓	12A	✓	✓
	30	Rh Dee		Iban	Dee Anak Pagon	10		✓		✓	✓
	31	Rh Matan		Iban	Matan Anak Sampai	30		✓		✓	✓
	32	Rh Ubie	Kuala Ridan	Iban	Ubie Anak Mujap	11		✓		✓	✓
	33	Rh Kiam	Logan Entasan	Iban	Edwin Kiam Anak Ujai	28	✓		06C	✓	✓
	34	Rh Michael Agan		Iban	Michael Anak Agan	-	✓			✓	✓
	35	Kampung Benawa Hijrah	Lubok Nibong	Kiput	Jaafar					✓	✓
	36	Kampung Lubok Nibong		Kiput	Medlie Bin Moss					✓	✓
	37	Rh Henry	Logan Tungga	Iban	Henry Iboh	35		✓	07C	✓	✓
	38	Rh Sator	Lubok Nibong	Iban	Sator Anak Baran	20		✓		✓	✓
	39	Rh Entawan	Padang Kerbau A	Iban	Entawan Anak Ujang	7		✓		✓	✓
	40	Rh Mullin	Padang Kerbau B	Iban	Mullin Anak Igah	6		✓		✓	✓
	41	Rh Joseph	Lobang Kompeni	Iban	Joseph Chong	22		✓		✓	✓
	42	Rh Michael	Sungai Brit	Iban	Michael Selangkor Anak Unting	54		✓		✓	✓
	43	Rh Telajan		Iban	Telajan Anak Luyoh	36		✓	06C	✓	✓
	44	Rh Siggan	Sungai Muam	Iban	Siggan Anak Bawin	45		✓		✓	✓
	45	Rh William	Poyut	Iban	William Endak	15		✓	07C	✓	✓
	46	Rh Blalang	Sungai Sengkabang	Iban	Blalang Anak Atom	20		✓	06A	✓	✓
	47	Rh Nanta		Iban	Nanta Anak Sandom	23		✓		✓	✓
	48	Rh Umbar	Sungai Melikat	Iban	Umbar Anak Manila	46		✓	03A	✓	✓
	49	Rh Nyala	Sungai Belasoi	Iban	Nyala Anak Kedit	21		✓	06A	✓	✓
	50	Rh Jugah		Iban	Jugah Anak Anyi	11		✓		✓	✓

Table 1-13 List of Communities by Cluster

1.14.9.3 Cluster 1

Villages in this cluster are located on the banks of two main rivers covered in the study area which are the Btg Baram and its tributary, Sg Tinjar.

Cluster 1 communities suggest that nowadays there are more months of flooding (bulan tengkujuh) and rain after the climate change phenomena. For instance, the hot and rainy seasons can last as long as 6 months of the year while the total flooding event can be tantamount to 3 months of the year.

The ethnicity in cluster one is Kayan, and this is followed by 35.8% of Iban. Other ethnic groups in this cluster include 13.2% Kiput, 1.9% Kenyah, and 1.9% Berawan. 3.8% are listed as others. Often, those who identify as others are married into these communities; thus, they still identify with their remarried ethnic groups.

For a variety of reasons, both on an individual and societal level, skill acquisition is critical. Personal development, flexibility, career progression, economic possibilities, problem-solving, innovation, and society progress all rely on skill learning. It enables individuals to have satisfying lives and helps the overall well-being and progress of societies. Unfortunately, the community in this cluster lacks a fundamental structure—a training center.

Studies revealed that more than 60% of community members rely on fishery as their main activity and agriculture is practiced only for subsistence due to their exposure to flooding.

The impact of communities in Cluster 1 on the forests and environment is described below.

1.14.9.3.1 Unresolved land claims (land disputes).

- Unsettled land boundary clarification – The government's mapping tasks are pending; therefore, it leads to disputes between villages. Disputes between neighboring villages happen when a new village is formed inside the main village's land.
- Disputes with project developers – Lubok Kulat & Kg Benawa versus Pelita, SOP, Magna White (Miri Timur Plantation), SPAD.
- Disputes between villages with the logging company (Hua Aik).

1.14.9.3.2 Deforestation from agriculture.

- Most of the villages do not plant paddy due to the frequent flooding of the lowland area for paddy planting except for 1 village.

1.14.9.3.3 Collection of wood for fuel and timber.

- Collecting drifted wood/timber for firewood, building longhouses, and making boats.

1.14.9.3.4 Impact of uncontrolled hunting, fishing, and foraging

- Hunting is minimal to non-practiced, and foraging and fishing are controlled, except for electric-shock fishing (electrofishing) by some villagers from Kampung Benawa in Tinjar River around Lubok Kulat to downstream of Long Maro, potentially down to the river mouth of Tinjar.

1.14.9.3.5 Uncontrolled pollution from within the concession.

- Pollution from oil palm plantation - strong pesticides and chemical fertilizers that flow in the plantation ground drainage system pass through the village area into the Baram River, and pruned oil palm fronds cause ground drainage to clog (Kg Benawa to Tanjung Upar area).
- Generation of synthetic organic wastes from the upper Baram River and nearby areas during floods.
- Water and air pollution from smoke from the SOP factory. The smoke caused rainwater collected for drinking to get cloudy (greyish/blackish).

1.14.9.3.6 Uncontrolled pollution from settlements and community activities.

- Some villages do river dumping, and most communities practice open burning and landfilling.

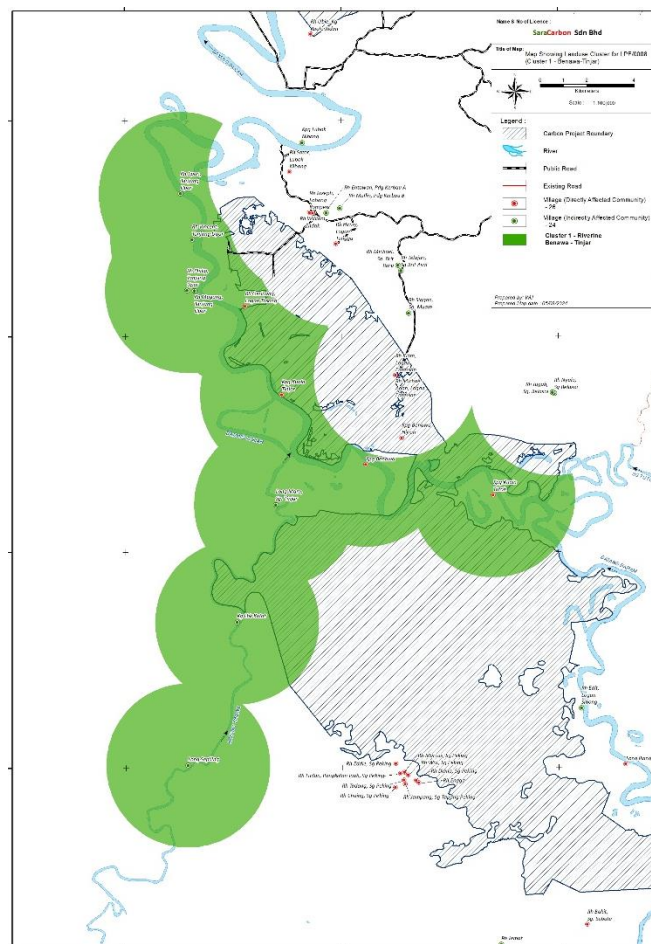


Figure 1-4 Community Cluster 1

List of Villages in Cluster 1	
•	Rumah Vincent
•	Rumah Jipun
•	Rumah Gerinang, Logan Tasong
•	Rumah Phillip
•	Rumah Mugang
•	Kampung Kuala Tutoh
•	Kampung Kuala Tinjar
•	Kampung Benawa
•	Long Maro
•	Lubok Kulat
•	Long Sepiling

Table 1-14 List of Villages in Cluster 1

1.14.9.4 Cluster 2

Cluster 2 consists of villages located near the main river, Btg Baram, a smaller river like Sg Peking, which is the tributary of Sg Tinjar.

For Logan Sibong, in the past, the first three months of a year were usually hot and rainy, but nowadays these months are rainy with flooding events. April to September used to be dry weather, but nowadays it is raining and flooding with intermittent weeks of dry weather. There is an indication that there are more months of rain than dry weather. Meanwhile for the Peking communities, during the musim dulu, there were 2 months of drought and the remaining 10 months of rain and floods. However, the trend today is that it rains most of the year with flooding events happening at the end of July. The weather pattern is uncertain/unpredictable during the first 6 months of the year.

The Iban are most of the ethnic group in cluster 2, followed by Kenyah, and Kayan. Morek and Kiput are the minority. The 'others' include those in mixed marriages. There are no facilities for skill development in their areas.

The Study revealed that more than 70% of community members rely on agriculture. Fishing is also intensively practiced.

The impact of communities in Cluster 2 on the forests and environment is described below.

1.14.9.4.1 Unresolved land claims (land disputes).

- Disputes between neighboring villages - overlapping of boundary claims.

1.14.9.4.2 Deforestation from agriculture.

- Reduced practices of seasonal hill paddy plantation (annual rotational basis on previous sites) – area size decreasing due to increased activity in oil palm plantations.

1.14.9.4.3 Collection of woods for fuel & timber:

- The collection of wood is mainly driftwood from the river –for firewood and constructing a floating jetty.

1.14.9.4.4 Impact of uncontrolled hunting, fishing, and foraging.

- No overhunting, no overfishing, and no uncontrolled foraging. Hunting is only conducted, when necessary, but the main activity is fishing. Fishing is conducted for their own consumption and for sale.

1.14.9.4.5 Uncontrolled pollution from within the concession.

- River pollution is caused by high volume activities of private companies such as extracting and transporting logs and sand (villages along the Batang Baram), and oil palm plantations (through connecting rivers).

1.14.9.4.6 Uncontrolled pollution from settlements and community activities.

- Communities practicing river dumping (flow downstream) other than landfilling and open burning.
- Minimal external and synthetic organic wastes resulted from the community's small-scale oil palm plantation (Sungai Peking).

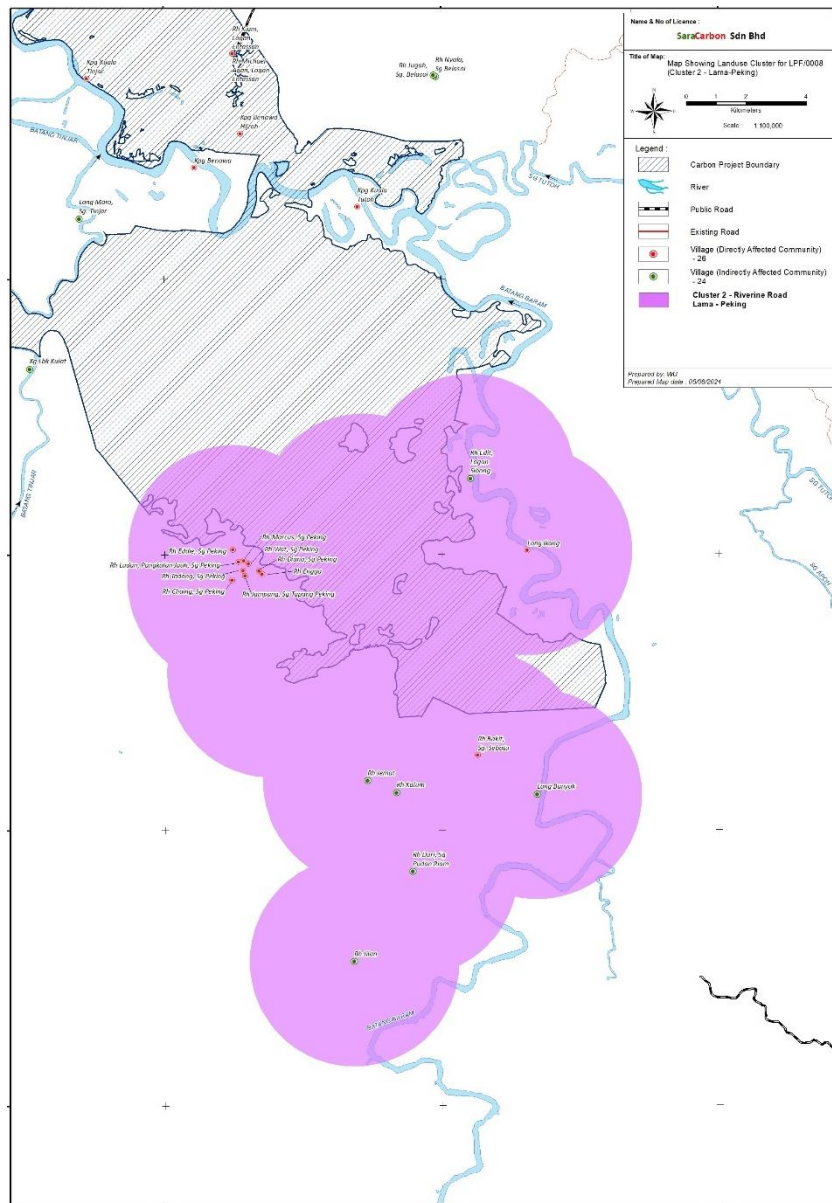


Figure 1-5 Community Cluster 2

List of Villages Cluster 2
• Rh Chaing
• Rh Marcus
• Rh Eddie
• Rh Wat
• Rh Tadong
• Rh Diana
• Rh Jampang
• Rh Ludan
• Rh Engga
• Rh Jemat
• Rh Kalum
• Rh Jilan
• Rh Duri
• Rh Bakit
• Logan Sibong
• Long Ikang
• Long Banyok

Table 1-15 List of Villages in Cluster 2

1.14.9.5 Cluster 3

Although Cluster 3 of villages and communities was included in the initial analysis of LPF/0008. The exclusion of Batu Belah block from the Project area has eliminated the relationship between this cluster and the Project,

1.14.9.6 Cluster 4

The present musim often rains and floods between the months of July to December. Compared to the past, the months of July to September were dry and drought prone and September to February often rains and floods. The major difference in weather patterns is the unpredictable season - one significant indicator is the number of floods that hit their village/longhouse in one year.

The Ibans are most of the ethnic group in cluster 4 followed by Kayan and others from mixed marriages. There are no facilities for skill development in their areas.

The study revealed that community members rely on both agriculture and fishery and sell the excess to the local market in Marudi.

The impact of communities in Cluster 4 on the forests and environment is described below.

1.14.9.6.1 Unresolved land claims (land disputes)

- Disputes within the village (among community and village leaders, and among village members)
- Disputes with a private company (Syarikat Sekaloh Sdn. Bhd.).

List of Villages in Cluster 4	
• Rh Adang	
• Rh Dee	
• Rh Matan	
• Rh Ubie	
• Rh Kiam	
• Rh Michael Agan	
• Kampung Benawa Hijrah	
• Kampung Lubok Nibong	
• Rh Henry	
• Rh Sator	
• Rh Entawan	
• Rh Mullin	
• Rh Joseph	
• Rh Michael	
• Rh Telajan	
• Rh Siggan	
• Rh William	
• Rh Balang	
• Rh Nanta	
• Rh Umbar	
• Rh Nyala	
• Rh Jugah	

Table 1-16 List of Villages in Cluster 4

1.14.9.7 Descriptions of Communities at Project Start

1.14.9.7.1 Ethnic composition

Local communities live in 50 villages.⁵ and longhouses, with the Chinese and Malay living in the town, and Iban, Kenyah/Kayan, Berawan, and Kiput in longhouses. Nine longhouses are situated inside the Project Area, with the inhabitants subsisting on fishing, farming, livestock, hunting, and gathering of forest produce.

In the previous EIA report, there are about 60 LH / village communities in LPF/0008, and most are located within 3 KM from the project boundary. There are about 2,800 households with a total population of about 22,700 people. The majority are Ibans, and other ethnicities are Kayan, Kenyah, Kiput, Berawan, Malay, and Bisaya. For this study, there are 6 ethnic groups involved: Iban, Kayan, Kenyah, Kiput, Berawan, and Morek.

UNIMAS has prepared a detailed analysis of the Indigenous communities in their community engagement report.

⁵ The definition of villages is quite fluid, and it is impossible to be exact. 58 is probably a conservative number.

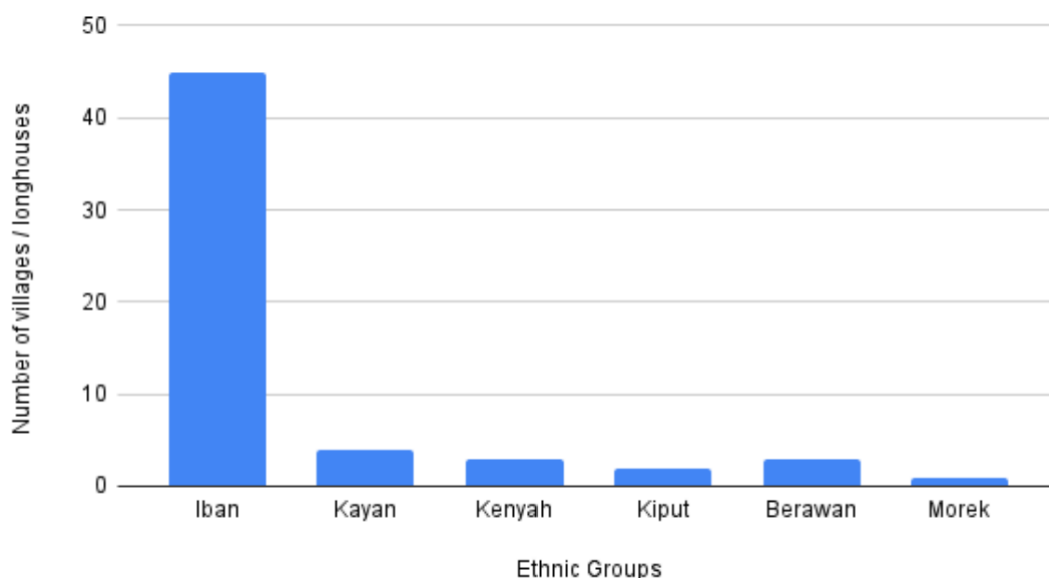


Figure 1-7 Villages/longhouses of communities residing in and around Marudi LPF/0008

NO	Community	Number of Doors	Population
1	Iban	999	6547
2	Kayan	247	2555
3	Kenyah	91	848
4	Kiput	472	59
5	Berawan	102	897
6	Morek	103	1200
Total		2014	12106

Table 1-17 Ethnic Communities and Population LPF/0008

The settlements in the study region are found in and around the Marudi township and the road between Marudi and Lubok Nibong, along Btg Baram, Btg Tinjar, Sg Tutoh, Sg Linei, Sg Peking and Sg Sebuoh. About nine (9) settlements are found inside the LPF Area while another sixty-four (64) settlements are located within a 3-km radius of the LPF Area.

The Marudi town area has a mix of Malay, Narum, Iban, and Chinese with approximately 14% of the total settlements recorded, and other minority native groups from the upper Baram area, such as Kayan, Kenyah, and Kiput who have moved to the urban area seeking better living conditions. The Iban form the major ethnic group (about 66%) in the study region, followed by Kayan (8%), Kenyah (4%), and Kiput (5%). Other minority orang ulu groups found include the Bisaya (2%) and Berawan (1%).

The Malay and Narum are Muslims. The Chinese may be Christians, Buddhists, or freethinkers. The Iban, Kayan, and Bisaya are partly Christians and partly pagans. Even though many of the natives have embraced Christianity, their traditional pagan beliefs still form an essential component of their culture and way of life. The Kiput at Benawa are Muslims while the Kiput at Kuala Tutoh are Christians.

Depletion of nearby forest resources forces ethnic communities to go deeper and further into the forest to obtain the forest resources (petai, honey, rattan, building materials, and medicinal plants) to maintain their livelihood, making their life more difficult. Forest roads facilitate the entry of outsiders looking for

forest produce, thereby increasing the number of people collecting the resources and thus contributing further to its depletion.

1.14.9.7.2 Impacts of commercial businesses on communities

The Karisma Pelita Marudi Oil Palm Plantation (OPP) and the Universal Pelita Marudi OPP are adjacent to the LPF Area. The Permata Gehara OPP is located to the northwest of the Marudi Block, while the Woodijaya Marudi OPP, SOP Tinbarap OPP, and the Magna OPP are located further to the west, across Batang Baram. Immediately to the southeast, an area had been alienated for the development of the Formasi Abadi OPP. The PUSAKA-KTS's Tutoh FP (LPF/0011) is located to the south of the LPF Area, across Sg Tutoh. Further south, the Rimbunan Hijau (RH) Group has developed a few oil palm plantations/estates, such as the PJP Pelita Long Ekang-Banyok OPP, Temala Oil Palm Estates and the Tabib Oil Palm Estates.

Some pockets of land at the confluence of Sg and Sg Buloh had been licensed to Syarikat Sebangsan Sdn Bhd for silica sand mining under 01/2011, Area A.

Despite the presence of all these companies, data the field survey indicates that there are still some community members residing in the project zone have never attended school, few who have completed primary school, and very few who have completed lower secondary school and higher secondary school. However, only 1 community member in one of the longhouses visited has completed a degree at the university level. Most community members also considered their financial situation as worse despite having a source of revenue, with a cumulative monthly revenue between RM500 and RM1200.



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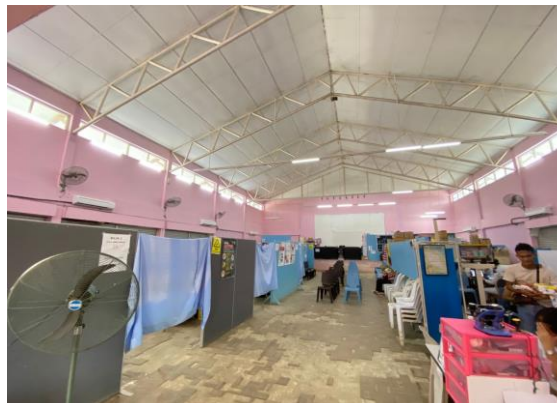
1.14.9.7.3 Community based infrastructure

Below are the descriptions of the infrastructure conditions at the project start in the project zone that should contribute to the community's well-being as soon as their employment, capacity, and income improve because of project activities as described in the project benefit sharing section below.

1. Long Lama Clinic



The clinic is located at the Long Lama community hall. The number of patients visited daily is estimated to be around 100 plus visitors to the clinic. This includes OPD (outpatients) and Mother and Child (pelawat klinik ibu dan anak). The clinic's electricity is generated by a generator which is placed opposite the clinic.



Staff and personnel at Long Lama Clinic consist of 6 MAs/AMO, 5 doctors, 1 FMS (Family Medical Specialist), 3 staff nurses, 2 community nurses, 1 nurse sister, and 4 pharmacists. Long Lama Clinic facilities are equipped with an X-ray machine, a Lab, Physiotherapy, and a Pharmacy.

2. Solar SARES (Sarawak Alternative Rural Electrification Scheme)

Supervised by Kementrian Utility & Komunikasi the project is implemented by SEB (Sarawak Energy Berhad). The project aims to provide 3000KV solar capacity to Long Banyok, Long Ikang, and Peking communities/Longhouses/Villages. The terms of the contract for the project are that major maintenance of the solar is managed by SEB for the term of 5 years while minor maintenance is managed by the community. Larger villages are considering shifting to hybrid electricity power Where the village utilizes both Solar and generators as their source of electricity.

3. Waste Management



Bukit Sabun dumping site

Supervision under the Ministry of Health (Water supply & sewage system)

Long Lama Town operation under the supervision of the Marudi District Council. Waste collection is done daily. Collected waste will be sent to Bukit Sabun dumping site and for the incineration process.

4. Sarawak Rural Water Supply Department (JBALB)

An initiative of the Sarawak government, through the Ministry of Utilities Sarawak to provide water supply to isolated settlements that have yet to have safe and clean water. The implementation of SAWAS (Sarawak Alternative Water Supply) is one of the means towards achieving Sarawak's vision of 100% water supply coverage by 2025. Uma Akeh, Long Puak water source is one of the beneficiaries of the SAWAS project. Located at the Uma Akeh Long house vicinity. A water treatment tank is built. The Baram River is pumped into the tank, and the treated water is then distributed to every household at Uma Akeh. Centralized water level monitoring is being done by the Department of Irrigation and Drainage, Sarawak.

5. Telecommunication and Internet

Jalinan Digital Negara (JENDELA) plan was implemented by the Malaysian Communications and Multimedia Commission (MCMC) to provide wider coverage and better quality of broadband for the rakyat. Project tenure is 2 years in selected villages. Listed are the villages around the Marudi area that are included in the JENDELA plan: Linei Puteh, Sungai Kejaman, Rumah Ridap Ak Slat, Kampung Benawa, and Kampung Narum.

6. SK Morek Primary School, Long Banyok

No photos were permitted by the schoolteacher.

Currently, there are 17 students at the pre-school while the primary school students of SK Morek have a total of 57 students. There is 1 teacher and 1 assistant for the teaching of preschool students. According to SK Morek's principal, the number of school staff for primary school is 11 teachers (including the principal), 2 assistant teachers, 1 warden (Asrama), and 2 cooks. Facilities such as treated water and electricity are still lacking at the school as currently electricity at the school is generated by Gen Set while water is being pumped from the river in front of the school. There is a shortage of computers in school computer labs and a shortage of teachers, resulting in teachers having to take over some extra subjects to teach.

7. District Education Office of Marudi (PPD Marudi)

During the visitation, some issues were discussed:

i. Replacement of teacher's quarters

ii. Lack of teachers: Teachers who are willing to transfer to Marudi must go through a tedious process and it will take time for them to get approval for transfer as documents need to go through various stages for clearance as it needs PPD letters and JPN letters.

8. Sahabat Alam Malaysia (SAM), Marudi Office

Sahabat Alam's leading role is to assist villages regarding land disputes. Some of their projects with the local community are an Agro Ecology Project and the Forest Project-Planting Forest trees for forest conservation.

9. Marudi Department of Sarawak Rural Water Supply Department (JBALB)

JBALB Marudi is under the supervision of KPLB (Kementerian Pembangunan Luar Bandar). The high-level tank is situated at Sg Selejau, Booster station is at Telang Usan. Currently, during the feasibility study at Sg Selejau, some issues to highlight are the water pressure issues as there is trouble in pumping out water as there is not much water pressure. There is also the need for replacement of pipes as the current pipes used are deteriorating and in need of replacement. The current pipes are made with asbestos cement; the budget proposed for the replacement is RM 48 million just to cover Marudi town only.

10. Marudi District Office

During the visitation trip listed are some issues being discussed:

i. The main challenge for waste management is to finance new waste dumpsites. Even though the issue has been brought forward to the council, they are still facing a shortage of budget to relocate to a new site. Some suggested for SDO (Sarawak State Development Office) infrastructure to build a “Pondok” (waste disposal pick up station) for the convenience of the council to pick up the garbage.

ii. For settlements that are accessible by road (except Sg Belasoi) they are provided within the power grid, whilst for rural settlements are provided by SARES. Regularity is still average as blackouts are still expected to happen occasionally.

iii. JBALB is in progress for the construction of water piping to Lubuk Nibong (Rh Sator). Problems arise as no water meter is provided for the Rh Sator household. Water intake for Kampung Padang Kerbau Melayu is waiting for relocation as the piping arrangement is poorly designed and the shortage of budget is the cause of the delay.

iv. Poverty is still high in Marudi due to the high number of E-kasih recipients based on income per capita and most of the B-40 are government servants.

11. SK Kuala Tutoh primary school

The school's foreground building is the classroom. Built about 12 feet above the ground as the school is at risk of flooding during flooding season. It is typical to find combined classes around the school as one of the main facility problems is the lack of classrooms and storage rooms. For school power supply they are using 2 generators (12 hours of usage for each generator) to supply electricity to the school. Aside from the lack of electricity supply SK Tutoh still lacks a properly treated water supply to the school as for alternative water supply the school water resources came from rain fed. From the government initiative, MT (Rancangan Makanan Tambahan) is provided for SK Tutoh B40 students to improve their nutrition and well-being.

12. Marudi Hospital

Currently, the capacity of Marudi Hospital is around 150-200 patients. There are 54 beds for admitted patients while for critical cases will be referred to Miri Hospital. There are around 200 to 210 staff and sometimes there will be short staff as some of the hospital staff requested to transfer to other work locations. Also highlighted during the interview session were the issues with budget as some medications are not available/ shortage due to the high price of certain medications resulting with the Marudi Hospital being unable to obtain them due to insufficient budget but for common medications they are readily available.

13. Sarawak Energy Berhad (SEB) / SESCO Marudi

The main source of electricity is from the Bakun Dam. For rural areas e.g., the Ulu area (Linei) is powered by (SARES) solar while for Long Lama up to Long Laput SEB provides Genset as they are (scheduled maintenance: minor and Major is borne by SEB). For Solar capacity, it will be checked regularly at Kuching headquarters. Some issues highlighted are the issues of road and land access that halted some SEB installation progress as it needed permission from the community and required a long time for the negotiation process.

14. Giatmara Training Centre, Baram (Vocational college)



Giatmara Baram is the only training center located in the Baram area. It was first established in 2016 and accepts only local students. There are 2 intakes yearly for students of age 15 and above. Courses offered at Giatmara are Automotive courses which are open to 20 students per intake and Hairdressing courses open to 20 students per intake. The levels of courses offered at Giatmara Baram are SKM levels 1 and 2. The fee for the courses is RM 100 and the student will receive RM 200 monthly allowance. This course is 80% based on skill training, where the student will have firsthand experience with their assignments. Most students who graduate from the training will get their job placement. Students who wish to pursue SKM Level 3 will be referred to Giatmara Miri.

1.15 Compliance with Laws, Statutes, and Other Regulatory Frameworks

The SaraCarbon Project is designed and implemented in full compliance with both state (Sarawak), and Malaysian national laws. The project complies with international law and relevant regulations on land use, forestry, REDD+, AFOLU, and climate agreements.

Sarawak State Laws:

- Forest Ordinance 2015 (Cap 71);
- Sarawak Land Code (Cap 81);
- Forests (Forest Carbon Activity) Rules 2022;
- Natural Resources and Environment Rules Ordinance (Cap 84);
- Wildlife Protection Ordinance 1998 (Cap 26);
- Sarawak Cultural Heritage Ordinance 1993 (Cap 6),and
- Labor Ordinance (Cap 76)
- Environment (Reduction of Greenhouse Gases Emission) Ordinance 2023

Malaysian National Laws:

- Employment Act, 1955;
- Immigration Act, 1959/63;
- Environmental Quality Act, 1974;
- Pesticides Act, 1974;
- Occupational Safety and Health Act 1994;
- Workmen's Compensation Act, 1952;
- Employees' Social Security Act 1969;
- Plant Quarantine Act, 1976; and
- Renewable Energy Act, 2011.

International Agreements:

- Convention on Wetlands of International Importance, 1971;
- Convention on the International Trade in Endangered Species of Wild;
- Flora and Fauna, 1973;
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000;
- International Tropical Timber Agreement, 1994;
- United Nations Convention on Biological Diversity, 1992;
- United Nations Framework Convention on Climate Change, 1992;
- United Nations Declaration of the Rights of Indigenous Peoples, 2007;
- The Kyoto Protocol to the Convention on Climate Change, 1997.
- Paris Agreement, 2015
- UNESCO Cultural Heritage Conventions:
- United Nations Declaration on the Rights of Indigenous People and ILO Convention 169 on Indigenous and Tribal Peoples,⁶

⁶ Although Malaysia has yet to ratify the declaration the Project Proponent will adhere to the principles of the Declaration as required by the VCS standard

SaraCarbon will operate in full compliance with Sarawak and Malaysia's laws and will also comply with all relevant international conventions, best practices, and agreements applicable to a REDD + project. As part of the preparation of this Project Description Document (PDD), a legal opinion was sought to ensure full compliance with all the relevant Malaysian regulations. The project management has reviewed the existing Standard Operating Procedures (SOP) and is in the process of revising them to ensure their compliance with the objectives of the SaraCarbon project.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

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

☐ Yes ☒ No

1.16.2 Registration in Other GHG Programs

Has the project registered under any other GHG programs?

☐ Yes ☒ No

Is the project active under the other program?

☐ Yes ☒ No

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

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

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

☐ Yes ☒ No

1.17.2 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

☐ Yes ☒ No

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 0 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes

☒ No

1.18 Sustainable Development Contributions

The project activity contributes to sustainable development in multiple ways. The project activity aims at conserving and restoring 21,410 hectares of forest lands and preserving 24,180 hectares of wetlands through various combinations of activities. Conserving the existing forests from deforestation and degradation will reduce greenhouse gas emissions by avoiding deforestation, avoiding degradation of peatlands, and increasing carbon stock through forest restoration. The project activity will keep the forests and wetland ecosystems intact and protect them from loss. Therefore, it will contribute to the state's and country's forest cover. The project activity also aims at conserving existing floral and faunal diversity, principally through the protection of forests and wetlands. Specifically, the project activity aims to contribute to achieving the following UN SD Goals. 13 Climate action, 14 Life below water, and 15 Life on Land. (See table below)

Nationally as well, the project activity is aligned with the sustainable development goals of Malaysia. The country's sustainable development priorities are now closely aligned with the UN Sustainable Development Goals (UN SDGs). Malaysia assisted in the creation of the UN SDGs and has expressed its strong commitment to the 2030 Agenda and the SDGs overall. The SaraCarbon Project supports the achievement of the SDGs as outlined in the table below. Malaysia has recently completed a voluntary national review and is currently developing the SDG roadmap phase 2. The Malaysian government emphasizes SDG 13.

Malaysia has an SDG index of 69.32% indicating it is 69% of the way to meet all its SDG goals.

All project data is available to support monitoring efforts at the provincial and national levels.

Table 1-18 Sustainable Development Goals

	SDG	Relevant project activity
	Climate Action	GOAL: Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy The high rate of deforestation has had a serious impact on the climate resulting in elevated temperatures, low and erratic rainfalls, and floods, among others. Furthermore, increasing pressure for palm oil production expansion, timber extraction, and other socio-economic factors have negatively impacted the biological resources in the SaraCarbon Project Area. SaraCarbon works to combat climate change through the sequestering of carbon in a direct, quantifiable way. Sequestration is accomplished through the planting and growing of trees and sequestering carbon by peatland soil. In addition to sequestering carbon, forests reduce the temperature of the air by evaporating water through their leaves and reduce the soil temperature by shading the ground. SaraCarbon aims to collaborate with local communities to create adaptation strategies and ways to combat the local ramifications of climate change. Climate change is often considered on the macro level with little thought to the day-to-day impacts on vulnerable populations. By collaborating directly with communities, listening to their concerns, and helping to develop strategies, SaraCarbon's approach will be local results oriented.
		GOAL: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development The SaraCarbon Riparian Tree Program has a direct impact on marine resources. The protection of wetlands and riparian areas is crucial to the overall health of watersheds, rivers, and lakes. (Project Area not close to seascape). The riparian areas restoration will support trapping sediment, storage of floodwater and energy, recharge groundwater, and promote biological diversity.

	Life on Land	GOAL: Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. The planting of trees increases biodiversity while also providing the structural conditions for subsequent forest growth. Tree growth not only restores degraded land but also allows for the return of various forms of life. Practices such as agroforestry and conservation farming that will be introduced will revitalize the entire project region and create wildlife corridors between habitats.
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1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

Appropriate production and water table data from the Project Area will be collected, analyzed, and compiled upon each verification event to estimate activity shifting and ecological leakage.

Any actual or potential threat of leakage will be mitigated by the Carbon Project by taking active steps to reduce and remove the threat of leakage from any displacement of planned deforestation activities and ecological leakage (see § 4.3). SaraCarbon, along with Project partners has been engaging the Government of Sarawak, as well as key industry players, to assist with a systemic change in industrial land use for Acacia plantations across the country and to modify land-use practices to ensure greater sustainability. Samling as plantation owner and operator has taken steps to limit the expansion and increase the sustainability of its own plantations in peatlands and has stopped harvesting in natural forest areas.

1.19.2 Commercially Sensitive Information

All relevant information has been provided following the VCS Standard 4.7

1.19.3 Further Information

1.19.3.1 Climate, Community, and Biodiversity Programs

SaraCarbon will meet the VERRA Climate, Community, and Biodiversity requirements of the VCS standard. Aspects of the community and biodiversity program are shown below:

1.19.3.2 Forest Preservation and Restoration

The forest preservation and restoration program are at the core of the Project. Three core capabilities will be established at the outset of the project:

- (1) Forest Preservation
- (2) Fire Protection and
- (3) Community Engagement

Forest Preservation

A preservation program will be implemented to monitor activities within and on the boundary with the Project Area. The purpose of the preservation program is to detect and mitigate activities that lead to deforestation and degradation of the forest ecosystems within the project. When activities or threats are detected, the forest preservation team will restrict the immediate activities within their powers and report the activities to project management and the community engagement teams, whose job it is to implement long term problem resolutions.

Fire Prevention and Control

A specialist capability will be established to detect and fight forest fires. Community programs will also be established to mitigate risks from community-based activities and from neighboring land management activities.

Community Engagement

Community programs will also be established to mitigate risks from community-based activities and from neighboring land management activities. At a basic level, the community team will actively engage with the community to ensure they are fully aware of the project and its needs and requirements and to identify any claims and grievances communities may have in relation to the Project Area.

The project also intends to share the benefits from the Project through preferential employment of local community members and through the promotion of harvesting of non-timber forest products. The project may also implement other livelihoods and welfare programs as a benefit sharing mechanism during project implementation.

Community Engagement

Community Employment Opportunities

Most of the communities residing in the villages are farmers with a small number of them operating village shops and transportation services. Many of the more educated members of the communities have become civil servants or working for private firms outside the SaraCarbon Project Area.

Out-migration is common in rural areas and there is no exception to the communities from these villages. The main reasons for out-migration include outside employment opportunities, following spouses, and schooling. The biggest reason was due to the availability of employment outside their villages, which were attractive, especially to the young and educated members of the households. The destinations of out-migration are the major towns of Sarawak and Peninsular Malaysia.

SaraCarbon management will prioritize employment among the local communities to enhance their long-term social and economic well-being. Job priority for locals would ensure that they benefit directly from the development of the Marudi Forest Conservation and Restoration Project.

SaraCarbon will practice two (2) mechanisms to advertise any job vacancy within the Project Area:

- i. Advertisements for vacant positions will be posted on the noticeboard at security posts in the nursery camp.
- ii. Recently, SaraCarbon has created awareness in every village related to the Project Area about the vacancies in SaraCarbon. The team has handed over the vacancy advertisement to the headmen of each village; consequently, the headmen will put the ad on their respective notice boards in their village.

At the microeconomic level, the SaraCarbon project will stimulate the local market through the demand for foodstuffs such as livestock, vegetables, and fruit for the canteen and workers in the operation camp and nursery.

The existing forestry plantation is already a major employer in the region. The Project Proponent's intention is to retain existing staff where possible, including retraining to fit in with carbon related activities. In the case where new opportunities exist, local candidates will be prioritized where feasible. Open positions will be advertised in a variety of ways to reach a broad array of potential applicants. This includes online posting on job boards, announcements and postings to District offices and in villages and local educational institutions, and through social media. Project field staff will communicate with community leaders (or other appropriate representatives) to announce any upcoming employment positions, giving communities an opportunity to discuss the position's requirements and qualifications. After this consultation process, villagers who fit the job description and meet the minimum requirements will be recommended to the project team.

Programs for the Promotion of Communities and Biodiversity

The Project will involve the restoration of forest ecosystems through protection from logging and fires, the employment of community members, and the promotion of sustainable harvesting of non-timber forest products where possible. The project will not impose any changes to access or legal land use rights by the community in the project areas. The Project will not result in net harm to the communities and enhance environmental services generated from the Project Area.

During the project implementation, the Project Proponent may identify further community-based programs that enhance the livelihoods and social welfare of communities, while being consistent with the overall project objectives. These programs will be designed considering communities' needs and preferences and only entered with the full prior informed consent of the communities.

Also, during the project implementation, the Project Proponent may identify further programs for the enhancement of biodiversity within the project area.

Worker Training

The Marudi LPF/0008 has existing training and new employee induction procedures. These will be continued on as operations begin for the Marudi Forest Conservation and Restoration project. The LPF portion of the existing license will continue as an LPF. There will be no staff reductions due to this project. Additional staff will be employed to manage the carbon project.

Consequently, there will be the requirement to induct and train new hires for the SaraCarbon Project. Such training can take many forms, from work shadowing, internships, ad hoc training, to formal classroom style teaching.

SaraCarbon will utilize expertise within the Samling Group wherever suitable and will bring additional third party expertise in the form of consultants and or new hires to address and bridge skill gaps and to provide training appropriate to the forest concessions' new role as a forest Carbon project.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification

The Forestry Concession was operated by Samling Reforestation (Bintulu) Sdn Bhd for twenty years before being transferred to the Project Proponent and has continually collaborated with the local communities, the Forestry Department, and other agencies, since the founding of the timber plantation.”

The Project Proponent then undertook a comprehensive process to identify impacted communities which is described in detail in section 1.14.9:

1. The Project Proponent initially contacted the District Officer (DO) of the Sarawak Administrative Service of the Government of Sarawak, which is the competent authority for these matters. The DO provided a comprehensive list of communities that would be impacted by the Project.
2. The Project Proponents identified communities with Native Customary Rights within or adjacent to the Marudi LPF/0008 boundaries as having authoritative evidence of legal or customary tenure/access rights to territories and resources in the locality of the project.
3. The Project Proponents then retained the Universiti Malaysia Sarawak (UNIMAS) to undertake community identification and community engagements.

The team from the Universiti Malaysia Sarawak (UNIMAS) first started with DO advice and the list of communities with Native Customary Rights (NCR) areas in the LPF. The UNIMAS team then visited the communities, organized the communities into clusters, and then held a series of workshops and meetings with community and community leaders. The workshops shared the Project Proponent’s vision for the SaraCarbon Project Area and provided information and training sessions to further educate the communities on climate change and how the SaraCarbon Project will help reduce GHG emissions and provide benefits to the local community. The tables below list the identified Stakeholders. A 5-step engagement process was implemented, and the first stages were used to identify all impacted communities. Later stages engaged with 100% of identified communities.

Table 2-1 State level Agencies and their Duties/Relevant Responsibilities

Agency	Duties/ Relevant responsibilities
State Planning Unit of Sarawak	Responsible for economic planning at the state level and budgetary management and disbursement of funding allocations, including

		coordination of Government co-financing and in-kind contributions. To be effective, the planned activities in the state peatland will be coordinated with development proposals and plans, for example for land development in the state land.
	Forest Department Sarawak (FDS)	- Administer and manage the state's forest resources based on sustainable forest management (SFM) concept to benefit the social, economic, and environment for the people. - Function as the implementing agency for policies and enforcement of forestry laws and regulations. - Function as the implementing agency for development efforts, rehabilitation, and reforestation through proper silvicultural practices for optimum and sustainable production of forest produce.
	Fire and Rescue Department (BOMBA)	BOMBA is responsible for suppressing fire and provides training for the stakeholders on firefighting operations
	Department of Agriculture (DOA)	- Provide consultation services and technical support in a package format to entrepreneurs, private organizations, and agriculture development agencies. - Development of a trained and skilled workforce to cater to the needs of the agriculture industry. - Develop Agriculture Food and Soil Information Centres for planning purposes and implement development programs for the agriculture sector. - Conduct training at the agriculture Institute and Training Centre to fulfil the requirements for a skilled workforce within the agriculture sector. - Monitor and control the quality of the country's agriculture resources and seedlings. - Assessing land and crop suitability classification and soil survey - Promoting sustainability agriculture and advisory services to smallholders - Implementing government agricultural policy - Promoting and implementing the Good Agriculture Practices
	Department of Irrigation and Drainage (DID)	- Conserve, manage, and develop water resources, land, and related resources across all sectors within a river basin. - Implement erosion control plans across the country.

	- Integrated River Basin Development and Integrated Flood Management for flood management plans. - Provide Standards and Procedures for Urban Drainage Design for Peninsular Malaysia.
Sarawak Natural Resources & Environment Board (NREB)	- The NREB is tasked with the responsibility of protecting and managing the environment and the conservation of the natural resources of the State based on the principles of sustainable development. - The NREB enforces Sarawak specific Environmental Regulations
Department of Land and Survey	- Ensuring proper land administration by recording alienation and land-use changes - Determine the exact boundaries of different land uses and ensure their legal status
Sarawak Forestry Corporation.	- Conservation measures and monitoring of wildlife - Coordinate the enforcement of wildlife protection - Objectives of the department: i) Protection, management, and preservation of biodiversity for production benefits. ii) Protection and development of protected areas for the purpose of research, education, economic, aesthetic, recreation, and ecological purposes. iii) Enhancement of knowledge, awareness, and public support on the importance of biodiversity conservation.
Department of Veterinary Services	- Control, prevent, and eradicate animal and zoonotic diseases. - Production of livestock, livestock produce, and animal feed. - Training for the livestock and domestic animal industries. - Expand livestock production and animal health as well as general veterinary health.
Department of Health (DOH)	- DOH is responsible for a healthy community through: - i) Provision of high-quality, affordable and accessible healthcare service ii) Prevention and control of disease iii) Protection of the health of the population iv) Sustainable and continual health promotion in smart partnership with various agencies, organizations, and the community

District Offices/ District Land Offices	• Management development and disposal of land. • Provides technical services and enforcement. • Management of land title registration. • Management of land revenue. • Management Services include administration, human resources, finance, and information technology. • Management of socio-economic development and the implementation of small-scale rural infrastructure projects. • Management of Disaster Management Committee at District level
District Municipality / Council	• Their functions are as local government of respective areas including provision and management of services such as waste disposal. • Enforcement and monitoring of development at the district level • Implementation of the local district plan
Other relevant stakeholders	• Interested parties (NGOs, JKK Kampung, Head of Village, Community Based Organizations - CBOs) • Work together with government and other agencies to protect and support the government in creating national and local awareness of the importance of conserving ecosystems • Landowners, local community involvement, and support are important for a successful management program that will involve the protection, monitoring, development, conservation, and promotion of the buffer zone
Research institutions and universities (government and private)	• Undertaking fundamental and applied ecosystem research using federal funds adding to the overall understanding of these systems • Provision of expert opinions on issues related to peatland and water conservation management • Providing a pool of scientific expertise to undertake research and monitoring development and application (R,D & A)

Table 2-2 Stakeholder Analysis

Group	Strengths	Weakness
Government stakeholders	- Deconcentrated services available	

		- Agricultural technical advice and guidance: political and strategic directions; Crop protection (control of diseases and pests); - Post-harvest (improvement of traditional silos, cereal banks, equipment, and machines: rice beater and husks), rehabilitation of rice fields, etc. - Experience in providing technical support to farmers to increase their productivity and rehabilitate activities in rice fields - Support farmers and farmers' organizations' access to goods and services for the achievement of - Experience in the implementation of a Memorandum of Understanding (MoU) with projects and NGOs on peatland - Technical capacity for advising and supporting rice seed multipliers - Experience in ecological monitoring, and participatory mapping - Experience in wetland conservation - Experience in peatland restoration	- Insufficient technical staff (higher level) in the regions, sectors, and sections - Insufficient technical and financial means to implement activities and operations in the field. - Insufficient motivation for the personnel thereby - Insufficiently qualified human resources
	Local authorities	- Proximity monitoring and law enforcement	- Insufficient motivation
	NGOs	- Own offices in Marudi - Staff available, including active local animators equipped with vehicles and motorized.	- Insufficient financial resources for the implementation of activities

		- Experience in vegetable gardening, sensitization of local communities; facilitating farmers' concertation, diagnosis piloting, and recovery of seawater rice fields	
	Local communities		
	All Farmers (men and women)	- Traditional knowledge about wetland rice cultivation through a land conversion system - Knowledge of freshwater management - Land users	- Weak capacity to manage rice fields for increased productivity. - Low capacity to counter sea level rise and coastal erosion - Reduction of workforce due to rural exodus - Low literacy level
	Women	- Sound understanding of the wetland ecosystems, their services, and their importance for human well-being. - Awareness of wetland ecosystems' conservation needs - Responsibility for the use of ecosystem resources and services	- Low capacity to reduce post-harvest loss. - Insufficient Income Generating Activities (IGA) opportunities offered. - Insufficient access to education - Absence of services and employment opportunities in the communities
	Young people	- Important workforce for rice field maintenance	- Migration to urban areas. - Insufficient access to education
	Council of elder/ Traditional power structure	- Hold the traditional power. - Regulator role that promotes consultations and manages conflicts within the community. - Existence of women's council of elders	- Loss of traditional knowledge
	Village committees	- link between the village and the State, and the village and the local administration - Existence of village development committees and land management committees in some LPF Areas - Reflection on and implementation of	

	integrated community development actions	
Youth and women's associations	- Informal groups - Assist and provide services to their members	

Table 2-3 Stakeholder Ranking

		Influence of the stakeholders on peatland preservation, afforestation, and reforestation activities			
Stakeholders		Low	Moderate	Significant	Highly influential
Public Sector (Govt)	Ministries and deconcentrated administration			X	
Local authorities	Sections authorities	X			
NGOs	International NGOs			X	
	National NGOs	X			
Local communities	Traditional rulers,		X		
	Cooperatives			X	
	Associations		X		
	Farmers				X
	Fishermen				X
	Women				X
Private sector	Processing industries		X		

Legal or customary tenure/access rights

The Project Area comprises land that has been utilized by the Samling Group under license LPF008 for twenty years and as such most claims have been addressed. Nevertheless, the boundaries of the Project Area have been adjusted to remove areas with conflicting claims. No Native Customary Rights Land has been included in the Project Area. Areas of cultural significance have been identified and excluded. The Project also has in place a grievance mechanism through which any future claims can be addressed.

**Stakeholder
diversity and
changes over
time**

See section 1.14.9 on the current situation of communities.

Expected changes in well-being	The project will directly employ community members who will enjoy employment preference as a project priority. The project will provide protection from the impacts of fire and other deforestation activities. The project will not disturb existing property rights to access and use Native Customary Rights Lands (NCR). The project protects community related historic and cultural sites and does not disturb their access or use of these areas. The project encourages the sustainable collection of non-timber forest products by communities with such customary rights provided endangered species are fully protected. Finally, the project proactively implements actions to resolve any outstanding land claims.
Location of stakeholders	See section 1.14.9 on the current situation of the communities.
Location of resources	All areas with the LPF/0008 concession to which stakeholders have Native Customary Rights and areas that have been identified to have religious or cultural significance have been excluded from the Project Area.

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	01-July-2022 was the start of the Consultation Process by UNIMAS. The Process was broken down into 5 stages as shown in the table below.			
	Stage	Start Date	End Date	Purpose
	Stage 1	01-07-2022	06-07-2022	Recce” Community Location Organization, Accessibility, Known Issues and establish contacts for stage 2 & 3
	Stage 2	26-07-2022	03-08-2022	Community Profiling: Native Customary rights holders, shifting cultivation, Community location, ethnicity, livelihoods. Assignment of Communities into Clusters, Community expectations
	Stage 3	03-08-2022	08-08-2022	Focus Group Discussions. FPIC

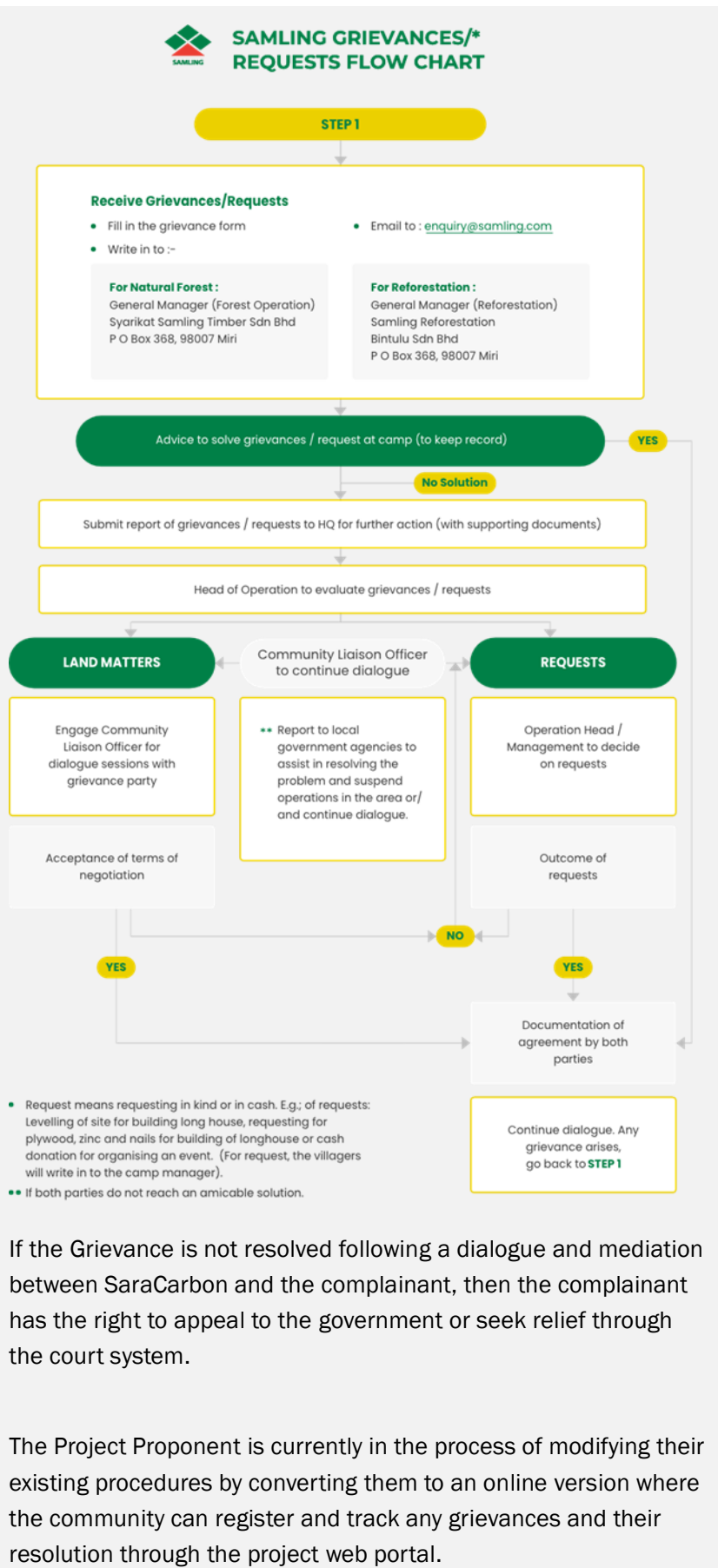
				discussions. Map leadership patterns and assess community needs.
	Stage 4	10-03-2023	12-03-2023	Presented findings of the Stage1,2,3 study to communities. In the spirit of FPIC, and collected additional input from the community
	Stage 5	26-07-2023	19-08-2023	
	A Household Survey	26-07-2023	31-07-2023	Survey of Communities to establish demographics (age Gender, position in the household, marital Status, Ethnicity, Education level) Employment Income, and technical training. Access to infrastructure
	B. Social Facilities	17-08-2023	19-08-2023	Survey and observation of the status of schools, hospitals, infrastructure facilities
Stakeholder engagement process	A list of meetings, agendas and minutes, and resolutions of community engagements is provided in Appendix II.			
Consultation outcome	In general, the communities supported the implementation of the project and the benefits they will enjoy.			
Ongoing communication	The community engagement process is ongoing with the SaraCarbon team examining the possibility of adding the CCB label in the future.			
Stakeholder input	Stakeholder consultations took place over 2 years and went through five separate stages. All inputs were recorded in the minutes and project notes. These were used to develop the community aspects of the project.			

2.1.3 Free Prior and Informed Consent

Obtaining consent	See 2.1.2 on the community engagement process which is entirely voluntary according to the FPIC process. Because there are no pre-existing property rights within the project area, then the agreement process is simplified and largely related to voluntary participation in planned, regular, and ongoing community consultation. This was discussed during the community engagement. Further consultation with other stakeholders was implemented during the public launch of the project at the Asia Carbon Conference, 14-16 March 2023, which was hosted by Samling Group at the Pullman Kuching. Note that the project will not encroach on land or relocate people. Currently, every attempt has been made to exclude all areas with pre-existing property rights. Where there are current or future claims on project areas, these will be dealt with according to the claims and grievance processes described in 2.1.5.
Outcome of FPIC	The concession license for utilization of the project areas is issued exclusively to SaraCarbon Project. The Project Developer recognizes Native Customary Rights Lands (NCR), and these areas are excluded from the project areas. The Project developer recognizes community rights for the collection of non-timber forest products and encourages communities to continue these activities provided these are conducted sustainably and exclude endangered species that are protected by law. Current and future land claims shall be processed by the relevant authorities and the Project will recognize the resolution of such claims and act accordingly. The Project Proponent has endeavored to maintain cordial relations with the local community and is considering pursuing the CCB certification which will increase direct benefits to the local communities.

2.1.4 Grievance Redress Procedure

Development process	The Samling group has been operating in the area for over 20 years and has an established grievance mechanism. During the Project development, the Community Relations team and the consultants from UNIMAS have further highlighted the grievance mechanism. Following consultations, the procedures have been updated to allow for online filling as the current methods, and in the interest of transparency the progress of a grievance can be tracked online.
Grievance redress procedure	See grievance resolution SOP in Appendix III.



- The grievance is reported by the affected community member(s) to a designated representative (to be appointed by the communities themselves) for verification.
- If the issue is considered by the community representative to constitute a legitimate grievance with respect to any aspect of project implementation or staff conduct, the representative will submit written details to the project staff member responsible for the implementation of field activities (field manager or equivalent). This will be overseen by the Community Liaison officer.
- The field manager (or equivalent) is responsible for resolving the issue directly and amicably within a period of 7 days.
- If no amicable resolution can be reached, the matter is referred to the highest managerial levels of the project for appropriate intervention (the precise nature of which being contingent on the nature of the grievance); the matter to be resolved within a further 14 days.
- If no amicable resolution can be found, the matter will be referred to an independent third party for formal mediation and arbitration. This mediator is to be agreed upon by all parties prior to the commencement of arbitration.
- If the matter is still not resolved to the satisfaction of the parties originally submitting the grievance, the final recourse is legal arbitration pursuant to all relevant Malaysian laws and statutes.
- These procedures have been discussed, disseminated, and socialized with local communities and have been operating for the many years that the Forest Plantation has been operating. As part of the community engagement for the Forest Carbon procedures, the community members were reminded of the procedures and informed that the process will become easier and more transparent as the web portal version of the process is implemented.

Accessibility of the Feedback and Grievance Redress Procedure

The grievance procedures already in place will be amended to accommodate changes required for the Project. At the recent community meetings, the procedures were highlighted. The procedures are currently available as a brochure in both Malay and English and the brochures are made available at meetings and during the regular meetings between the community leaders and the Community Liaison officer. Copies of the procedure are available on the project website, the company website. Currently, the project team is porting the process onto a web portal. This will

	improve the accessibility and transparency of the grievance process.
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2.1.5 Public Comments

The Project has yet to reach the Public Comment Stage

Comments received	Actions taken
N/A	N/A.
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2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

The Samling Group of Companies has been running a timber plantation in the area for 20 years and has a dedicated team of professionals with many years of experience managing Forests. This includes Fire Prevention, Water management, and Community Relations. Currently, the management team is being supported by the group, and staff members will be assigned to SaraCarbon as the project progresses. SaraCarbon has retained the service of the following consultants to support the Project during the implementation stage. ECOSOL- Environmental and Biodiversity, UNIMAS Community Relations, ATA Marie Forestry, and Carbon-related matters. As the project moves into implementation the SaraCarbon team will be expanded so that the in-house team will be able to organize all the required management functions for the Project

2.2.2 Risk Assessment

	Risks identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	No Additional risk due to the Project	N/A
Risks to stakeholder participation	The willingness of communities to accept and participate in project activities, both in the short and long term may be reduced and replaced by exploitative practices if the project fails to deliver tangible benefits over the long term to affected communities	Project activities are designed to ensure sustainable community benefits. Such activities are implemented in partnership with each community. Aiming to improve local economies in a way that relieves pressure on the adjacent natural ecosystem. In parallel, measures have been put in place to ensure a high level of participation of both local communities and local government in project planning and operation, to ensure grievances are heard and corrected, and to ensure long-term benefit-sharing
Working conditions	Employees will be working in the Forest and as such they are at risk of injury utilizing tools for Fire Control, nursery and planting activities.	Most of the employees will be from the local community and as such are familiar with the environment and the risks from the Flora and fauna. However, all

	Workers are also at risk from the natural flora and Fauna	employees will receive additional training on the safe use of tools and will be issued with safety equipment. The company has its own Health and Safety Policy enforced by the HSE Department. Part of the benefits that will be provided to the local communities will be improved access to medical facilities and all employees will be covered by the company's medical and insurance programs.
Safety of women and girls	No Additional risk due to the Project.	Most of the employees will be from local communities and as such no additional risk from project implementation is envisioned. Instances of threats to the safety of women and girls that the project becomes aware of will be reported to the authorities. The project will provide employment opportunities irrespective of gender, age, social class or ethnicity, and other factors.
Safety of minority and marginalized groups, including children	No Additional risk due to the Project	The majority of Project Employees will be from the local communities and as such no additional risk from project implementation is envisioned. The Project seeks to benefit communities through a variety of socio-economic activities that will target the most vulnerable and marginalized community members. This includes the poor, women, elderly, and disabled people
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials	Minimal	Although some vehicles will be utilized to support activities, the impact will be minimal and significantly less than

and chemical pesticides and fertilizers)		deforestation and conversion to a commercial timber plantation. The only time any herbicide will be used is in the case that an invasive species of plant is detected. Any herbicide used will be the recommended government treatment for the invasive species in question. Any application of Herbicides will follow the Health and Safety guidelines from the Ministry of Agriculture.
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2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified ⁷	Mitigation or preventative measure(s) taken
Discrimination	Discrimination is an ever-present risk. However, no additional risk is expected due to the project	Internal policies and education programs are in place for employees of the Samling group. Internal reporting mechanisms exist as well as the option for any aggrieved party to report instances of discrimination to the Malaysian authorities
Sexual harassment	Sexual harassment is an ever present risk. However, no additional risk is expected due to the project	Internal policies and education programs are in place for employees of the Samling group. Internal reporting mechanisms exist as well as the option for any aggrieved party to report instances of sexual misconduct and/ or harassment to the Malaysian authorities. The Samling HR and Community relations team includes a women's officer specifically to address these issues

⁷ The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

Equal pay for equal work	In Malaysia, the Global Gender Gap Index Score is 0.682 ⁸ So Nationally issues exist	The Samling Group has equal pay for equal work policy and will not pay different rates for the same work based on gender
Gender equity in labor and work	In Malaysia, the Global Gender Gap Index Score is 0.682 ⁹ So Nationally issues exist	The Samling Group has equal pay for equal work policy and will not pay different rates for the same work based on gender. All opportunities will be open to all genders and efforts will be made to ensure fairness.
Forced labor	Forced labor is a risk. However, no additional risk is expected due to the project	The project intends to prioritize the employment of local community members and will wherever possible avoid utilizing contractors. However, if contractors are utilized the contracting organization and their employees are subject to screening All employees are subject to identification verification as part of their onboarding to the project.
Child labor	Children regularly labor in the local communities. However, no additional risks are expected due to the project	The Project Proponent has a strict no-child labor policy. All employees will be vetted before they can start work. The project intends to prioritize the employment of local community members and will wherever possible avoid utilizing contractors. However, if contractors are utilized the contracting organization and their employees are subject to screening and random age checks will also be conducted.
Human trafficking	Human Trafficking is an issue in Malaysia particularly with Migrant workers.	The Project has a strict policy against human trafficking. The project intends to prioritize the

⁸ World Economic Forum Global Gender Gap Report 2023

		employment of local community members. However, if contractors are utilized, then the contracting organization and their employees are subject to screening and random age checks will be conducted.
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2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
Erosion of IP and LC Rights	The Project has specifically addressed this issue by removing all areas over which Native Customary rights exist and those areas of cultural or religious significance

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measures taken
Restriction of access to areas of religious or cultural significance	The project has removed areas of religious or cultural significance from the Project area and the local community will have free access throughout the project area.
Damage or destruction to areas of religious or cultural significance,	All areas of cultural and religious significance have been excluded from the project area and as such no project activities will take place at these sites

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
Erosion on the rights of IP's or LC's	The project area is fully enclosed in the LPF license which the Sarawak government awarded to the Samling Group over 20 years ago. Consequently, no formal land claim against the property exists. However, the government recognizes Native customary rights land and has designated part of the LPF/0008 as Native customary rights lands. These areas have been excluded from the Project Area

2.3.5 Benefit Sharing

The Project area does not impact on the property rights of the community as all areas with any conflicting claims have been excluded from the Project Area. This includes all NCR lands. Therefore, no benefit sharing agreements are required. However, the Project Developer is committed to preferential employment of community members and implementation of voluntary community co-benefit programs that will be negotiated with communities during project implementation. Previous community consultations have identified community needs and preferences, and community co-benefit programs will be designed accordingly.

Process used to design the benefit sharing plan	Through the five-stage community engagement process all the communities have been informed of the project and the related benefits.
Summary of the benefit sharing plan	The Project Proponent will offer preferential employment to local community members and will wherever possible utilize local community-owned businesses. Local community members also have free access to the forest area to collect NTFP from the project area and to fish.
Approval and dissemination of benefit sharing plan	The climate benefits and the benefits to the local communities were shared and explained to all communities as part of the community engagement process with the team from UNIMAS holding meetings in each of the clusters of communities.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure(s) taken
Impacts on biodiversity and ecosystems	No Risk Identified	The Project will conserve all natural resources in the project area and restrict hunting of RTE species
Soil degradation and soil erosion	No Risk Identified	The Project Proponent does not plan for any forest clearance or soil disturbance
Water consumption and stress	No Risk Identified	The Project is in a high-rainfall area and includes a wetland. The project will preserve the natural water system and will not interfere with the natural flow of water within the Project Area.

2.4.1 Rare, Threatened, and Endangered Species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☒ Yes

☐ No

Species and habitat	All the Species listed below are native to the Natural Forest.		
	Scientific Name	Common Name	Status*
	Mammals:		
	<i>Arctictis binturong</i>	Bear cat	P
	<i>Helarctos malayanus</i>	Sun bear	P, VU
	<i>Hylobates muelleri</i>	Gibbon	TP, EN
	<i>Hystrix brachyura</i>	Common porcupine	P
	<i>Manis javanica</i>	Pangolin	P
	<i>Neofelis nebulosa</i>	Clouded leopard	TP, EN
	<i>Presbytis rubicunda</i>	Maroon leaf monkey	TP
	<i>Presbytis hosei</i>	Grey leaf monkey	TP
	<i>Ratufa affinis</i>	Giant tree squirrel	TP
	<i>Trichys fasciculata</i>	Long-tailed porcupine	P
	<i>Tupaia minor</i>	Lesser treeshrew	P

	<i>Tupaia tana</i>	Large treeshrew	P
	<i>Lutra</i> sp.	Otter	P
	<i>Echinosorex gymnurus</i>	Moon rat	P
	<i>Pteropus vampyrus</i>	Flying Fox	P
	<i>Sus Barbatulus</i>	Bearded Pig	VU
	<u>Reptilia:</u>		
	<i>Varanus nebulosus</i>	Tree monitor lizard	P
	<i>Geochelone emys</i>	Hill tortoise	P
	<i>Crocodylus porosus</i>	Estuarine crocodile	P
	<u>Birds:</u>		
	<i>Picus puniceus</i>	Crimson-winged woodpecker	P
	<i>Aerodramus fuciphaga</i>	White nest swiftlets	P
	<i>Anthracoceros malayanus</i>	Black hornbill	TP
	<i>Buceros rhinoceros</i>	Rhinoceros hornbill	TP, NT
	<i>Anorrhinus galeritus</i>	Bushy-crested Hornbill	TP
	<i>Rhinoplax vigil</i>	Helmeted Hornbill	TP, CR
	<i>Gracula religiosa</i>	Hill myna	P
	<i>Halcyon chloris</i>	Kingfisher	P
	<i>Pelargopsis capensis</i>	Stork billed kingfisher	P
	<i>Haliastur indicus</i>	Brahminy kite	P
	<i>Spilornis cheela</i>	Crested serpent eagle	P
	<i>Terpsiphone paradisi</i>	Asian paradise flycatcher	P
	<i>Actitis hypoleucos</i>	Common Sandpiper	P
	<i>Copsychus malabaricus</i>	White rumped shama	P
	<u>Flora</u>		
	All species of Dipterocarpaceae	Kapor, Keruing, Meranti, Luis	TP, Endemic
	Koompassia excelsa	Tapang	P

	Begonia spp.	Riang/Bergonia	P
	Orchids	Orchidkid	P
	Ficus App	Tempan, Lengkan, engkeruorh	P
	<i>Key According to the Wildlife Protection Ordinance Sarawak (1990) P=Protected, TP=Totally Protected, CR Critically endangered, EN=Endangered, VU=Vulnerable, NT=Near Threatened</i>		
Areas needed for habitat connectivity	Tolong and Marau are interconnected with each other but otherwise isolated from other natural forest ecosystems. Marudi block is connected to a large natural forest system in Brunei with a 1 km international buffer zone in between.		

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	Destruction of Habitats by deforestation and drainage of Wetlands	The project prevents the clearing of land for timber plantation and the draining of the wetlands
Areas for habitat connectivity	The northern block (Marudi) is isolated from the main project area	The Marudi block is connected to the border area and other natural forest.

2.4.2 Introduction of Species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
No New Species will be Introduced	N/A	N/A	N/A

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
No Invasive Species Identified	N/A

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species		
Mikania micrantha	Smothers other vegetation	Monitoring and Mechanical control and herbicides
Decalobanthus paltata	Smothers other vegetation	Monitoring and Mechanical control and herbicides

2.4.3 Ecosystem Conversion

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	The peatland areas in the project are determined to be completed undrained.	The project will protect the peatland areas from drainage in the future.
	There are small areas of peatland that appear to be deforested or changed to non-forest. The area is approximately 69 ha.	These forest areas have been removed from any WRC activities. They will be protected from further degradation by the Project and be left to naturally regenerate.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0007	VM0007 REDD+ Methodology Framework (REDD+MF),	1.8
Module	VMD0001	Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools (CP-AB)	1.1
Module	VMD0006	Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL)	1.4
Module	VMD0042	Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities (BL-PEAT)	1.1
Module	VMD0009	Estimation of emissions from activity shifting for avoiding planned deforestation/forest degradation and avoiding planned wetland degradation (LK-ASP)	1.3
Module	VMD0044	Estimation of emissions from ecological leakage (LK-ECO)	1.1
Module	VMD0013	Estimation of greenhouse gas emissions from biomass and peat burning (E-BPB)	1.3
Module	VMD0015	Methods for monitoring of GHG emissions and removals in REDD and CIW projects (M-REDD)	2.3
Module	VMD0046	Methods for monitoring of soil carbon stock changes and greenhouse gas emissions and removals in peatland rewetting and conservation project activities (M-PEAT)	1.1

Module	VMD0016	Methods for Stratification of the Project Area (X-STR)	1.3
Module	VMD0017	Estimation of Uncertainty for REDD+ Project Activities (X-UNC)	2.2
Module	VMD0019	Methods to project future conditions	1.0
Tool	VT0001	Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities	3.0
eTool	NPRT	AFOLU Non-Permanence Risk Tool	4.2

3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
VM0007 4.2.1	REDD activity types are applicable under the following conditions: 1) Land in the project area has qualified as forest (following the definition used by the VCS standard; in addition, see Section 5.1.2) for at least 10 years prior to the project start date. Mangrove forests are excluded from any tree height requirement in a forest definition, as they consist of 95 percent mangrove species, which often do not reach the same height as other tree species. Mangroves occupy contiguous areas and their functioning as a forest is independent of tree height. 2) Where land within the project area is peatland or tidal wetlands and emissions from the SOC pool are deemed significant, the relevant WRC modules are applied alongside other relevant modules. 3) Baseline deforestation in the project area falls within either of the following categories: a. Unplanned deforestation (VCS category AUDef) b. Planned deforestation (VCS category APDef)	Condition met. The land area qualified as forest 10 years prior to the start date. The forest area is not mangrove. There is a wetland in the project area and WRC modules are applied. Baseline deforestation in the project area falls within Planned deforestation (VCS category APDef). There was 22 ha that was previously heavily degraded forest in 2012 but was categorized as open land / non-forest in 2022. This area was removed from the Project Area. The area was so small it could have been included for being insignificant. It was felt its exclusion from the project area supported the integrity of the area selection process.
	REDD activity types are not applicable under the following conditions: 4) Leakage prevention activities include: a. Flooding agricultural lands to increase production (e.g., rice paddies); and/or	Condition met. There is no flooding of agricultural lands to increase production nor is there livestock intensification through feedlots or manure lagoons.

	b. Intensifying livestock production through use of feed-lots⁸ and/or manure lagoons.	
VM0007 4.2.2	Avoiding unplanned deforestation activities is applicable under the following conditions: 5) Baseline agents of deforestation meet all the following criteria: a) Clear the land for tree harvesting, settlements, crop production (agriculturalist), ranching or aquaculture, where such clearing for crop production, ranching or aquaculture does not amount to large scale industrial agriculture or aquaculture activities. b) Have no documented and uncontested legal right to deforest the land for these purposes; and c) Are either residents in the reference region for deforestation (see Section 5.1.2 below) or immigrants. Under any other condition, this methodology must not be used.	Condition met. The project baseline does not include unplanned deforestation, and the conditions do not apply.

	Avoiding unplanned deforestation activities is not applicable under the following conditions: 6) Post-deforestation land use in the baseline scenario constitutes reforestation.	
VM0007 4.2.3	Avoiding planned deforestation activities is applicable under the following conditions: 7) Where conversion of forest lands to a deforested condition is legally permitted	Condition met. The project baseline includes planned deforestation. The LPF license authorizes planned deforestation.
4.3	ARR activities are applicable under the following conditions: 8) The project area is non-forest land or land with degraded forest. 9) In strata with drained 12 organic soils, ARR activities are combined with rewetting.	Condition met. The project will not be claiming ARR activities therefore the conditions do not apply. The project may be conducted some natural forest replanting and enrichment planting as a bio-diversity co-benefit program only.
	ARR activities are not applicable under the following conditions: 10) The project scenario involves the application of nitrogen fertilizers. 11) Where ARR activities enhance peat oxidation. Therefore, on peatland, the project must include at least some degree of rewetting. In a tidal system where the tidal regime is restored or continues to be in place, ARR activities are considered not to enhance peat oxidation. 12) Where project activities on wetlands are excluded by the applicability conditions of applied modules or tools, such applicability conditions may be disregarded for the purpose of their use within this methodology, as quantification procedures for peat and tidal wetland soils are provided in modules BL-PEAT, M-PEAT, BL-TW, and M-TW. Therefore, ARR activities on wetlands are regarded as combined ARR-RWE activities.	Condition met. The project may conduct some replanting and enrichment planting as a bio-diversity co-benefit program only and not project activities. No planting will use nitrogen fertilizer.

VM0007 4.4.1	WRC activities are not eligible under the following conditions: 13) Project activities lower the water table, unless the project converts open water to tidal wetlands, or improves the hydrological connection to impounded waters. 14) Changes in hydrology do not result in the accumulation or maintenance of SOC stock, noting that a) this pertains to projects that intend to sequester carbon through sedimentation and/or vegetation development and b) this does not pertain to projects that increase salinity to reduce CH₄ emissions. Projects that aim to decrease CH₄ emissions through increased salinity must account for any changes in SOC stocks. 15) Hydrological connectivity of the project area with adjacent areas leads to a significant increase in GHG emissions outside the project area. 16) Project activities include the burning of organic soil. 17) Nitrogen fertilizers(s), such as chemical fertilizer or manure, are applied in the project area during the project crediting period.	Condition met. The project activities will not lower the water table. The project activities will maintain SOC levels and it is expected that SOC levels may increase. The project activities will not lead to any changes in hydrological conditions on neighboring lands. There will be no burning of organic soil under the project. Nitrogen fertilizer will not be used.
VM0007 4.4.2	<i>RWE project activities are applicable under the following conditions:</i> 18) Prior to the project start date, the project area meets one of the following criteria: a. The project area is free of any land use that may be displaced outside the project area, as demonstrated by at least one of the following, where relevant: i. The project area has been abandoned for two or more years prior to the project start date; or ii. Use of the project area for commercial purposes (i.e., trade) is not profitable because of salinity intrusion, market forces or other factors. In addition, timber harvesting in the baseline scenario within the project area does not occur; or iii. Degradation of additional wetlands for new agricultural/aquacultural sites within the country will not occur	Condition met. The project will not be claiming RWE activities therefore the conditions do not apply.

	or is prohibited by enforced law. OR b. The area is under a land use that may be displaced outside the project area, although in such case, baseline emissions from this land use must not be accounted for, and where degradation of additional wetlands for new agricultural/aquacultural sites within the country will not occur or is prohibited by enforced law. OR c. The area is under land use that will continue at a similar or greater level of service or production during the project crediting period (e.g., reed or hay harvesting, collection of fuelwood, subsistence harvesting, commercial fishing). The project proponent must demonstrate (a), (b) or (c) above, based on verifiable information such as laws and bylaws, management plans, annual reports, annual accounts, market studies, government studies or land use planning reports and documents.	
	Peatland Rewetting 19) Rewetting drained peatland (RDP) activities occur on project areas that meet the VCS definition for peatland (see VCS Program Definitions).	Condition met. The project will not be claiming RWE activities therefore the conditions do not apply.

	Tidal Wetland Restoration 20) Project activities restoring tidal wetlands include any of the following or a combination of the following: a. Creating, restoring and/or managing hydrological conditions (e.g., removing tidal barriers, improving hydrological connectivity, restoring tidal flow to wetlands or lowering water levels on impounded wetlands) b. Altering sediment supply (e.g., beneficial use of dredge material or diverting river sediments to sediment-starved areas) c. Changing salinity characteristics (e.g., restoring tidal flow to tidally restricted areas) d. Improving water quality (e.g., reducing nutrient loads leading to improved water clarity to expand seagrass meadows, recovering tidal and other hydrologic flushing and exchange or reducing nutrient residence time) e. (Re-)introducing native plant communities (e.g., reseeding or replanting) f. Improving management practice(s) (e.g., removing invasive species, reduced grazing) g. In RWE-ARR project activities, prescribed burning of herbaceous and shrub aboveground biomass (cover burns)	Condition met. The project will not be claiming RWE activities therefore the conditions do not apply.
VM0007 4.4.3	Conservation of undrained and partially drained peatland (CUPP) activities are applicable under the following conditions: 21) Activities occur in project areas that meet the VCS definition of peatland (see VCS Program Definitions). 22) Project activities conserving tidal wetlands include: a. Protecting at-risk wetlands (e.g., establishing conservation easements, establishing community supported management agreements, establishing protective government regulations, and preventing disruption of water and/or sediment supply to wetland areas) b. Improving water management on drained wetlands c. Maintaining or improving water	Condition met. The project CUPP activities only occur in peatland areas. The project area does not contain any tidal wetlands and so condition 22 does not apply.

	quality for seagrass meadows d. Recharging sediment to avoid drowning of coastal wetlands e. Creating accommodation space for wetlands migrating with sea-level rise	
	Avoiding Unplanned Wetland Degradation (AUWD) 23) Baseline agents of wetland degradation in avoiding unplanned wetland degradation activities 15 meet all the following criteria: a. Cause an alteration in the hydrology of the project area (involving drainage, interrupted sediment supply or both) and/or a loss of soil organic carbon b. Have no documented and uncontested legal right to degrade the wetland, and c. Are either residents in the reference region for wetland degradation (see Section 5.1.4 below) or immigrants. Under any other condition, this methodology is not applicable for avoiding unplanned wetland degradation activities.	Condition met. The project does not include AUWD activities and so the conditions does not apply.
	Avoiding Planned Wetland Degradation (APWD) 24) Conversion of intact or partially altered wetlands into a degraded condition is legally permitted in the project area in which avoiding planned wetland degradation activities 16 will take place.	Condition met. Conversion of intact or partially altered wetlands into a degraded condition is legally permitted in the project area.
VMD0001	This module is applicable to all forest types and age classes.	Condition met.

VMD0006	The module is applicable for estimating the baseline emissions on forest lands (usually privately or government owned) that are legally authorized and documented to be converted to non-forest land.	Condition met. The forest lands in the project area are legally authorized to be converted to non-forest in the baseline.
VMD0042	This module is applicable to RDP and CUPP activities on project areas that meet the VCS definition for peatland. The scope of this module is limited to domed peatlands in the tropical climate zone.	Condition met.
	The following applicability conditions apply: - It must be demonstrated by using the latest version of T-SIG that N₂O emissions in the project scenario are not significant, or that N₂O emissions will not increase in the project scenario compared to the baseline scenario, and therefore N₂O emissions need not be accounted for. - In the baseline scenario the peatland must be drained or partially drained. At the start of the project, the peatland may still be undrained	Condition met. GHG emissions (specifically N₂O) are excluded from the baseline and project scenarios. The potential emissions sources are fire and nitrogenous fertilizer applications, which are both assumed to be absent in both the baseline and project scenarios. Therefore, the net GHG emissions from both the baseline and project scenarios are estimated to be zero, which is less than 5% of the total decreases in carbon pools and increases in emissions and less than 5% of net anthropogenic removals by sinks. The baseline scenario is of industrial biomass plantation in peat soil that requires substantial water table management (i.e., lowering). At the start of the project, all the Project Area remained undrained.
VMD0009	The module is applicable for estimating the leakage emissions due to activity shifting from forest lands that are legally	Condition met.

	authorized and documented to be converted to non-forest land, including activity shifting to forested wetland that is drained or degraded because of project implementation. The module is also applicable for estimating the leakage emissions due to activity shifting from non-forested wetlands that are legally authorized and documented to be converted and degraded. Under these situations, displacement of baseline activities can be controlled and measured directly by monitoring the baseline deforestation or wetland degradation agents or class of agents. This tool must be used for projects in areas where planned deforestation happens on forested wetlands, regardless of the absence of wetland within the Project Area boundaries. The module is mandatory if Module BL-PL has been used to define the baseline, and the applicability conditions in Module BL-PL must be complied with in full.	The project area has planned deforestation and Module BL-PL has been used to define the baseline and it is applicable.
	Where, pre-project, unsustainable fuelwood collection is occurring within the Project Area boundaries Modules BL-DFW and LK-DFW must be used to determine potential leakage³.	Condition met. The project area has no history of significant fuelwood collection and does not contain fuelwood collection in the baseline.
VMD0044	This module is applicable under the following conditions: Leakage caused by hydrological connectivity is avoided by project design and site selection.	Condition met. The project area has peatland which is hydrologically connected to neighboring areas so is applicable.
VMD0013	This module is applicable to REDD project activities with emissions from biomass burning and REDD-WRC project activities with emissions from biomass and/or peat burning. This module is also applicable to	Condition met. There are no emissions from biomass burning so this methodology does not apply. However, should fires occur following monitoring then

	RWE and ARR-RWE project activities with emissions from peat burning.	this module will be used to estimate emissions from biomass and/or peat burning
VMD0015	Strata as defined in the relevant baseline modules are fixed and may not be changed without baseline revision. The module is mandatory for REDD, CIW-REDD, RWE-REDD, and stand-alone CIW project activities. Where selective logging is taking place in the project case: - Emissions from logging may be omitted if it can be demonstrated the emissions are de minimis using tool T-SIG or Appendix 1 of REDD-MF. - If emissions from logging are not omitted as de minimis, logging may only take place within forest management areas that possess and maintain a Forest Stewardship Council (FSC) certificate for the years when selective logging occurs. - Logging operations may only conduct selective logging that maintains a land cover that meets the definition of forest within the project boundary. - All trees cut for timber extraction during logging operations must have a DBH greater than 30 cm. - During logging operations, only the bole/log of the felled tree may be removed. The top/crown of the tree must remain within the forested area. - The logging practices cannot include the piling and/or burning of logging slash - The volume of timber harvested must be measured and monitored.	Condition met. The same stratification classification is used in the baseline and project scenarios. This module applies because the project includes REDD, CIW-REDD, and CIW activities. The project baseline does not include selective logging, and the associated conditions do not apply.

VMD0046	This module is applicable to RDP and CUPP activities as defined in the VCS Standard. The project area must meet the VCS definition for peatland. This module is limited to domed peatlands in the tropical climate zone.	Conditions met. The module applies because it includes CUPP activities and includes domed peatland in a tropical zone.
	Furthermore, the following applicability conditions apply: - It must be demonstrated using tool T-SIG that N₂O emissions in the project scenario are not significant, or it must be demonstrated that N₂O emissions will not increase in the project scenario compared to the baseline scenario, and therefore N₂O emissions need not be accounted for. - In the baseline scenario the peatland must be drained or partially drained. - At project start the peatland may still be undrained. It must be demonstrated using Module LK-ECO that ecological leakage must not occur.	Conditions met. GHG emissions (specifically N₂O) are excluded from the baseline and project scenarios. The potential emissions sources are fire and nitrogenous fertilizer applications, which are both assumed to be absent in both the baseline and project scenarios. Therefore, the net GHG emissions from both the baseline and project scenarios are estimated to be zero, which is less than 5% of the total decreases in carbon pools and increases in emissions and less than 5% of net anthropogenic removals by sinks. The baseline scenario is of industrial biomass plantation in peat soil that requires substantial water table management (i.e., lowering). At the start of the project, all the Project Area remained undrained. Module LK-ECO has been used to determine that ecological leakage has not occurred.
VMD0016	For peatland rewetting and conservation project activities, this module must be	Conditions met.

	used to delineate non-peat versus peat and to stratify the peat according to peat depth and soil emission characteristics unless it can be demonstrated that the expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario is de minimis, In the case of WRC project activities, the project boundary must be designed such that the negative effect of drainage activities that occur outside the project area on the project GHG benefits are minimized.	The project includes CIW activities, and this module is applicable for modeling peatland emissions. This module has been used to delineate the peatland boundaries and peat depth strata. The project design does not include drainage and so does not have a negative effect outside the project area.
VMD0017	This module is mandatory when using the methodology REDD+ MF. It is applicable for estimating the uncertainty of estimates of emissions and removals of CO₂-e generated from REDD and WRC project activities. The module focuses on the following sources of uncertainty: • Determination of rates of deforestation and degradation • Uncertainty associated with the estimation of stocks in carbon pools and changes in carbon stocks • Uncertainty associated with the estimation of peat emissions • Uncertainty in the assessment of project emissions	Conditions met. The project uses the REDD+ MF methodology and this module has been used as required for deforestation, carbon stock changes and peat emissions.
	Where an uncertainty value is not known or cannot be simply calculated, a project must justify that it is using an indisputably conservative number and an uncertainty of 0% may be used for this component. Guidance on uncertainty – a precision target of a 95% confidence interval half-width equal to or less than 15% of the recorded value must be targeted. This is especially important in terms of project	Condition met. The project used precision target of a 95% confidence interval half-width equal to or less than 15% of the recorded value to assess uncertainty.

	planning for the measurement of carbon stocks; sufficient measurement plots should be included to achieve this precision level across the measured stocks.	
VMD0019	There are no specific applicability conditions for this module	Conditions met. This module is used as a guide for preparation of ex-ante projections of GHG pools and emissions under the baseline and project scenarios.
VT0001	The tool is applicable under the following conditions: a) AFOLU activities the same or like the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced. b) The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.	Conditions met. The proposed AFOLU activities are legal and do not lead to the violation of any applicable law. The tool has been used to determine the additionality of the baseline according to the existing stepwise approach.
NPRT	There are no applicability conditions for this module	The application of this tool is mandatory.

3.3 Project Boundary

3.3.1 General

The Project Area is located within the boundaries of the Marudi LPF/0008 which has a total area of 55,818 ha.

The Project Area is defined as the area which has been issued under a Carbon License totaling 25,675 ha. Within the Project Area, carbon activities generating carbon credits will be conducted on 25,215 ha referred to as the Carbon Activity Area. A further 459 ha is within the Carbon Project license area but will not have carbon activities – these are areas where carbon activities are ineligible, or the project developer has decided not to claim carbon credits.

A map of the project boundary is provided below. The geographical boundaries are derived from legally mandated boundary surveys whose coordinates have been captured in GIS. A digital copy of all the concession boundary data in GIS format will be made available to the Project's auditor, which will be separate from the mandatory Project Area .kml file. The Project Area contains no land areas registered under the CDM or any other GHG program. The Project Area boundaries are fixed and will not change over the lifetime of the Project.

The original LPF Area, the Project Area and Project Activity Area have been created as follows:

- A. The carbon project is located within the License for Planted Forests called “Marudi LPF/0008”. The area within the boundaries of Marudi LPF/0008 are referred to as the LPF Area.**
- B. The Project Area is the area for which a Carbon License has been issued, For the Marudi Forest Conservation And Restoration Project this includes the land within the boundaries of Marudi LPF/0008, excluding:**
 - a. The Batu Belah block
 - b. All Native Customary Rights (NCR) lands
 - c. International Buffer Zone (IBZ) between Malaysia and Brunei
 - d. Cut off areas where there are contested titles with neighbors
- C. The Project Activity Area are those areas within the Project Area where carbon activities occur. The Project Activity Area includes areas that will generate verified carbon units (VCUs):**
 - a. All areas with natural forest cover are designated for plantation development under the tree planting plan.
 - b. All non-forest areas designated for plantation development on peatland soils under the tree planting plan.
 - c. Conservation areas which will be drained under the baseline plantation development and classified as CIW activity areas because drainage of the surrounding areas will lead to these areas also being drained.
- D. The areas inside the Project Area but which do not have carbon activities include:**
 - a. Areas already designated for conservation prior to the commencement of the project except for those conservation areas which will be affected by drainage and the baseline and classified as CIW areas.
 - b. Settlements

- c. Water bodies
- d. Small areas of non-forest lands, not already classified as CIW potentially could be classified as Afforestation, Reforestation and Revegetation (ARR). The Project Proponent has decided that while some ARR activity is possible, they will not be claiming emissions reductions for these activities.

Note that where communities have established crops and plantations on non-Native Customary Rights lands, these shall be included by default in the project but left in their current land use. These areas will then be subjected to the land claims process to determine the legality of the land use by communities and the resolution of its status. Where legitimate property rights are established, the areas will be removed from the project area.

The areas within the Project Area boundaries which are eligible for carbon crediting, and which are not eligible for carbon reduction activities, are described in the table below.

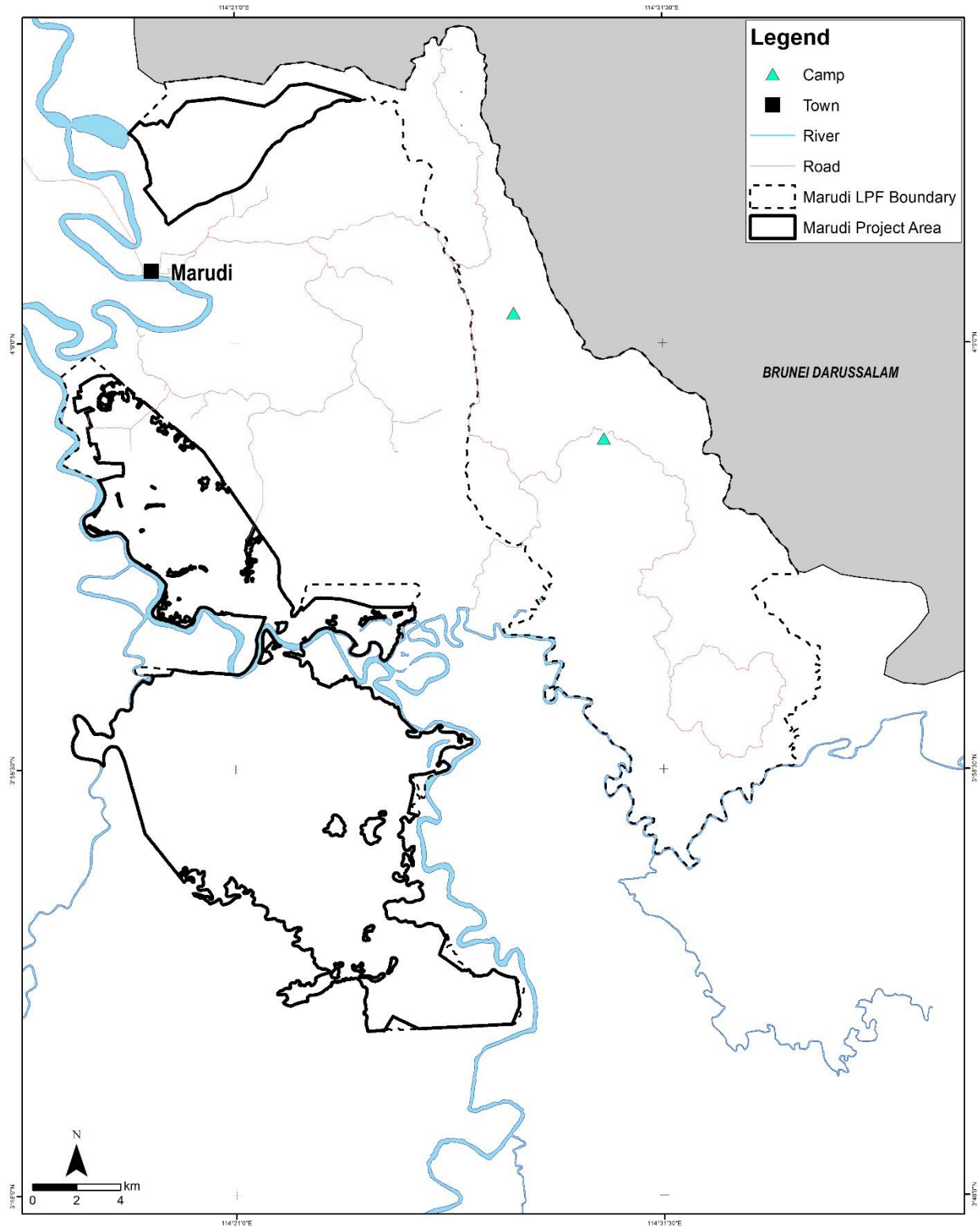
The areas inside and outside of the Project Area boundaries are shown in the table below.

Block	Marudi LPF / 0008 Area by project status		
	Inside Project	Outside project	Total
Batu Belah	0	27,265	27,265
Marau	16,518	272	16,790
Marudi	2,824	1,211	4,035
Tasong	6,333	1,395	7,728
Total	25,675	30,143	55,818

Table 3-1 Areas by Project Status

Block	Marudi LPF / 0008 Area by project status								
	Inside Project Boundary							Outside Project Boundary	Total
	Carbon Activities				ARR	No Activity	Total		
	REDD	REDD+CIW	CIW	Total					
Batu Belah	0	0	0	0	0	0	0	27,265	27,265
Marau	197	12,574	3,558	16,329	17	172	16,518	272	16,790
Marudi	5	2,801	11	2,817	0	7	2,824	1,211	4,035
Tasong	833	4,999	236	6,069	82	182	6,333	1,395	7,728
Total	1,035	20,374	3,806	25,215	99	360	25,675	30,143	55,818

Table 3-2 Areas by Project Status and Activity Type



Map 3-1 Project status within Marudi LPF/0008

3.3.2 Project Activities – REDD and WRC

The overall purpose of section 3.3.2 is to describe the REDD and WRC activity boundaries. This is achieved by first stratifying the Project Area into discrete, relatively homogenous units from which the boundaries of eligible activities can be determined.

- All the REDD activity takes place in an area that has qualified as a forest for more than 10 years prior to the start date of the Project; and is specifically designated for production forest and conversion to plantation forest.
- WRC activity in the Project Area takes place on peat swamp forests that are internationally recognized as such¹⁰. There are no drained peatlands in the Project Area and all WRC activities are classified as Conservation of Intact Wetlands (CIW).

Four specific classes of project activity are modeled in this PDD:

REDD: Avoided Planned Deforestation (APDef) on mineral soils.

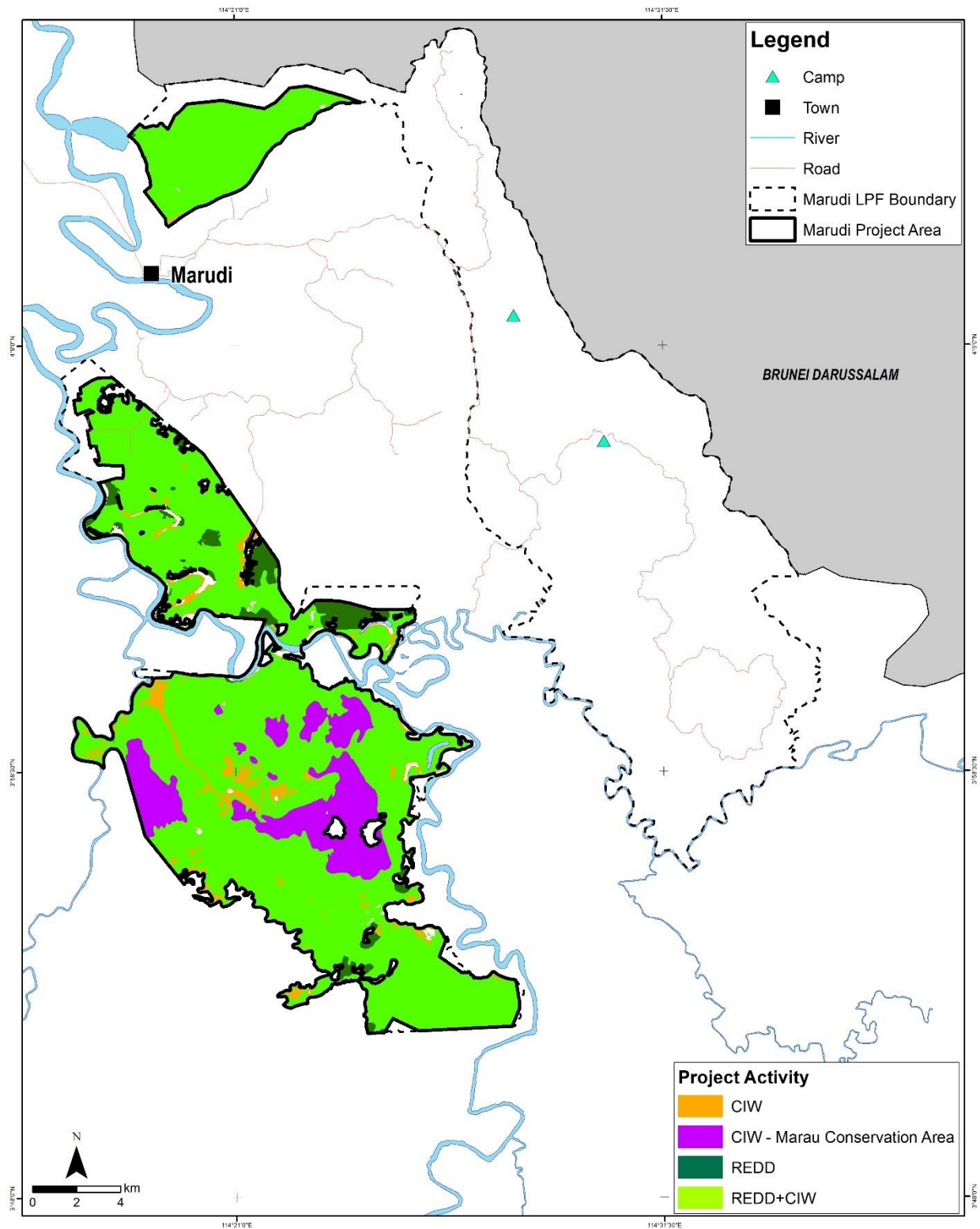
REDD+CIW: Avoided Planned Deforestation (APDef) on peatland soils.

CIW: Avoided Wetland Degradation on peatland soils with open land (non-forest).

CIW – Marau conservation areas: Avoided Wetland Degradation on peatland soils in Marau block which will be drained during plantation development under the baseline scenario.

Note that all open land located on peatland soils, which are eligible for plantation development, have been classified as CIW.

¹⁰https://data.globalforestwatch.org/datasets/d52e0e67ad21401cbf3a2c002599cf58_10?geometry=98.454%2C-1.818%2C112.264%2C2.027 accessed on 22 Mar 2021 and MoARI [Ministry of Agriculture Republic of Indonesia], Indonesia peat lands, Accessed through Global Forest [www.globalforestwatch.org]



Map 3-2 Emissions reduction activities in the Project Activity Area

3.3.3 Spatial Boundary of the Project Area

The Project Area, to clarify boundaries of project activities was required to be stratified into discrete units of land that have relatively homogeneous emission and/or carbon stock characteristics (per VCS methodology VMD0016 - X-STR). This includes stratification by:

- Aboveground biomass (AGB) & vegetation types
- Soil types (peat or non-peat soil)
- Peat thickness and peat depletion time (PDT)

The following sub-sections below describe the various spatial boundaries of the Project Area in much greater detail to clearly map out the boundaries of each project category and subsequent project activity.

3.3.4 Above-ground Biomass (AGB) Stratification

3.3.4.1 Mapping of vegetation cover types

To classify the above ground carbon stock, the Project Area was stratified into homogeneous classes based on the characteristics of the landcover.

Remotely sensed imagery assisted with the delineation of the Project Area based on the various vegetation types and structures as well as land cover features. Additionally, on the ground field data was used to verify and quantify above-ground biomass (AGB) and carbon (C) in each stratum. All the data, satellite imagery, and actual field data were subsequently calibrated cross-checked, and re-calibrated, as necessary. The figure below sets forth the process used by the Project for the stratification of AGB.

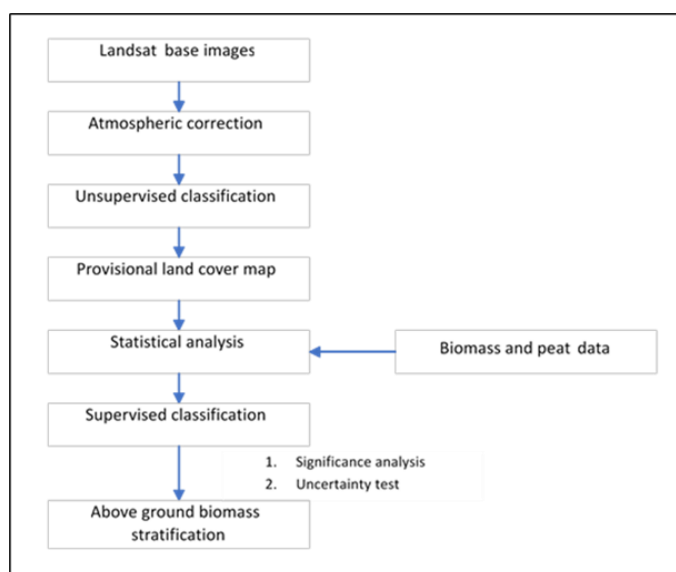


Figure 3-1 Above-ground stratification process

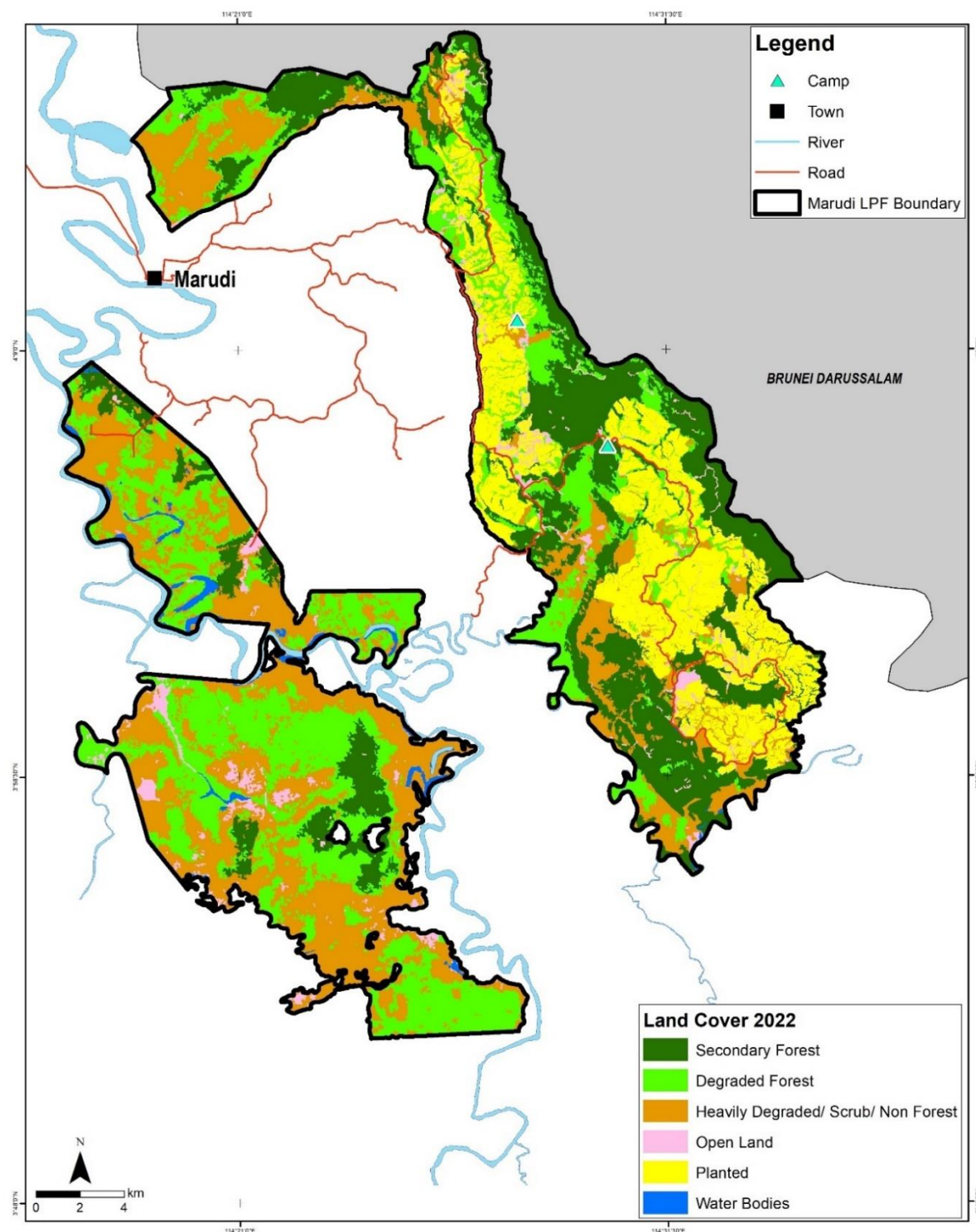
Spectral data from Landsat 8 imagery –

Number LC08_L2SP_119057_20220728_20220802_02_T1, downloaded from the USGS online database was used to map the land cover classes. The land cover class analysis was conducted using supervised classification with training points using 130 inventory plots. The data acquisition, pre-processing, classification, and accuracy assessment methods followed the steps outlined in §4.1.1.

Satellite images used for the process of stratification and AGB analyses are provided in §3.3.3.1.

No	Satellite sensor	ID	Dated
1	Landsat 8	LC08_L2SP_119057_20220728_20220802_02_T1	28 July, 2022

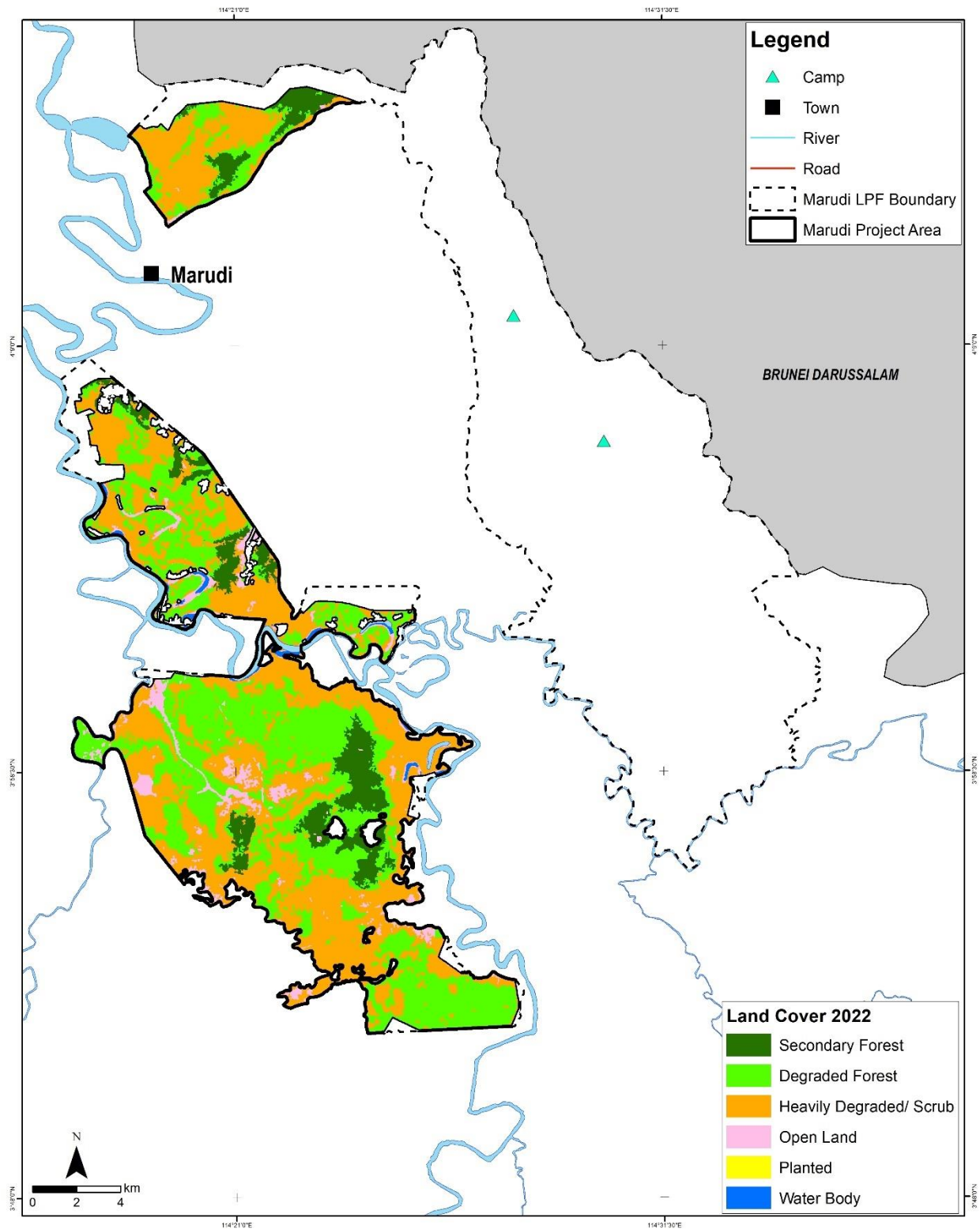
Table 3-3 Satellite imagery used for stratification.



Map 3-3 Land cover classification for Marudi LPF/0008

Block	Natural Forest			Non-Forest			Total
	Secondary Forest	Degraded Forest	Heavily Degraded	Open Land	Plantation	Water body	
Batu Belah	9,133	4,432	3,217	1,220	9,189	75	27,265
Marau	1,286	6,878	7,500	973	0	153	16,790
Marudi	1,079	1,086	1,835	35	0	0	4,035
Tasong	763	2,953	3,408	410	0	193	7,728
Sub-Total	12,260	15,349	15,960	2,638	9,189	421	55,818
Total	43,569			12,248			

Table 3-4 Land cover of the Marudi LPF/0008 based on analysis of remote sensing imagery.



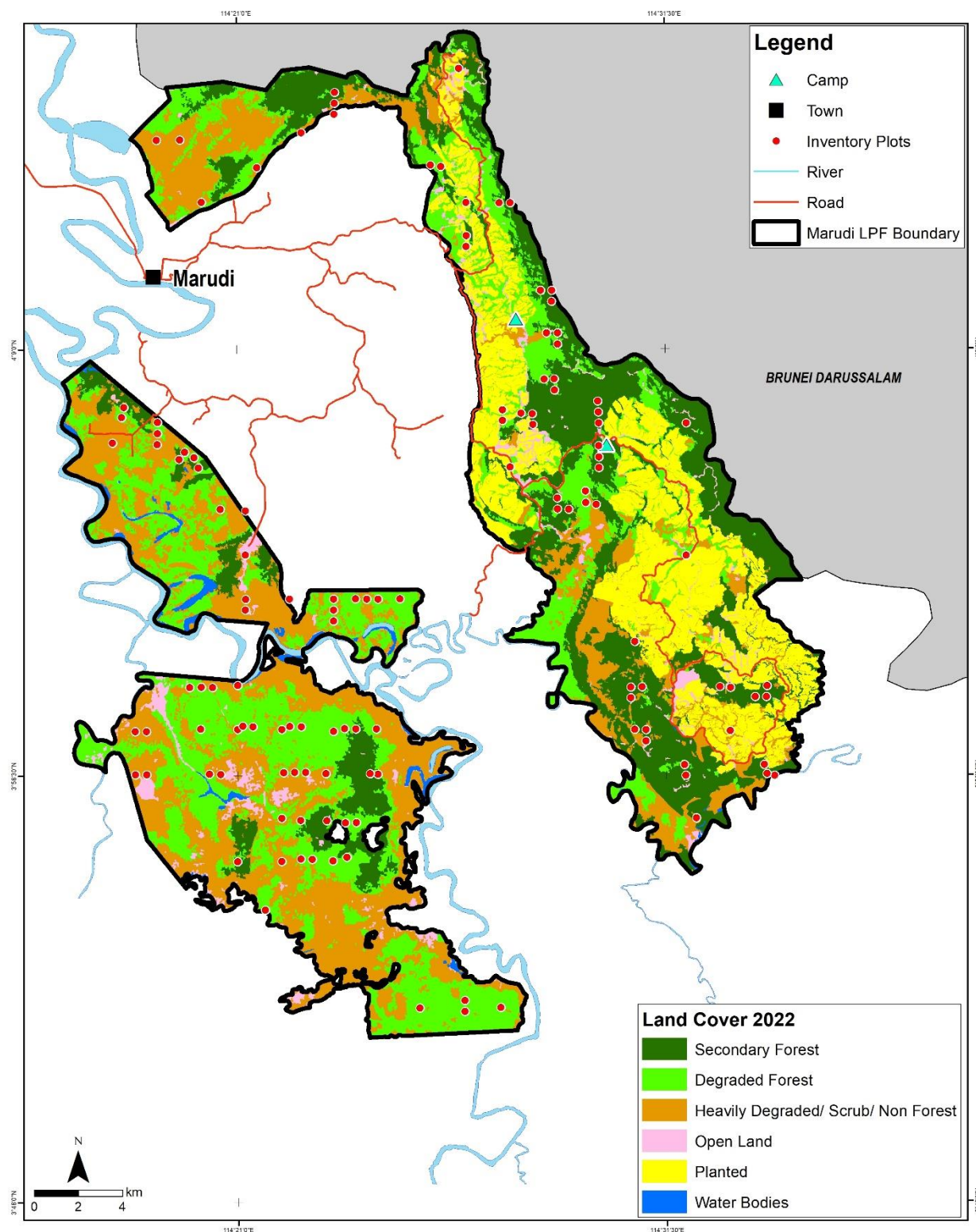
Map 3-4 Land cover classification for Project Area

Block	Natural Forest			Non-Forest			Total
	Secondary Forest	Degraded Forest	Heavily Degraded	Open Land	Plantation	Water body	
Batu Belah	0	0	0	0	0	0	0
Marau	1,286	6,810	7,375	915	0	133	16,518
Marudi	505	690	1,611	18	0	0	2,824
Tasong	605	2,322	2,905	336	0	164	6,333
Sub-Total	2,396	9,822	11,891	1,269	0	297	25,675
Total	24,109			1,566			

Table 3-5 Land cover of the Project Areas based on analysis of remote sensing imagery.

3.3.4.2 Biomass estimation using forest inventory

Above ground biomass was sampled using 130 sample plots distributed across the whole of the Marudi LPF/0008. However, for this project, only 74 sample plots located in Marau, Marudi and Tasong were included in the yield analysis. The plot data was used to calculate the mean AGB for each stratum. All forest landcover types were statistically significantly different and had biomass meaning more than 20% different from each other. As per VCS methodology module VMD0016 (X-STR), all strata with means were separated.



Map 3-5 Vegetation stratification of the Marudi LPF/0008 based on the analysis of remote sensing images.

For the purposes of AGB stratification, we have combined Secondary Forest, Degraded Forest and Heavily Degraded Forest into a single class called Forest Vegetation. Open Land, Plantation and Water Bodies have been combined into a single class called Non-Forest Vegetation.

The analysis of the forest area boundaries and biomass inventory are shown below:

No.	Vegetation type	Hectares (ha)	%
1	Forest vegetation	43,569	78%
2	Non-forest vegetation	12,248	22%
3	Total	55,818	100%

Table 3-6 Final AGB stratification summary of Marudi LPF/0008

No.	Vegetation type	Hectares (ha)	%
1	Forest vegetation	24,109	94%
2	Non-forest vegetation	1,566	6%
3	Total	25,675	100%

Table 3-7 Final AGB stratification summary of Project Area

Land Cover	Area	Avg ABG (kg.ha ⁻¹)	Stdev	No. plots	t stat	Uncertainty	L95%CL	U95%CL
Secondary Forest	1,606	160,600	88,110	9	2.306	67,728	92,872	228,327
Degraded Forest	8,625	68,408	47,507	38	2.026	15,615	52,793	84,024
Heavily Degraded Forest	11,178	31,934	21,608	27	2.056	8,548	23,387	40,482
Total	21,409	56,279	41,657	74	1.993	9,651	46,628	65,930

Table 3-8 Uncertainty analysis results

As mandated by the VCS methodology VM0007 in module VMD0015 (M-REDD), a precision target of a 95% confidence interval half-width equal to or less than 15% of the recorded value is targeted. The uncertainty of the inventory estimate of biomass for the whole Marudi was 12.8% and the uncertainty within the project area was 17.1%.

The suitability of the classification was assessed using standard ANOVA and Scheffé's method (single-step multiple comparison procedure) for testing *post hoc* differences between means.

The ANOVA indicates that the model (stratification) was significant at a 95% confidence level.

ANOVA						
Source	SS	df	MS	F	F_% CL95	Significant Diff
Model	307,898,002,573	2	153,949,001,287	69	3.13	Yes
Error	157,753,784,268	71	2,221,884,285			
Total	465,651,786,841	73				

Table 3-9 ANOVA test for stratification model

The Scheffé analysis demonstrated that all *post hoc* differences between means were significant at a 95% confidence level. Scheffé's method is a single-step multiple comparison procedure which applies to the set of estimates of all possible contrasts among the factor level means. It is commonly used in forestry to determine the significance of differences between paired mean estimates.

Scheffé Analysis			
Forest Type	N	SS	Avg.
Secondary Forest	9	62,107,337,067	160,600
Degraded Forest	38	83,507,408,276	68,408
Heavily Degraded Forest	27	12,139,038,925	31,934
	SSE	157,753,784,268	
	MSE	2,191,024,782	
	p	0.05	
	k	2	
	N	74	
	F(p, k-1, N-k)	3.97	

Table 3-10 Scheffé Analysis statistics

Pair Wise Differences Between Sample Means (kg.AGB.ha ⁻¹)			
Forest Type	Secondary Forest	Degraded Forest	Heavily Degraded Forest
Secondary Forest		92,191	128,665
Degraded Forest			36,474
Heavily Degraded Forest			

Table 3-11 Pair wise differences between sample means

Scheffé Comparison Values			
Forest Type	Secondary Forest	Degraded Forest	Heavily Degraded Forest
Secondary Forest		34,591	35,915
Degraded Forest			23,486
Heavily Degraded Forest			

Table 3-12 Scheffé Comparison Values

Significant Differences			
Forest Type	Secondary Forest	Degraded Forest	Heavily Degraded Forest
Secondary Forest		Yes	Yes
Degraded Forest			Yes
Heavily Degraded Forest			

Table 3-13 Scheffé test for significant difference

All forestry classifications are statistically significantly different at 95% confidence level as is recommended from each other as is recommended in the IPCC Good Practice Guidance 2003¹¹. Furthermore, alternative forest classifications were used, and none of these classifications were able to meet the 95% confidence level threshold.

¹¹ J. Penman, M. Gytarsky, T. Hiraishi, T. Krug, D. Kruger, R. Pipatti, L. Buendia, K. Miwa, T. Ngara, K. Tanabe, and F. Wagner. 2003. *Intergovernmental Panel on Climate Change, Good Practice Guidance for LULUCF, CH5, Section 5.2 Identifying and Quantifying Uncertainties*. (eds) IGES, Japan.

3.3.4.3 AGB carbon stock estimation

Using the AGB map of the Project Area, carbon stock was quantified for each stratum. Project equation 1 is derived from equation 1 of module VMD0001 CP-AB.

$$C_{AB_tree,sp,i} = \sum_j^S \sum_{l=1}^{N_{j,sp,i}} f_j(X,Y...) * CF_j \quad (1)$$

Where:

- $C_{AB_tree,sp,i}$ = Carbon stock in aboveground biomass of trees in plot sp in stratum i ; t C
- CF_j = Carbon fraction of biomass for species group j ; t C t⁻¹ d.m.
- $f_j(X,Y...)$ = Aboveground biomass of trees based on allometric equation for species group j based on measured tree variable(s); t. d.m. tree⁻¹
- i = 1, 2, 3, ... M strata
- j = 1, 2, 3 ... S tree species
- l = 1, 2, 3, ... $N_{j,sp,i}$ sequence number of individual trees of species group j in sample plot sp in stratum i

The AGB carbon stock of the Project Area was found to be 1,436,493 t.C for the forest stratum. We assume there is no above-ground forest-related carbon for the non-forest stratum. AGB carbon stock stratification in the Project Area at the beginning of the Project is set forth in map below, and the calculation results for each stratum is provided in the table below.

Strata	Strata Area (ha)	Average AGB (t. ha ⁻¹)	Total AGB C Stock (t C)
Secondary Forest	2,396	160.60	384,876
Degraded Forest	9,822	68.41	671,880
Heavily Degraded Forest	11,891	31.93	379,737
Total	24,109		1,436,493

Table 3-14 AGB carbon stock in the Project Area at the project start date

The Project Area includes areas for REDD activities (REDD and REDD+CIW) and areas with no REDD activities. The total areas for REDD activities (REDD and REDD+CIW) are estimated as per the table below:

Strata	Strata Area (ha)	Average AGB (t. ha ⁻¹)	Total AGB C Stock (t C)
Secondary Forest	1,606	160.60	257,853
Degraded Forest	8,625	68.41	590,051
Heavily Degraded Forest	11,179	31.93	356,987
Total	21,410		1,204,891

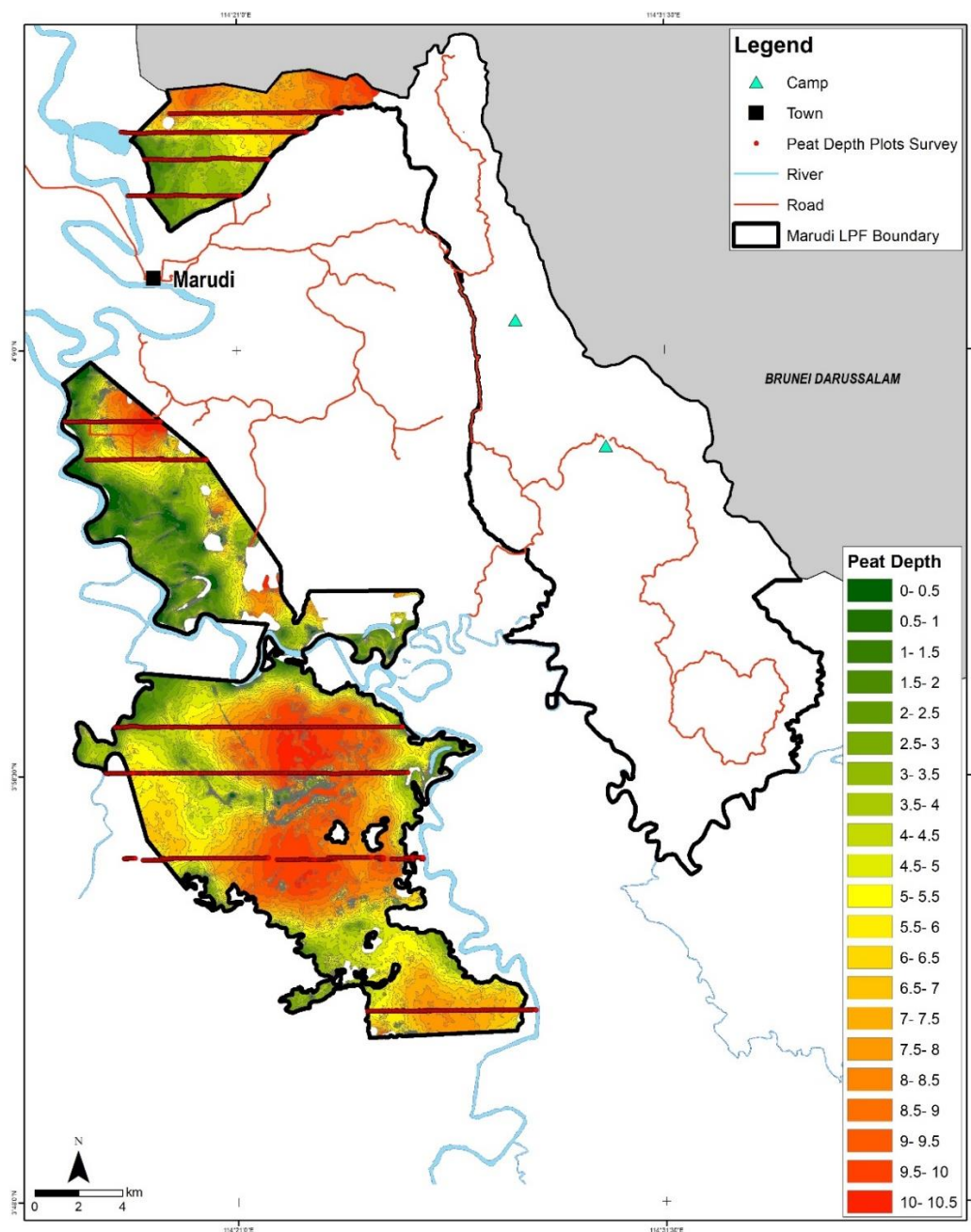
3-15 AGB carbon stock in the REDD Activity Areas at the project start date

3.3.5 Below-ground Biomass (BGB) Stratification

3.3.5.1 Stratification of Peatland and Non-Peatland

Peatland comprises the majority of the Marudi, Marau, and Tasong blocks.

A peat soil survey was conducted in 2022 by the Sarawak Tropical Peat Research Institute (TROPI). A theodolite survey was conducted at the same time to measure the contours and elevation of the landscape. The elevation measurements were placed along the transects at 100m intervals. Peat depths ranged from 50cm (which is the minimal depth for peatland classification) to 1517cm which was an outlier.



3.3.5.2 Stratification of Peat Thickness and PDT

The main peatland stratification tasks for the Project Area involve the stratification of peat according to peat depth and peat characteristics per VMD0016 (X-STR). Peatland covers a significant proportion of the landscape in the whole landscape area. Peat has been stratified according to peat soil depth at 50cm strata from 0.50m up to 10.50m.

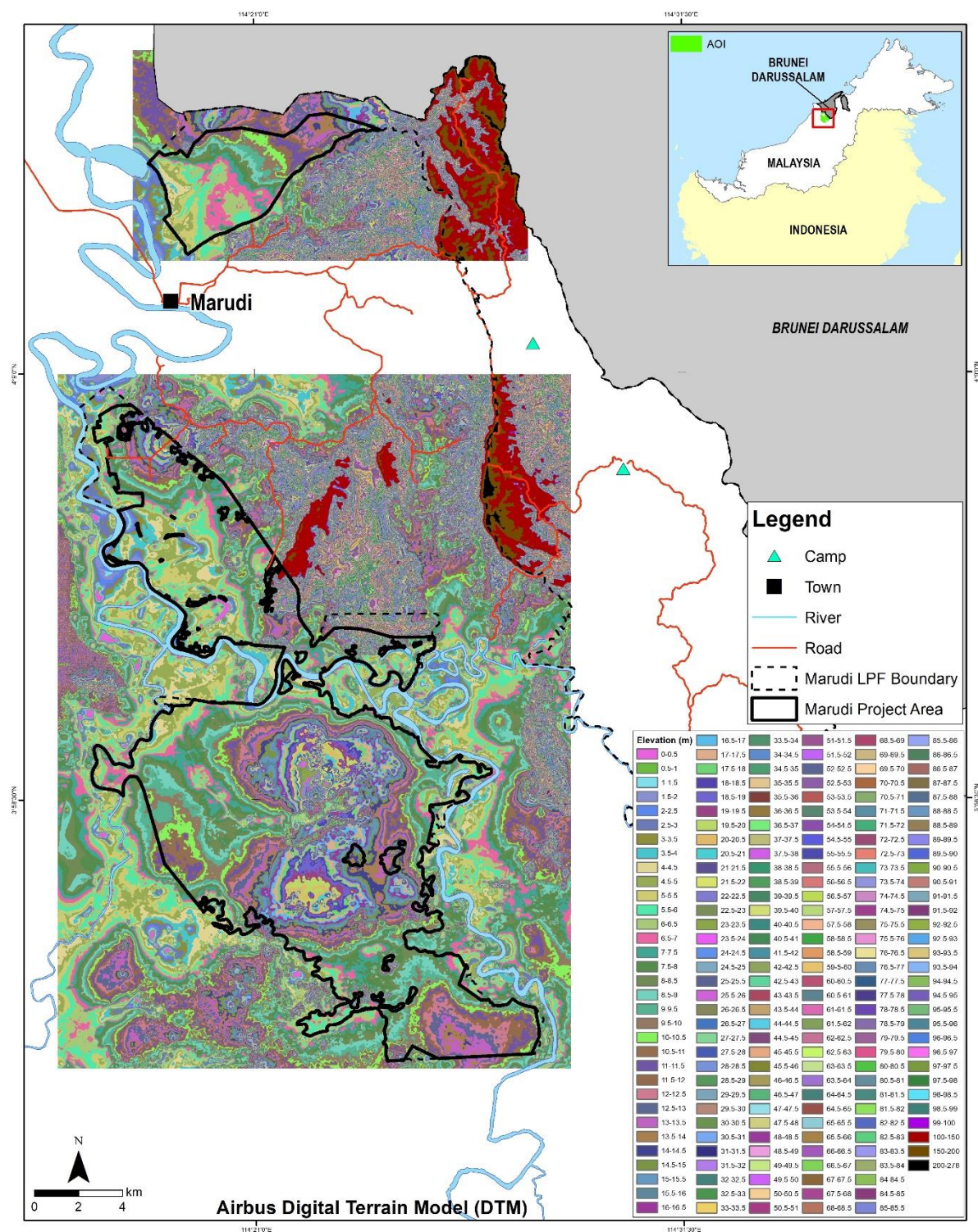
The rate of peat depletion in the Project Area was calculated based on the following, which are then each considered in more detail below:

- Surface elevation.
- Peat thickness.
- Drainability elevation limit; and
- Subsidence related to microbial decomposition and burning.

Digital Elevation Model and Drainability Elevation Limit

The deforestation agents in the baseline scenario were conservatively assumed to not practice mechanical pumping. The result is that any thickness of peat that would be lost is restricted by the Drainability Elevation Limit (DEL) – the elevation at which the peat cannot be drained any further without mechanical pumping, defined by the water level in the closest water body. As subsidence proceeds over time and the land surfaces eventually reach the DEL, additional drainage will nonetheless be avoided as the remainder of the peat layers will remain waterlogged. For the purposes of the Project Area, the DEL will be set at sea level, i.e., 0.0m altitude.

A terrain elevation map (Digital Elevation Model, DEM) was obtained from the Airbus WorldDEM™ service. The Airbus WorldDM™ has a reported horizontal accuracy of claims 2m (relative) and 4m (absolute) vertical accuracy in a 12m x 12m raster.



Map 3-7- Digital terrain model of the Marudi LPF/0008

Given that 100% of the peat is at or above the digital terrain model, we assume that 100% of the peatlands are available for microbial decomposition and burning.

Peat thickness

To determine peat thickness, data from TROPi peatland surveys were collected.

The TROPI peat soil survey comprised of 391 plots of which 290 were located on peat and peat soil samples were taken. These were placed along transects strategically located across the landscape.

This sampling design fulfills the requirements described in the VCS methodology VM0007 modules VMD0042 (M-PEAT) and VMD0016 (X-STR). Peat thickness was then modeled based on spatial interpolation (Kriging method) of inputs from peat thickness points.

A peat depth model was then derived from the peat depth sample points as follows. Project equation 2 derived from the regression line of in the Figure below:

$$\text{Peat Depth (m)} = -0.0236x^2 + 1.0771x - 2.1211 \quad (2)$$

Where,

x = surface altitude of peat dome in meters

$$R^2 = 0.5084$$

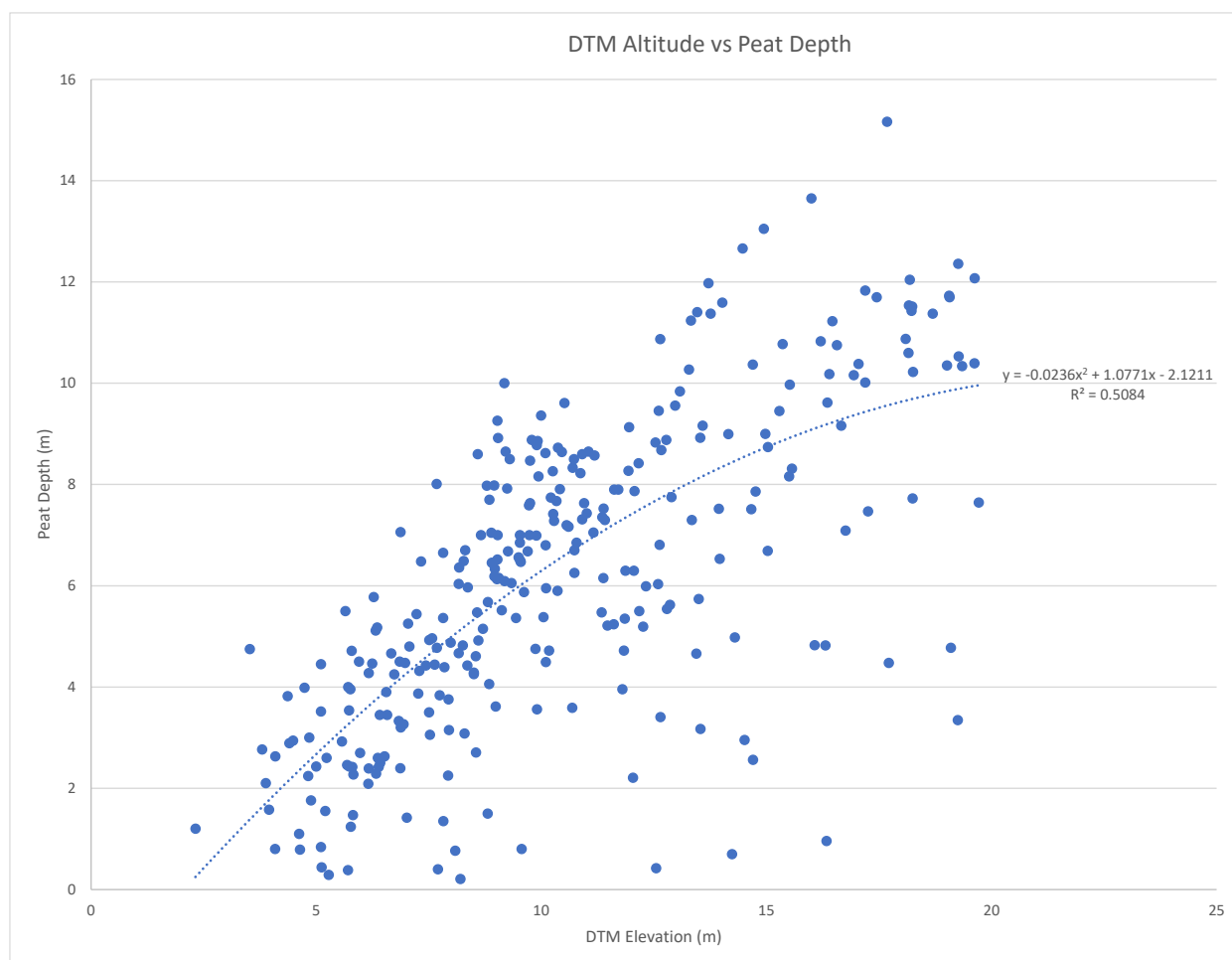


Figure 3-2 Peat Depth (m) Against Elevation (m) Graph

The peat depth model and the regression parameters are significant at a 95% confidence level and provide an accurate and precise predictor of peat soil depth in accordance with X-UNC.

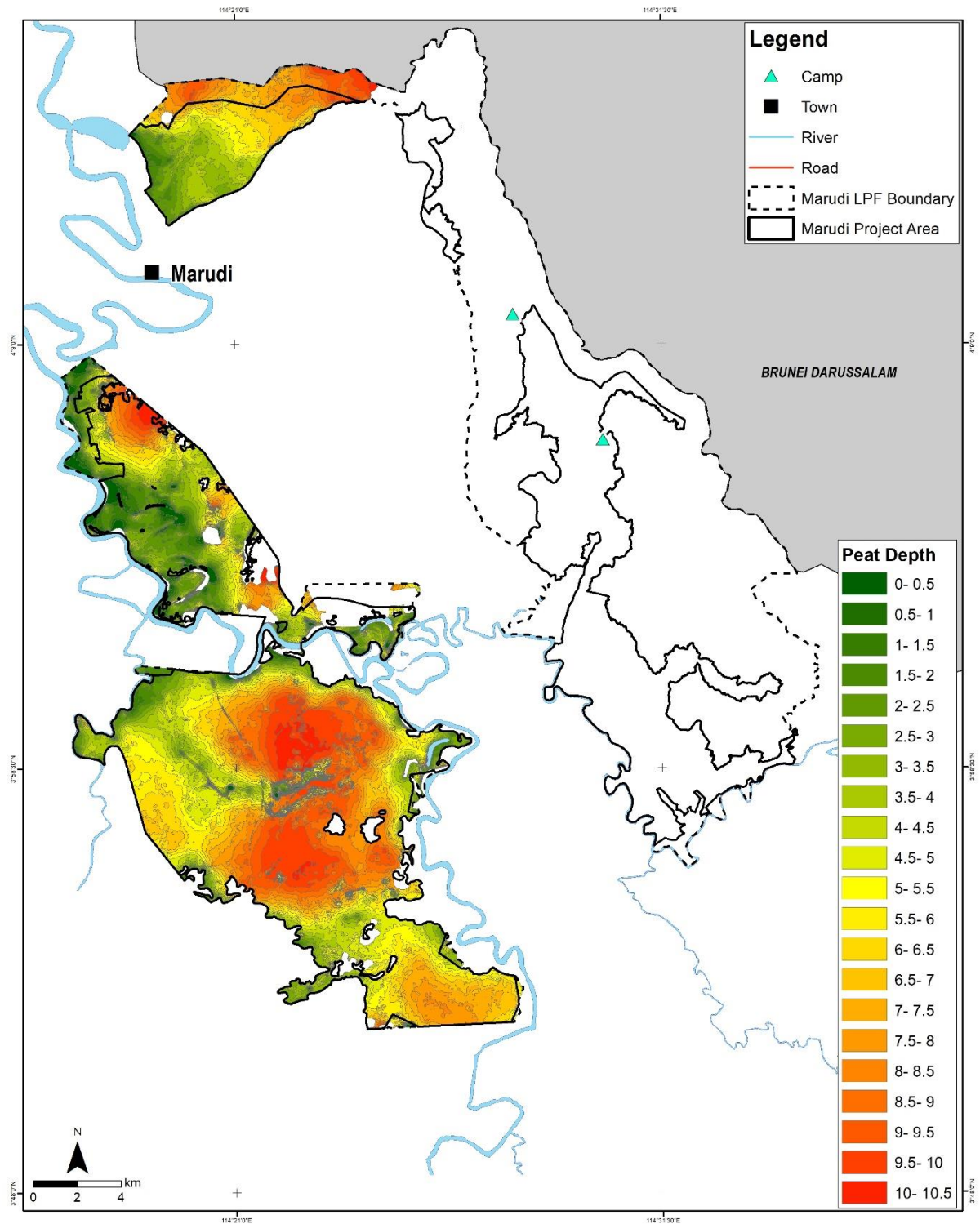
A peat depth map was then generated from the altitude map by estimating peat depth as a function of peat altitude at each point of the digital terrain model. As per VCS module VMD0016 (X-STR), our initial analysis indicated that the entire peatland in the Project Area must be stratified. Stratification by peat thickness was to be at a 50 cm resolution.

Peat Depth stratum (cm)	Block areas (ha)			Total Stratum (ha)	
	Marau	Marudi	Tasong	Total	%
50-100	43	8	294	346	1%
100-150	103	57	399	559	2%
150-200	254	125	519	898	3%
200-250	310	201	655	1167	4%
250-300	432	229	573	1235	5%
300-350	587	356	513	1456	6%
350-400	788	403	492	1683	6%
400-450	1065	168	454	1687	6%
450-500	1214	136	344	1695	6%
500-550	1209	154	292	1654	6%
550-600	1297	219	235	1751	7%
600-650	1119	232	206	1556	6%
650-700	1056	362	174	1591	6%
700-750	1003	249	151	1404	5%
750-800	1013	332	166	1512	6%
800-850	988	202	153	1343	5%
850-900	1123	131	111	1366	5%
900-950	1250	214	89	1554	6%
950-1000	1227	107	77	1412	5%
1000-1050	325	27	102	454	2%
Total	16,407	3,914	6,001	26,321	100%

Table 3-16 Peat thickness stratification in Marudi LPF/0008

Peat Depth stratum (cm)	Block areas (ha)			Total Stratum (ha)	
	Marau	Marudi	Tasong	Total	%
50-100	42	8	217	267	1%
100-150	90	57	317	465	2%
150-200	206	125	447	778	3%
200-250	289	201	582	1,072	4%
250-300	414	228	503	1,145	5%
300-350	548	356	447	1,351	6%
350-400	741	403	445	1,589	7%
400-450	1,046	168	414	1,628	7%
450-500	1,200	134	326	1,659	7%
500-550	1,181	148	276	1,605	7%
550-600	1,280	212	219	1,711	7%
600-650	1,110	209	191	1,510	6%
650-700	1,054	221	149	1,424	6%
700-750	1,003	82	128	1,213	5%
750-800	1,013	133	136	1,283	5%
800-850	988	66	125	1,179	5%
850-900	1,123	22	90	1,236	5%
900-950	1,250	27	73	1,349	6%
950-1000	1,227	11	68	1,306	5%
1000-1050	325	1	84	410	2%
Total	16,132	2,812	5,236	24,180	100%

Table 3-17 Peat thickness stratification in the Project Area



Peat physical and chemical properties

Laboratory analysis was conducted on 1932 soil samples at various soil depths from 192 peat soil sample locations. The average of the chemical properties assessed are shown in the table below:

Soil Property	Average Value
Average Bulk Density (t.DM/m ³)	0.07765
Average pH	3.609
Average Loss on Ignition %	95.36
Average Ash Content %	4.635
Average molecular C %	54.290
Average molecular N %	1.119
Peat depletion rate (cm/year)	4.74

Table 3-18 Physical and chemical properties of peat soil in the Project Area

Peat depletion time (PDT)

A peat depletion time (PDT) table was created. The resulting PDT table was based on the above peat thickness map, the DEM, the DEL, and the calculated peat subsidence in the baseline scenario (see § 3.4). The table below sets forth the calculation of the Project Area PDT stratification. Project equation 3 is derived from equation 23 of module VMD0016 X-STR.

$$t_{PDT - BSL_i} = \frac{Depth_{peat - BSL_i}}{Rate_{peatlost - BSL_i}} \quad (3)$$

Where:

$t_{PDT - BSL_i}$ Peat depletion time in the baseline scenario in stratum i in years elapsed since the project start (yr)

$Depth_{peat - BSL_i}$ Average peat depth in the baseline scenario in stratum i at project start (m). In this case = peat thickness available for microbial decomposition

$Rate_{peatlost - BSL_i}$ Rate of peat loss due to subsidence and peat burning in the baseline scenario in stratum i; (m yr⁻¹)

Peat Depth (cm)	Peat Depletion Time (yr)		Start Area (ha)	End area (ha)		
	Range	Average		40 years	60 years	100 years
0-50	0 - 10.5	5.3	0.0	892.9	1,164.4	1,635.2
50-100	10.5 - 21.1	15.8	266.9	1,072.9	1,399.3	1,590.7
100-150	21.1 - 31.6	26.3	465.0	1,185.4	1,607.6	1,701.1
150-200	31.6 - 42.2	36.9	778.1	1,423.7	1,609.6	1,503.1
200-250	42.2 - 52.7	47.4	1,072.4	1,611.5	1,626.7	1,410.3
250-300	52.7 - 63.2	58.0	1,145.0	1,612.9	1,611.2	1,217.7
300-350	63.2 - 73.8	68.5	1,350.5	1,621.1	1,669.6	1,277.4
350-400	73.8 - 84.3	79.0	1,589.4	1,622.1	1,470.8	1,194.8
400-450	84.3 - 94.8	89.6	1,627.7	1,649.1	1,384.0	1,237.4
450-500	94.8 - 105.4	100.1	1,659.4	1,462.0	1,217.7	1,353.5
500-550	105.4 - 115.9	110.7	1,604.9	1,362.4	1,274.7	1,295.0
550-600	115.9 - 126.5	121.2	1,711.2	1,224.9	1,204.6	406.8
600-650	126.5 - 137	131.7	1,510.4	1,264.2	1,245.2	2.4
650-700	137 - 147.5	142.3	1,424.3	1,210.4	1,352.4	0.0
700-750	147.5 - 158.1	152.8	1,212.8	1,256.8	1,147.7	0.0
750-800	158.1 - 168.6	163.4	1,282.6	1,348.0	287.0	0.0
800-850	168.6 - 179.2	173.9	1,179.0	1,056.1	0.0	0.0
850-900	179.2 - 189.7	184.4	1,235.8	245.1	0.0	0.0
900-950	189.7 - 200.2	195.0	1,349.3	0.0	0.0	0.0
950-1000	200.2 - 210.8	205.5	1,305.6	0.0	0.0	0.0
1000-1050	210.8 - 221.3	216.0	409.8	0.0	0.0	0.0
Total			24,180.0	23,121.4	21,272.7	15,825.4

Table 3-19 Summary of the PDT Stratification of the Project Area

12.0% of the peatland in the Project Area is expected to be completely depleted before reaching the end of the 60 year crediting period, and 34.6% of peatland is expected to be completely depleted over 100 years.

3.3.5.3 Peat carbon stock

This author used peat bulk density estimate of 0.07765 t.DM.m³ and molecular carbon content of 54.29% as determined from laboratory analysis of peat soil samples from the Project Area.

This equates to a carbon density (C_d) value of 42.15 Kg C m³ of peat for estimating carbon stock in the Project Area.

Peat Depth (cm)	Area (ha)	Volume (m3)	Carbon Stock (t)	
			CO2C	CO2E
50-100	267	2,001,577	84,377	309,411
100-150	465	5,812,224	245,016	898,475
150-200	778	13,617,613	574,055	2,105,061
200-250	1,072	24,127,994	1,017,124	3,729,794
250-300	1,145	31,486,327	1,327,317	4,867,272
300-350	1,351	43,891,402	1,850,257	6,784,894
350-400	1,589	59,603,699	2,512,615	9,213,758
400-450	1,628	69,176,867	2,916,175	10,693,614
450-500	1,659	78,823,075	3,322,814	12,184,760
500-550	1,605	84,258,800	3,551,959	13,025,034
550-600	1,711	98,391,279	4,147,719	15,209,685
600-650	1,510	94,400,197	3,979,473	14,592,729
650-700	1,424	96,142,660	4,052,927	14,862,085
700-750	1,213	87,925,474	3,706,529	13,591,842
750-800	1,283	99,399,595	4,190,225	15,365,554
800-850	1,179	97,264,943	4,100,238	15,035,572
850-900	1,236	108,130,085	4,558,262	16,715,145
900-950	1,349	124,805,698	5,261,228	19,292,922
950-1000	1,306	127,297,370	5,366,265	19,678,094
1000-1050	410	42,007,073	1,770,823	6,493,607
Total	24,180	1,388,563,951	58,535,399	214,649,308

Table 3-20 Peat carbon stock in the Project Area at the project start date

The combined carbon stock of the Project Area for above ground biomass from trees and below ground carbon stock from peat is estimated to be 58,535,399 tonnes of carbon which is the equivalent of 214,649,308 tonnes of CO₂E.

At the commencement of the project, no peatlands had been drained by drainage canals and we assume all areas of peat are categorized as undrained.

3.3.6 Definition of Activity Boundaries

3.3.6.1 REDD boundaries

The agent of deforestation in this project is Samling and the project has a planned plantation development program specified in the Planting Plan. The planting plan has been prepared by Samling and authorized by the Forest Department Sarawak¹².

The planting plan specifies the year of new planting by coupe. Planting requires the clear felling of existing land cover on areas designated for plantation development. The areas that qualify for plantation development in the designated years are shown in the table below.

Block	Coupe	Secondary	Degraded	Heavily degraded	Total
Batu Belah	1A	0	0	0	0
	2A	0	0	0	0
	3A	0	0	0	0
	4A	0	0	0	0
Marau	10A	219	434	1,029	1,683
	11A	0	1,599	1,425	3,024
	5B	89	635	1,539	2,263
	8A	187	1,175	1,458	2,820
	9A	0	1,771	1,211	2,981
Marudi	12A	505	690	1,611	2,806
Tasong	6C	324	1,474	1,831	3,629
	7C	282	848	1,075	2,204
Total		1,606	8,625	11,179	21,410

Table 3-21 REDD areas by coupe and forest cover type

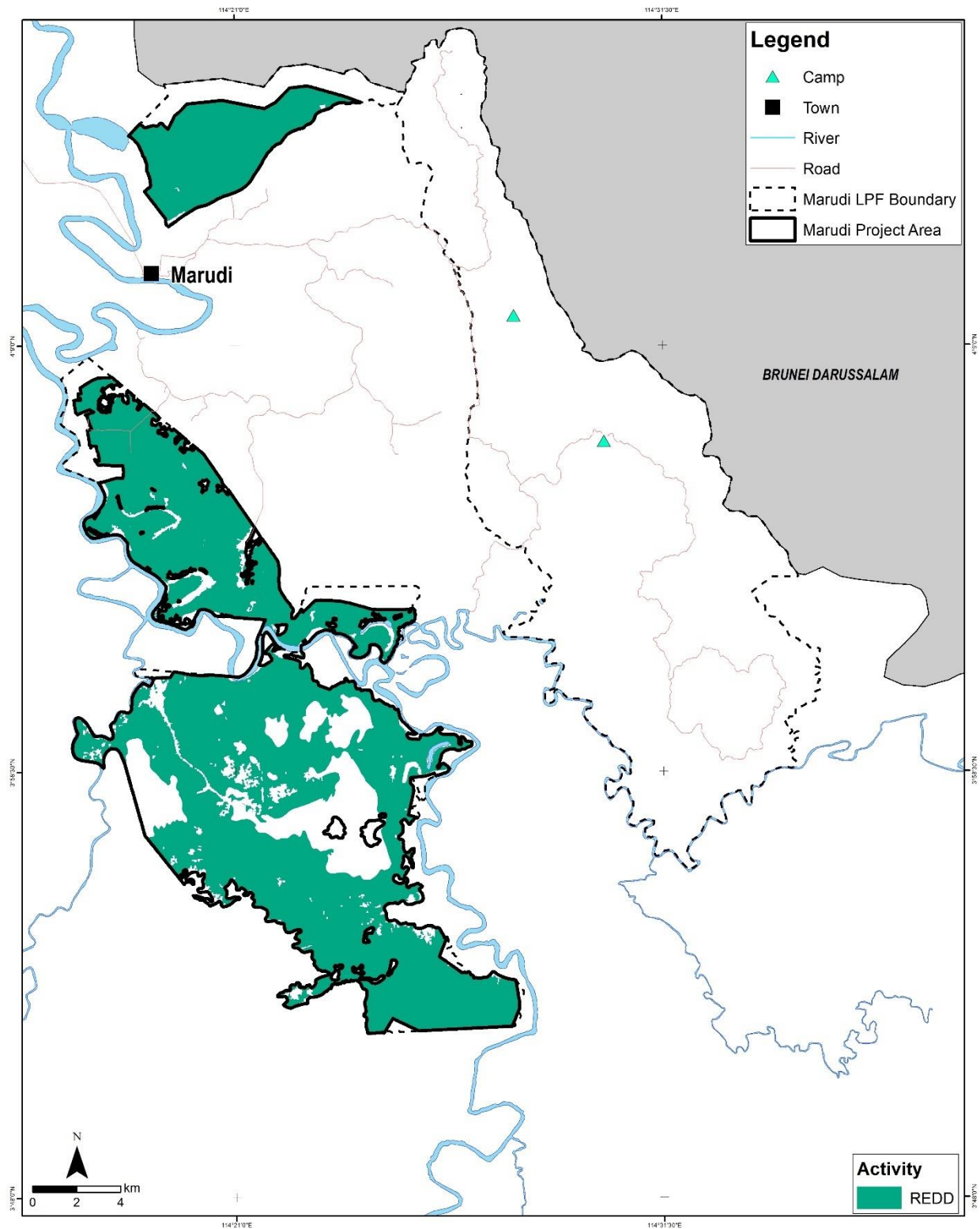
The two deforestation and forest degradation avoiding project activities identified in VM0007 V1.8 and APDef (called REDD in this report), AWD (called CIW in this report). The project only includes Avoiding Planned Deforestation (APDef) and applies to all forested land within the plantation development (“development area”) within the geographical boundaries of the project. The APDef boundaries are generated by intersecting the forest area stratification boundaries with the planned plantation development boundaries and identifying all areas of forest subject to planned deforestation.

The area of REDD is 1,035 hectares and REDD+CIW is 20,374 hectares giving a total REDD/REDD+CIW of 21,410 ha.

¹² A copy of the Planting Plan is provided as part of the supporting documents for review during validation.

Activity	Areas of plantations by year on REDD areas (ha)						
	Planting Year						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Secondary forest	0.0	0.0	605.3	0.0	406.2	594.0	1,605.6
Degraded forest	0.0	0.0	2,322.0	1,770.5	1,609.0	2,923.8	8,625.4
Heavily degraded forest	0.0	0.0	2,905.3	1,210.9	2,487.5	4,575.0	11,178.8
REDD Areas	0.0	0.0	5,832.7	2,981.4	4,502.8	8,092.8	21,409.8

Table 3-22 REDD areas by year of planned deforestation and forest cover type



Map 3-9 Boundary map of the REDD project activity within the Project Area Boundaries

3.3.6.2 WRC boundaries

The area within the geographic boundaries consists entirely of lands that are permanently saturated in their natural state. This meets the definition of wetlands as described in IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Chapter 7 Wetlands.

Peatlands are defined as organic soils greater than 50cm in depth. The area is located outside of the tidal zone and is not classified as “tidal wetlands,” rather the whole of the area within the geographic area of the project classified as “peatland.”

From the commencement of the baseline period to the project start date (December 2011) which is 10 years prior to project start date, none of the areas within the geographic boundary have been drained by canals. Therefore, they are classified as fully wetted peatlands.

The project identifies all areas planned for conversion for development and classifies them as Conservation of Intact Wetlands (CIW) - avoided peatland drainage associated with avoided planned plantation development.

Under the baseline scenario, canals will be established to support land clearing and plantation management resulting in complete drainage of the planned plantation development area. The CIW boundaries are generated by intersecting the planned plantation development boundaries and the peatland soils map.

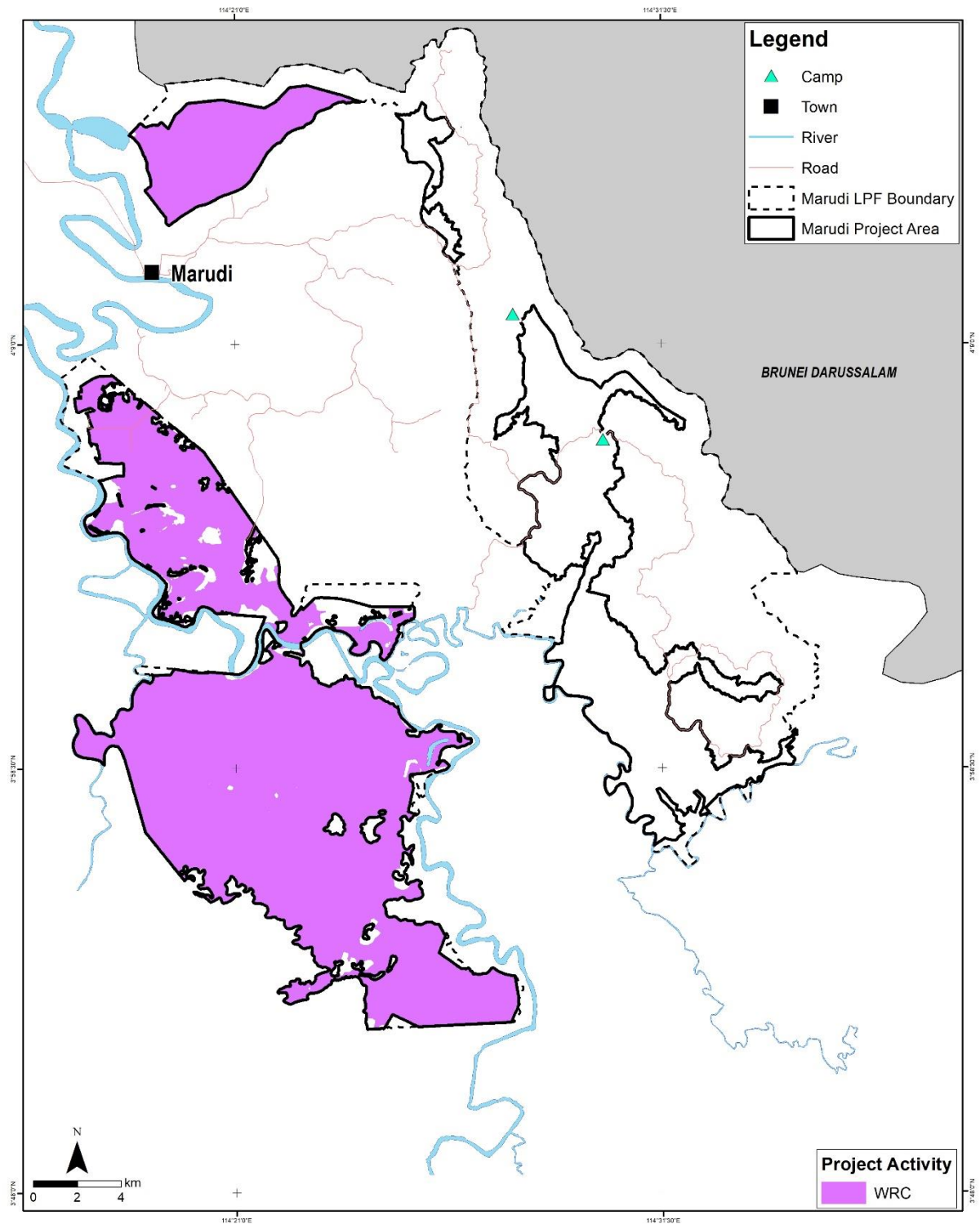
Two specific categories of WRC occur in the project area:

- REDD+CIW which are peatland areas are degraded by drainage of peatlands associated with land clearing of existing forest and subsequent plantation development.
- CIW, which are peatland areas are degraded by drainage of peatlands associated with plantation development on open peatlands.

Activity	Areas of plantations by year on WRC-CIW areas (ha)						
	Planting Year						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
REDD+CIW	0	0	4,999	2,970	4,499	7,906	20,374
CIW	0	0	236	422	1,831	1,316	3,806
WRC-CIW Areas	0	0	5,236	3,392	6,330	9,222	24,180

Table 3-23 REDD & CIW areas by year of planned deforestation and forest cover type

The Conservation of Intact Wetlands project activity will ensure that the peatlands are protected, and that soil carbon stock will be maintained and protect them from erosion and depletion from biodegradation and fires.



Map 3-10 Boundary map of the WRC project activity within the Project Area Boundaries

3.3.6.3 ARR boundaries

Afforestation, Reforestation, and Revegetation (ARR) are defined as activities that increase carbon sequestration and/or reduce GHG emissions by establishing, increasing, or restoring vegetative cover (forest or non-forest) through the planting, sowing, or human-assisted natural regeneration of woody vegetation.

For the purposes of the Project, ARR activities will comprise assisted natural regeneration of non-forest areas and enrichment planting in heavily degraded areas.

It is not the intention of the project to claim credits for emissions reductions from ARR activities and any reforestation and restoration will be seen as a biodiversity co-benefit, rather than a strict project activity. The project is committed to human-assisted natural regeneration of woody vegetation on bare lands within the Project Area boundaries where possible, with an element of enrichment planting. While no specific ARR targets are specified but ARR will be monitored and reported if and where it occurs.

3.3.6.4 Project Activity boundaries

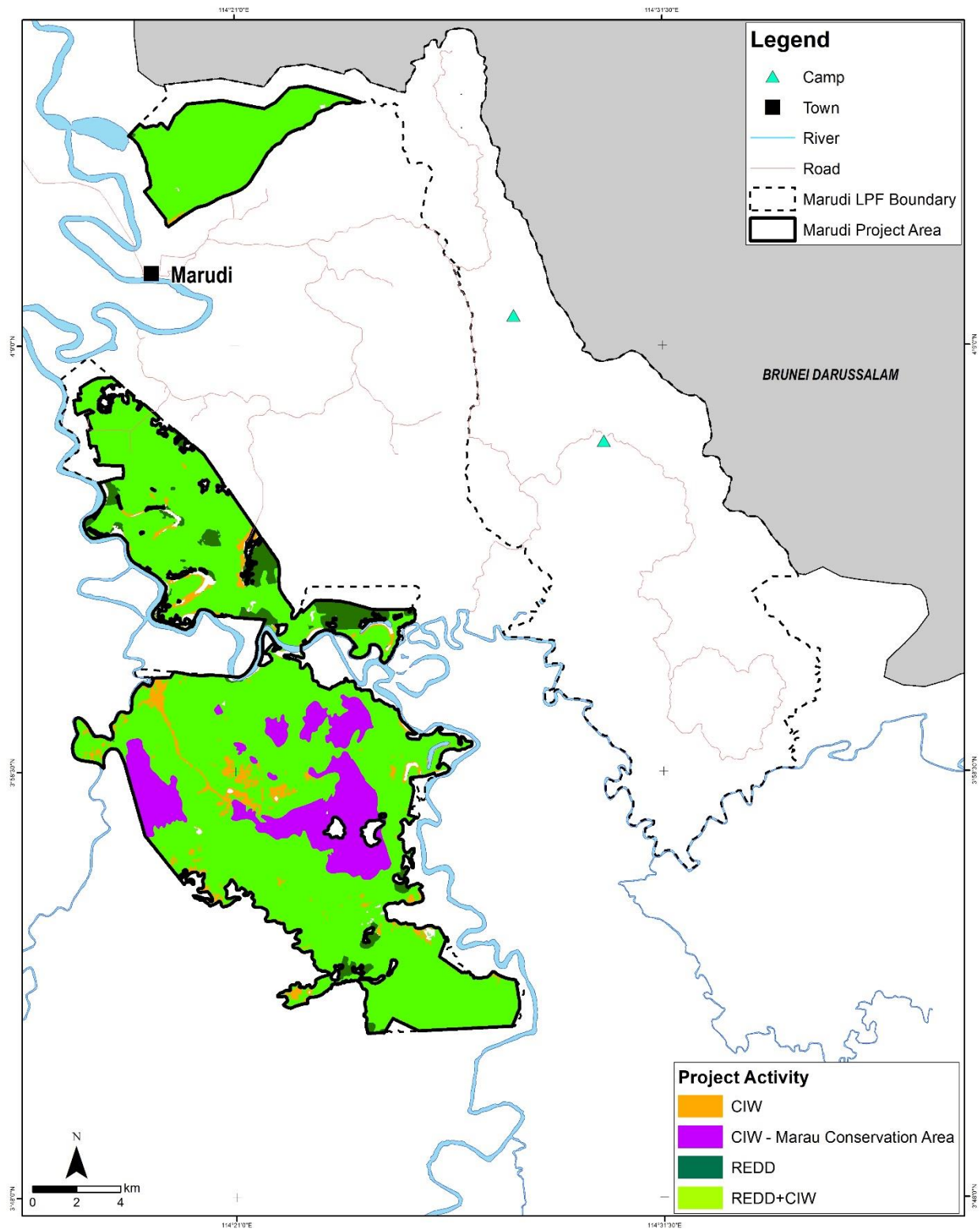
The Project Area has been classified into WRC categories as follows¹³:

Baseline Scenario		Project Activities	WRC Categories	Area (ha)
Soil	Land cover			
Undrained peatland	3,806	Avoiding drainage	CIW	3,806
	20,374	Avoiding drainage combined with avoiding deforestation	REDD+CIW	20,374
Mineral soil	1,035	Avoiding deforestation	REDD	1,035
Total area				25,215

Table 3-24 REDD / WRC activity boundaries

The map of all combined categories of project activities is shown above. In addition to the 25,215 ha of activity areas, there is an area of 460 ha within Project Area boundaries where no activities take place. This gives a total of 25,675 ha, which is the estimated total Project Area.

¹³ The determination of WRC categories is made in reference to VM0007 version 1.8, Table 3.



Map 3-11 Boundary map of all 4 WRC combined categories and project activities

3.3.7 GHG Sources

Source	Gas	Included?	Justification/Explanation	
Baseline	Deforestation	CO ₂	Included	Carbon stock decreases due to planned deforestation. Above-ground biomass losses because of deforestation are included in the baseline.
		CH ₄	Excluded	Potential emissions are negligible
		N ₂ O	Excluded	Potential emissions are negligible
		Other	Excluded	Potential emissions are negligible
	Oxidation of drained peat	CO ₂	Included	All drained peatland is considered a CO ₂ emissions source. However, Emissions from peat exposed to aerobic decomposition by spreading or piling following the establishment or maintenance of ditches are conservatively omitted as per BL-PEAT – Section 5.3. Initially, IPCC default factors will be used for the baseline and Project to estimate emissions, later in the project measurements will be performed to develop site-specific emission models, and if needed, in reference regions for the baseline.
		CH ₄	Included	IPCC default factors will be used to estimate CH ₄ emissions in the baseline and Project. All drained peatland is considered a CH ₄ emissions source. However, emissions from peat exposed to aerobic decomposition by spreading or piling following the establishment or maintenance of ditches are conservatively omitted as per BL-PEAT – Section 5.3.
		N ₂ O	Excluded	Not significantly increased in the baseline and conservatively omitted as per module BL-PEAT. The relative contribution (RE%) is estimated as zero and less than the 5% threshold of the pool as specified in T-SIG.
		Other	Excluded	Excluded as per module BL-PEAT
		Emissions from ditches and open water bodies	CO ₂	Included
	DOC		Included	DOC values for 'drained' and 'undrained' peatlands (IPCC) are used to calculate the differences in carbon losses between baseline and Project.
	CH ₄		Included	CH ₄ emissions from water bodies are included
	N ₂ O		Excluded	Not significantly increased in the baseline and conservatively omitted as per module BL-PEAT
	Other		Excluded	Excluded as per module BL-PEAT
Baseline	Emissions from tidal wetland mineral	CO ₂	Excluded	
		CH ₄	Excluded	
		N ₂ O	Excluded	
		Other	Excluded	

Source	Gas	Included?	Justification/Explanation	
		The project are does not include any tidal wetlands and so these emissions are non-existent.		
	Burning of woody biomass	CO ₂	Excluded	Above-ground biomass losses because of fire are conservatively assumed zero (see comment below)
		CH ₄	Excluded	Above-ground biomass losses because of fire are conservatively assumed zero (see comment below)
		N ₂ O	Excluded	Above ground biomass losses because of fire are conservatively assumed zero (see comment below)
		Other	Excluded	Above ground biomass losses because of fire are conservatively assumed zero (see comment below)
		No fires have been observed in the baseline to date and fire is assumed to be zero in the baseline and GHG from fires are conservatively omitted. Because measured biomass burning is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the biomass pool as specified in T-SIG.		
	Combustion of fossil fuels	CO ₂	Excluded	Conservative to exclude in the baseline
		CH ₄	Excluded	Potential emissions are negligible
		N ₂ O	Excluded	Potential emissions are negligible
		Other	Excluded	Potential emissions are negligible
	Use of fertilizers	CO ₂	Excluded	Potential emissions are negligible
		CH ₄	Excluded	Potential emissions are negligible
		N ₂ O	Excluded	The main plantation species for peatland plantation are Acacia species which are nitrogen fixing species. No nitrogenous fertilizers are used in Acacia plantation management. N ₂ O emissions from fertilizer applications are excluded in baseline scenario. Conservatively omitted as permitted under VM0007. Because measured nitrogenous fertilizer use is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the pool as specified in T-SIG.
		Other	Excluded	Potential emissions are negligible

Baseline	Peat or biomass combustion	CO ₂	Excluded	
		CH ₄	Excluded	
		N ₂ O	Excluded	
		Other	Excluded	
	No fires have been observed in the baseline to date and fire is assumed to be zero in the baseline and GHG from fires are conservatively omitted. If fire is observed during the project monitoring, it will be accounted for. Values will be calculated using forest degradation emission factors.			

Project	Deforestation	CO ₂	Excluded	
		CH ₄	Excluded	
		N ₂ O	Excluded	
		Other	Excluded	
		Deforestation is not included in the project scenario. If deforestation is observed during the project monitoring, it will be accounted for. Values will be calculated using deforestation emission factors.		
	Forest Degradation	CO ₂	Excluded	
		CH ₄	Excluded	
		N ₂ O	Excluded	
		Other	Excluded	
		Forest degradation is not included in the project scenario. If forest degradation is observed during the project monitoring, it will be accounted for. Values will be calculated using forest degradation emission factors.		
	Oxidation of drained peat	CO ₂	Excluded	
		CH ₄	Excluded	
		N ₂ O	Excluded	
		Other	Excluded	
		There is currently no drained peat in the project area. Peat drainage is not included in the project scenario. If peat drainage is observed during the project monitoring, it will be accounted for. Values will be calculated using deforestation emission factors.		

Project	Burning of woody biomass	CO ₂	Excluded	
		CH ₄	Excluded	
		N ₂ O	Excluded	
		Other	Excluded	
		No fires have been observed in the baseline to date and fire is assumed to be zero in the baseline and GHG from fires are conservatively omitted.		
	Peatland and biomass combustion	If fire is observed during the project monitoring, it will be accounted for. Values will be calculated using forest degradation emission factors.		
		CO ₂	Excluded	
		CH ₄	Excluded	
		N ₂ O	Excluded	
		Other	Excluded	
		No fires have been observed in the baseline to date and fire is assumed to be zero in the baseline and GHG from fires are conservatively omitted.		
	Combustion of fossil fuels	If fire is observed during the project monitoring, it will be accounted for. Values will be calculated using forest degradation emission factors.		
		CO ₂	Excluded	Potential emissions are negligible
		CH ₄	Excluded	Potential emissions are negligible
		N ₂ O	Excluded	Potential emissions are negligible
		Other	Excluded	Potential emissions are negligible
	Use of fertilizers	Fossil fuel use in the project as a relative contribution (RE%) is close to zero and less than the 5% threshold of the pool as specified in T-SIG.		
		CO ₂	Excluded	Potential emissions are negligible
		CH ₄	Excluded	Potential emissions are negligible
		N ₂ O	Excluded	There is no plan to use nitrogen fertilizers for project activities. The risk of increased use of fertilizer outside of the project because of the project is negligible. Conservatively omitted as permitted under VM0007.
		Because measured nitrogenous fertilizer use is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the pool as specified in T-SIG.		
		Other	Excluded	Potential emissions are negligible

Project	Emissions from tidal wetland mineral soils	CO ₂	Excluded	Potential emissions are negligible
		CH ₄	Excluded	Potential emissions are negligible
		N ₂ O	Excluded	Potential emissions are negligible
		Other	Excluded	Potential emissions are negligible
	The project are does not include any tidal wetlands and so these emissions are non-existent.			

3.4 Baseline Scenario

The historical and current land-use activity in and around the Project's area are industrial plantation, production forest-commercial selective logging, industrial oil palm plantation, smallholder oil palm plantation, and mining.

Samling Reforestation (Bintulu) Sdn Bhd (hereinafter referred to "Samling") is in possession of a License for Planted Forest (LPF) called Marudi LPF/0008. (Sarawak Malaysia). The concession is approximately 55,818 ha in area. An estimated 26,321 ha of the area has peatland soil.

Samling's current management plan for Marudi LPF/0008 is the development of fast-growing timber plantations mostly based on Acacia species as a future supply of raw materials for its existing and plywood plants, sawmills, and its fiber mills in Sarawak. Approximately 9,189 ha of the concession has been converted to plantation species as of March 2023.

Samling has now formed a new company called SaraCarbon SDN. BHD. This is the project company in whose name the new Forest Carbon License will be granted and SaraCarbon will be the operator of the Forest Carbon Project for the lifetime of the project.

Samling identified 3 blocks within the Marudi LPF/0008 - Marudi, Marau, and Tasong - within which the carbon project will be implemented. These areas are predominantly peatland areas although small outcrops of mineral soils. The Samling CEO issued an instruction / memo to halt all land clearing operations in Marudi LPF/0008 pursuant to the creation of a carbon project. The date for completion of all land clearing was 15 December 2021.

The Project will cease all future forest land clearing, and implement reforestation, and forest restoration as well as programs for forest monitoring and preservation, biodiversity protection and enhancement, community engagement and sustainable development.

It is assumed that remaining non-forest lands will return to their natural state through a combination of natural regeneration and assisted natural regeneration. The project proponent will not be claiming emissions reductions under ARR for these areas.

The way and steps for identification of baseline scenario are described in Section 3.5 using Verra tool VT0001 – T-ADD "Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities. Version 3.0.

The Project will implement a series of programs that will allow it to achieve its aims and emissions reduction activities, including:

1. **Forest preservation program:** The Project will establish a team and infrastructure for land use monitoring and security. The Project will liaise with the local authorities who will exercise enforcement.
2. **Forest fire control program:** The Project will establish a team and infrastructure to provide fire protection.
3. **Restoration of Degraded Forest Areas.** The project will protect all lands within the Project Area boundaries to allow natural restoration of the natural ecosystems. Additional restoration will be conducted including enrichment planting to increase species biodiversity in the project area and planting specific species that assist fauna biodiversity (for example *Ficus* species)
4. **Preservation of Wetland Areas:** The Project will seek to protect existing wetland areas.
5. **Community Engagement and Community Sustainable Development Program (Community Program):** The Project will implement a community engagement program to manage all interactions with communities that will support good community relations, resolve claims and disputes, and coordinate community involvement with the project.

Out of the original 55,818 ha in Marudi LPF/0008, approximately 25,675 ha will be allocated to the SaraCarbon project. The activities in the Project are further classified according to combinations of Avoided Planned Deforestation and Degradation (APDef) and Conservation of Intact Wetlands (CIW) which total 25,215 ha in area. The area breakdown of the activities is shown in the table below.

Block	Project Area						Outside Project Area	Inside original LPF
	Carbon Activities				No activity	Total		
	REDD	REDD+CIW	CIW	Sub-total				
Batu Belah	0	0	0	0	0	0	27,265	27,265
Marau	197	12,574	3,558	16,329	172	16,518	272	16,790
Marudi	5	2,801	11	2,817	7	2,824	1,211	4,035
Tasong	833	4,999	236	6,069	182	6,333	1,395	7,728
Total	1,035	20,374	3,806	25,215	460	25,675	30,143	55,818

Table 3-25 Areas of potential baseline activities

The successful implementation of the project over an estimated 60 year lifecycle shall result in total removals and reductions in CO₂E of approximately 99,009,535 tonnes and generate an estimated 87,128,391 tonnes of Verified Carbon Units (VCUs). This will generate average annual reductions in CO₂E of 1,650,159 tonnes CO₂E per year and an average annual production of 1,452,140 VCUs per year.

3.5 Additionality

3.5.1 Regulatory Surplus

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country

☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☒ Yes

☐ No

If the project is located inside a Non-Annex 1 country and the project activities are mandated by law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

☒ Yes

☐ No

3.5.2 Additionality Methods

3.5.2.1 General Approach

Additionality requirements are described in VT0001: tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry, and Other Land Use (AFOLU) project activities Version 3.0; 1 February 2012.

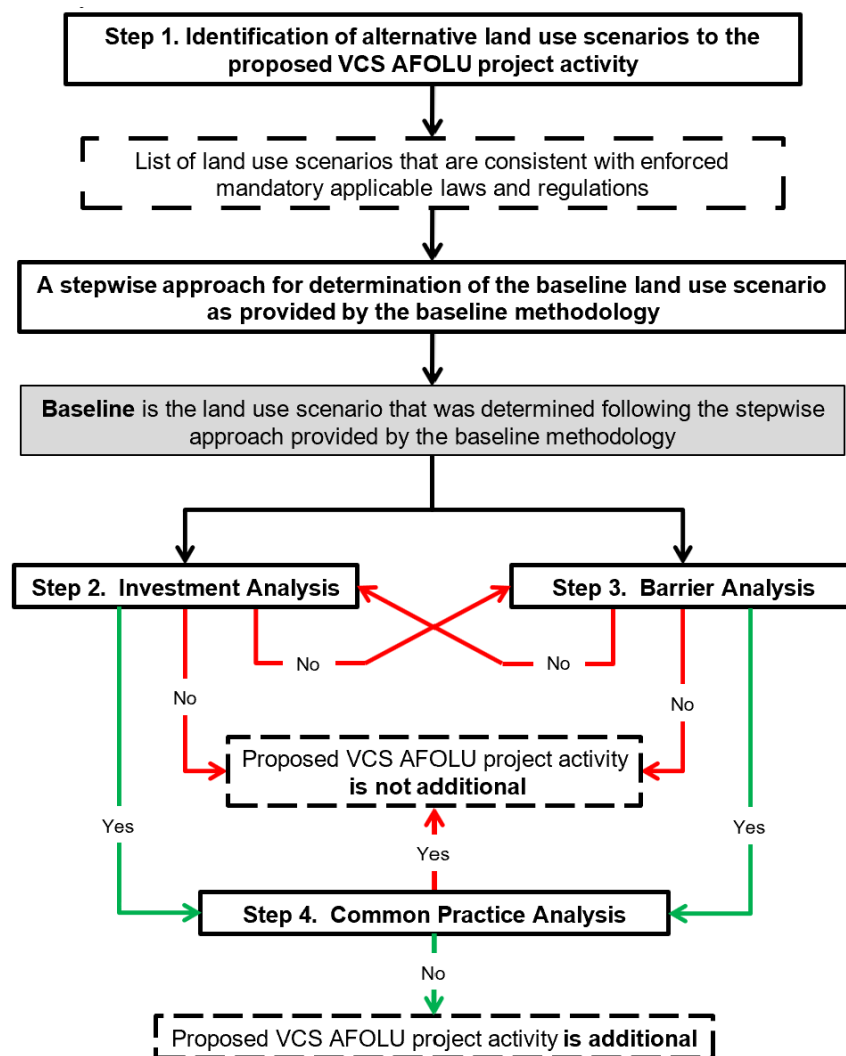


Figure 3-3 Flowchart for the Demonstration and Assessment of Additionality

3.5.2.2 Assessment of Additionality

The project scenario involves the protection of lands from planned and unplanned deforestation and the protection of wetlands from degradation. The major considerations for the assessment of project additionality are:

1. There is a realistic and legal alternative baseline scenario for Marudi LPF/0008 in the form of forest plantation development and the project meets step 1 requirements.
2. An investment analysis based on existing plantations will be prepared prior to validation to demonstrate the financial feasibility of the baseline and the financial infeasibility of project activity without GHG credits. The investment analysis for the Project is clear-cut and meets the requirements of step 2. The investment analysis can be implemented using a simple discounted cash flow analysis although the methodology offers several alternatives.
3. As Step 2 investment analysis clearly demonstrates additionality, then Step 3 barrier analysis is not strictly required. However, persuasive arguments can be made that there are several barriers to the proposed project activities that would block its implementation if it were not registered as a VCS carbon project. These include:
 - a. Similar large scale conservation project activities have only ever occurred with grants and non-commercial finance.
 - b. Debt funding is not available for this type of project activity.
 - c. The project activity is the “first of its kind”: No project activity of this type is currently operational in the host country.
 - d. The project activities could not occur without the benefit of VCS approaches and institutional support of VCS that is leading to the resolution of social conflicts, land claims and widespread illegal activities, unclear land tenure, and probably several other factors.
 - e. These barriers are additional to the extent that SaraCarbon will not implement the project activities if they are not expected to be registered as a VCS project. This can be established by formal documentation confirming that condition.
 - f. Furthermore, it can be easily established that these barriers to the project activities do not restrict Samling from implementing the baseline plantation development scenario.

These barriers are summarized in the table below:

Barriers	Relevance to the project context as capable of preventing the implementation of the project activity if not registered as a VCS carbon project
Institutional barriers	Yes. This barrier will be mitigated once SARACARBON will be granted a carbon license to proceed with the certification of the emission reduction as per December 2022 carbon law
Investment barriers	No
Technological barriers	No
Barriers related to local tradition	No
Barriers relating to land tenure, ownership, inheritance, and property rights	No

Barriers relating to markets, transport, and storage	No
Barriers due to local ecological conditions such as degraded soil (e.g., erosion, salination, etc.) and catastrophic natural and / or human-induced events (e.g., landslides, fire, etc.).	No
Barriers due to social conditions such as shortage of available labor to undertake the ARR project activity; and lack of skilled and/or professionally trained labor force.	No

Table 3-26 Barriers to Additionality

4. Step 4 requires proof that similar project activities do not commonly occur without the sale of GHG credits to subsidize them. While large scale forest conservation and protection activities do occur, they require Government funding or non-profit / donor-based financing to happen. There are no similar VCS projects applying VM0007 methodology framework, to our knowledge, in Malaysia and SaraCarbon is pioneering this mode of conservation financing in Malaysia. A common practice analysis shall be conducted prior to verification of the project performance and the result will clearly demonstrate additionality as per step 4 requirements.

3.5.2.3 Most-Likely Scenario Justification

The Tree Planting Plan for Marudi LPF/0008 included expansion of the area under cultivation to include all remaining natural forest and wetland areas. The company suspended the implementation of the planned deforestation within the Project Area boundaries and permanently stopped all land clearance as of the 15th of December 2021. This was as per Samling Group management's decision to convert the project area from a timber plantation development area into a forest conservation project. While the development of the Carbon project is progressing with no additional planting or land clearance within the Project Area boundaries.

3.5.2.4 Community and Biodiversity Additionality

Project scenario:

Traditional knowledge and skills of Indigenous communities under the baseline scenario:

The study region is mainly settled by the Iban communities. The Iban communities are still regulated by customary laws or *adat* which govern their daily lives and the management of natural resources.

The Iban communities have traditional knowledge of the use of plants to cure certain illnesses. For example, *daun sireh* (betel leaf) are used to stop nose bleeding and *buah engkudu* (noni fruit) are used for hypertension treatment. Tradition healing, such as *pelian* and *besunting*, are still available but not common. *Pelian* is the healing ritual conducted by a *manang* (shaman) to discover the location of a patient's soul. In the ritual, the sick person and the immediate family will be put under *pemali manang* (taboo) to increase efficiency. *Besunting* is a ritual conducted by *lemambang* (bard) to heal patients. The *lemambang* will read spells and rub the body of the patient with *kapu sireh* (lime betel) (Jawol et al., 2018).

The development and improvement in health facilities (clinics and hospitals) have improved the standard of living of the people and reduced the dependency on traditional rites, tools, and materials for healing. People now prefer to go to clinics or hospitals for medical treatments.

However, there is insufficient data to indicate how many natural resources are taken from the Project Area.

Further studies will determine whether any of the natural resources are available in sufficient quantities to be commercially developed as a socio-economic activity in the fringe. The need to regulate the resources will be dependent on their availability, as well as the quantities that are extracted.

- **Forest-based knowledge:** There is a decrease in traditional and forest-based knowledge and skills (such as herb identification and use, hunting/trekking, and fishing skills) among the younger generation in Indigenous communities due to reduction in their practice because of resources being less accessible, decreasing interest as well as the availability of alternative sources of income.
- **Knowledge of handicrafts:** Reduction in materials has led to diminishing practice in the art of making traditional handicrafts such as fish/animal traps and musical instruments.
- **Use of traditional knowledge and compensation:** The traditional knowledge of the community on herbs, languages, and the arts, as well as skills in hunting and fishing, which has been studied by researchers or acquired by outsiders, is generally not compensated.

- **Historical and cultural sites (including sacred areas):** Such sites are at times destroyed or degraded unintentionally through forest operations. These may also include sites of potential archaeological significance. Such sites may be in the form of graves, saka/ancestral areas, and rock/ monolithic formations.
- **New knowledge and skills:** The community acquires new knowledge and skills related to forest management operations such as felling, planting, tractor driving, nursery works, inventory, and surveying. As a result of the existence of forest roads, local people find it easier to go out and acquire new knowledge and skills by attending training programs organized by various government agencies and the private sector.
- **New values and ethics:** Interactions with outsiders may bring positive values and ethics such as on work and outlook.

Project scenario: HCV assessment was conducted, and measures will be taken to preserve all HCV identified.

3.5.2.5 Benefits to be used as Offsets (G2.2)

Not Applicable.

3.6 Methodology Deviations

3.6.1 First Methodology Deviation/Alteration

The Project has deviated from the peat depth measurement requirements of VMD0016 – Methods for Stratification of the Project Area (X-STR) Ver 1.2 because it was not operationally feasible to implement at the time the Project undertook its peat depth sampling efforts.

The current methodology: **VMD0016 – Methods for Stratification of the Project Area (X-STR) Ver 1.2** states:

“To create a peat depth map, depth measurements must be conducted in a systematic way along transects that cover the peatland. Starting from the margin (or boundary) of the peatland, the initial distance between depth observations along transects must not be greater than 100 m with a Distance between transects must be 200 m at maximum. When two subsequent depth observations along a transect fulfill the required depth criteria by a margin of at least 50 cm, the distance between transects and observation points can be raised to 500 m (4 measurements per km). Transects must cross the entire terrain of the peatland and must be initiated from opposed margins.”

The Project is deviating from the peat depth map requirements contained in X-STR Ver 1.2 because the sampling requirement is extremely operational and financially onerous. Given an estimated peatland area of 26,321 ha, strictly applying the methodology might have required measurement of more than 13,100 plots.

Instead, the Project Proponent (PP) sought the advice of Sarawak Tropical Peat Research Institute (TROPI) and Dr. Gusti Z. Anshari, Prof. at the Department of Soil Science, Tanjungpura University, Pontianak, Indonesia. TROPI are the State organization responsible for peatland research and management projects. Dr. Anshari is an internationally recognized expert in the field of peatland soil survey and mapping. Both parties advised us on the appropriate techniques for soil surveys that meet accepted scientific and regulatory requirements for peatland soil survey in the region.

What the Project Proponent did when it undertook peat measurements per X-STR:

- a. A systematic sampling manner.
- b. Using a staircase transect system.
- c. Sampling intervals of 500 m was generally used, but never more than 1,500 m; and
- d. Sampling resolution accuracy was 50cm.
- e. Transect started at project boundary.
- f. Initial distance between depth observations along transects must not be greater than 100 m.
- g. Initial depth accuracy of at least 50 cm for tropical peat
- h. Transects must cross the entire terrain of the peatland and must be initiated from opposed margins wherever possible.

The differences between the Project soil survey sample approach and X-STR will not significantly impact the Project. All peat areas were located within clearly defined and discrete landscape features such as between rivers. High quality DTMs were used to excise hills and other mineral protrusions that projected out of peatlands.

The deviation only relates to the procedure for measurements of the peat depth and does not relate to any other part of the methodology. Noteworthy though, with the peat being as thick as it is in the Project Area, the peat would not be depleted in the first ten years i.e., until the first baseline reassessment. The accuracy of the emission reductions is not affected by this deviation. The Project will update the peat map to the Baseline re-assessment in 2031. The temporary deviation is also appropriate as it is not reasonable to have the Project reassess its peat map where such a reassessment will have no impact whatsoever on the GHG emission reductions or removals.

The Project has not undertaken any other deviations from the VM0007 methodology or any of the related modules relating to the criteria and procedures for monitoring or measurement.

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The Project has used VM0007 (REDD-MF), VMD0006 (BL-PL), and VMD0042 (BL-PEAT) to assess the Project's baseline. The baseline uses the Tree Planting Plan which has been approved by the Sarawak Government as the management plan for deforestation and plantation development.

4.1.1 General Procedures and Assumptions

VMD0042 (BL-PEAT) § 5.1.1 requires that a set of "General Procedures and Assumptions" be followed in assessing Baseline emissions; the Project makes additional assumptions as well related to the APDef component of the Project.

The Project's baseline emissions and carbon stock assumptions were assessed based on an analysis of the likeliest baseline scenario. Accounted emissions resulted from the following:

- Avoided deforestation.
- Avoided microbial peat decomposition.
- Avoided organic carbon dissolved from water bodies.

The Project assumes that no non-human-induced rewetting of the peatland would have occurred under the baseline scenario. Examples of such rewetting include:

- Avoided wetland degradation through avoided drainage and avoided plantation development.
- Dike or canal collapses, which would have closed naturally over time, and
- Any progressive subsidence resulting in a raising of relative depths in the water table, increasingly thinner aerobic layers, and reduced CO₂ emission rates.

All assumptions made by the Project team are based on expert assessments considering verifiable scientific experience for the local area and published scientific documentation available. All such assumptions were made on a conservative basis.

The Project also has assumed that the baseline deforesting agent would perform regular maintenance of canals for drainage and transportation purposes.

Emissions from peat exposed to aerobic decomposition by spreading or piling following the establishment or maintenance of ditches are conservatively omitted as per BL-PEAT – Section 5.3.

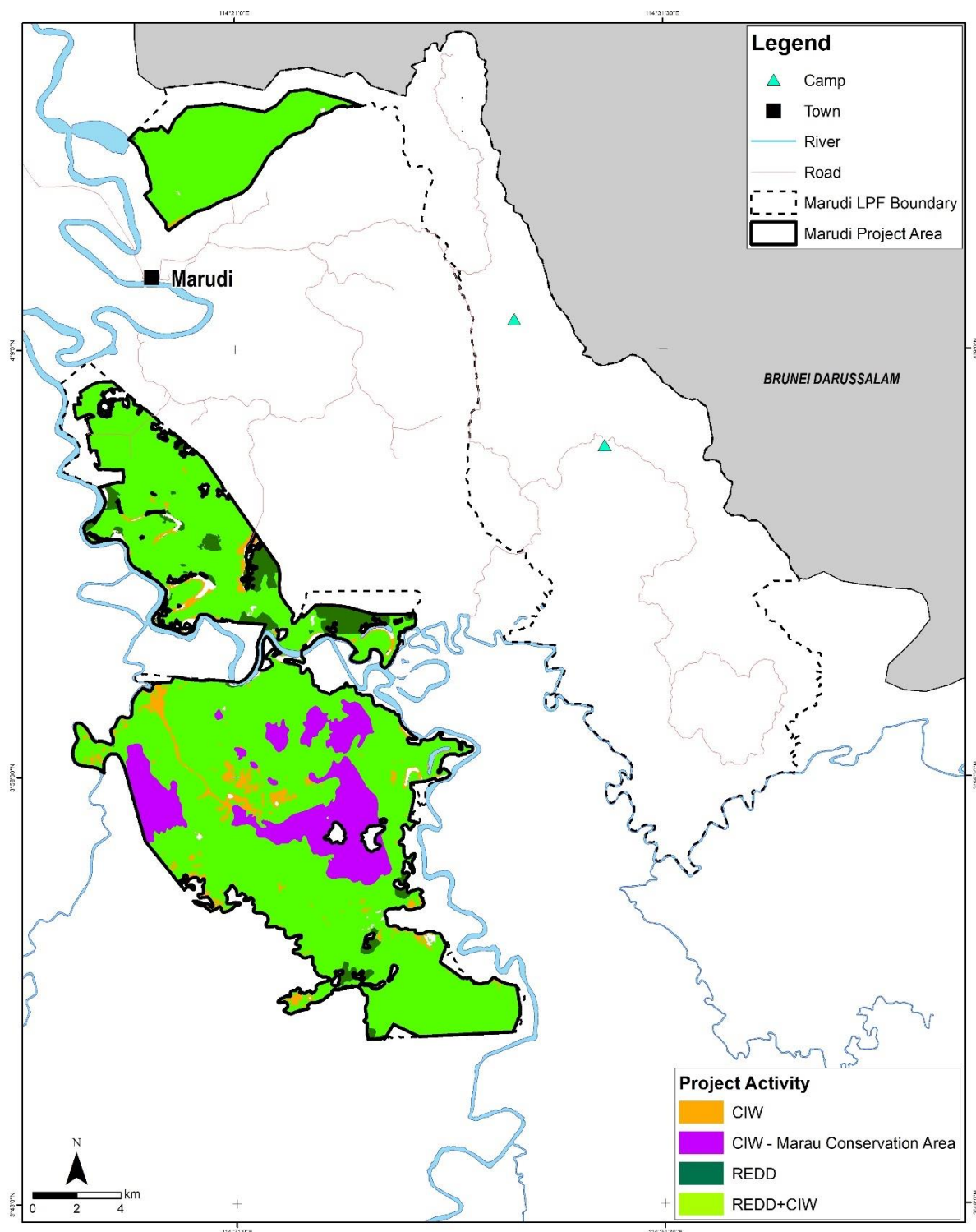
The Project assumed because of the known fire record for the Project Area that no uncontrolled burning of peat would occur in the Project Area. These emissions are not accounted for since the loss is insignificant. It was therefore considered conservative to omit GHG emissions from biomass burning in the baseline.

Baseline emissions have been calculated on an annual basis. This has been done as baseline changes in land cover classes and drainage status during the project lifetime determine (changes in) emissions of CO₂ and CH₄.

The Project has followed the requirements of VM0007 v1.8 § 5.4.2 and included N₂O as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting, § 5.4.2 of VM0007 v1.8 is set forth in §4.1.4.1.

4.1.2 Description of Project Activities

As a result of the Project reporting separate Project Activities, separate baseline emissions calculations have been prepared for each of the 3 separate project activities that would occur in comparison to the baseline scenario, REDD, REDD+CIW and CIW.



Map 4-1 The Project Activities

The Project will undertake the following activities:

1. **REDD** – Avoiding planned deforestation.
2. **CIW** – Avoiding wetland degradation with no avoiding planned deforestation. This includes:
 - a. Peatland with bare land cover to be converted into plantation under the baseline scenario
 - b. Peatland that is classified as conservation lands but will be rewetted in the baseline scenario when plantations on adjacent areas are converted to plantation
3. **REDD+CIW** - Avoiding wetland degradation by avoiding planned deforestation.

Potential areas of ARR are also documented, but the project has no intention of claiming credits for ARR, and it is not included as a crediting activity.

All the area developed into plantations under the baseline scenario in any given year is expected to be clear-felled of all forest cover, then drained and converted to plantations.

Quantification of GHG emissions from microbial decompositions of peat and water bodies in peatlands has been conducted by using a spatially and temporally explicit approach. Each baseline stratum was discretized into parcels of the smallest land or water body unit with relatively uniform combinations of spatial variables as given in the table below. Temporal discretization has been used by sequencing the calculation into 1-year time-steps, while temporal variables determine the sequence of strata changes. Temporal variability of GHG emission parameters and temporal restrictions to GHG emissions are presented in the table below. The schematization assures the proper use of GHG emission parameters at the correct spatial location and the correct time.

Variables	Description
(A) Spatial Variables	
(A1) Soil type	The distinction between peat or non-peat. This is used to exclude all non-peat parcels from GHG calculation.
(A2) Initial peat thickness available for microbial decompositions	Derived from DEM and Peat Thickness maps. These maps are used to determine the initial condition for subsequent calculations of the remaining peat layer available for microbial decomposition.
(A3) Initial stratum	The stratum of the corresponding parcel at the project start date (as derived in § 4.4 before conversion into baseline stratum takes effect. This is used to determine the correct emission factor for the corresponding parcel for the duration before B1 and B2 (in this table, below) take effect.
(B) Temporal Variables	
(B1) Year of drainage	Determines the onset of conversion from the initial stratum to the drained stratum and sets all the drainage-related parameters/variables accordingly, such as initial consolidations, bulk density changes, etc. This does not take effect if the initial stratum of the parcel is already drained. Together with B2, this is used to determine the correct Emission Factor for the corresponding parcel.
(B2) Year of deforestation/ planting of the baseline land cover	Determines the onset of conversion of the initial stratum to deforested/planted stratum. Together with B1, this is used to determine the correct Emission Factor for the corresponding parcel.
(B3) PDT	The Peat Depletion Timeline (PDT) is the period that it takes to deplete the remaining peat layer by microbial decomposition (conservatively will be assumed that PDT is reached once the remaining peat layer has reached 20 cm). Once the PDT is reached in each stratum, all GHG emissions in that stratum are set to zero.

Table 4-1 Variables used in the schematization of quantification of GHG emissions from microbial decompositions of peatland dissolved organic carbon from water bodies in peatlands in the baseline scenario.

4.1.3 Methods for Quantifying Baseline Emissions from REDD (BL-PL)

The methods for estimating net carbon stock changes and GHG emissions from planned deforestation under the baseline scenario are described in module BL-PL §5 Part 1.

4.1.3.1 Part 1 - Calculating the annual area of planned deforestation.

4.1.3.1.1 Step 1.1 - Identification of agent of planned deforestation

The agent of planned deforestation is Samling. The baseline involves Samling developing plantations on lands scheduled for plantation development as per the Government endorsed Tree Planting Plan.

4.1.3.1.2 Step 1.2. - Area of planned deforestation

The area of planned deforestation is described in section 3.3.2 called “REDD, WRC and ARR Boundaries.” This area applies to all forested land within the plantation development (“development area”) within the geographical boundaries of the project. The APDef boundaries are generated by intersecting the forest area stratification boundaries with the planned plantation development boundaries and identifying all areas of forest subject to planned deforestation. The specific areas for planned deforestation REDD and REDD+CIW activities are described in sections 4.1.5 and 4.1.7, respectively.

Step 1.3. - Rate of planned deforestation

The planned deforestation rate is specified in the Tree Planting Plan. Each coupe within Marudi LPF/0008 has a year designated for land clearing and plantation establishment. The baseline management plan is a valid and reasonable proposition, meeting Sarawakian legal requirements, permissible under the regulations, practical in terms of plantation siting and practical implementation, and technically feasible from an operational perspective.

4.1.3.1.3 Step 1.4 - Likelihood of planned deforestation

Since all tree plantation concessions are zoned for deforestation, area under the private control of the concessionaire, and not under government control for the entire duration of the concession license, the likelihood of deforestation (L-Di) is assumed to be equal to 100%. Proprietary concession management documents controlled by SAMLING are also available to provide further proof of this.

4.1.3.1.4 Step 1.5 - Risk of abandonment

Since Samling is currently managing plantations within the Marudi LPF/0008 concession, the risk of abandonment is virtually zero.

4.1.3.1.5 Step 1.6 - Annual area of deforestation

The annual area of deforestation is directly derived from the Government endorsed Tree Planting Plan.

The actual planned rate of deforestation is shown in the table below.

Activity	Areas of plantations by year on REDD areas (ha)						
	Planting Year						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Secondary forest	0	0	605	0	406	594	1,606
Degraded forest	0	0	2,322	1,771	1,609	2,924	8,625
Heavily Degraded Forest	0	0	2,905	1,211	2,488	4,575	11,179
REDD Areas	0	0	5,833	2,981	4,503	8,093	21,410

Table 4-2 Baseline Plantation Development Program

4.1.3.2 Part 2 - Baseline Carbon Stock Change

The Project next applies Part 2 – Baseline Carbon Stock Change as per VMD0006 (BL-PL). For terrestrial carbon pools, stock changes in each pool are calculated by subtracting post-deforestation carbon stocks from forest carbon stocks using equations 6 to 13 of VMD0006 BL-PL.

$$\Delta C_{AB,tree,i} = C_{AB,tree,bsl,i} - C_{AB,tree,post,i} \quad (6)$$

$$\Delta C_{AB,non-tree,i} = C_{AB,non-tree,bsl,i} - C_{AB,non-tree,post,i} \quad (7)$$

$$\Delta C_{BB,tree,i} = C_{BB,tree,bsl,i} - C_{BB,tree,post,i} \quad (8)$$

$$\Delta C_{BB,non-tree,i} = C_{BB,non-tree,bsl,i} - C_{BB,non-tree,post,i} \quad (9)$$

$$\Delta C_{DW,i} = C_{DW,bsl,i} - C_{DW,post,i} \quad (10)$$

$$\Delta C_{LI,i} = C_{LI,bsl,i} - C_{LI,post,i} \quad (11)$$

$$\Delta C_{SOC,i} = C_{SOC,bsl,i} - C_{SOC,PD-BSL,i} \quad (12)$$

Where:

$\Delta C_{AB_tree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$C_{AB_tree,bsl,i}$	Forest carbon stock in aboveground tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$C_{AB_tree,post,i}$	Post-deforestation carbon stock in aboveground tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$\Delta C_{BB_tree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$C_{BB_tree,bsl,i}$	Forest carbon stock in belowground tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$C_{BB_tree,post,i}$	Post-deforestation carbon stock in belowground tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$\Delta C_{AB_non-tree,i}$	Baseline carbon stock change in aboveground non-tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$C_{AB_non-tree,bsl,i}$	Forest carbon stock in aboveground non-tree vegetation in stratum i ; t CO ₂ -e ha ⁻¹
$C_{AB_non-tree,post,i}$	Post-deforestation carbon stock in aboveground non-tree vegetation in stratum i ; t CO ₂ -e ha ⁻¹
$\Delta C_{BB_non-tree,i}$	Baseline carbon stock change in belowground non-tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$C_{BB_non-tree,bsl,i}$	Forest carbon stock in belowground non-tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$C_{BB_non-tree,post,i}$	Post-deforestation carbon stock in belowground non-tree biomass in stratum i ; t CO ₂ -e ha ⁻¹
$\Delta C_{DW,i}$	Baseline carbon stock change in dead wood in stratum i ; t CO ₂ -e ha ⁻¹
$C_{DW,bsl,i}$	Forest carbon stock in dead wood in stratum i ; t CO ₂ -e ha ⁻¹
$C_{DW,post,i}$	Post-deforestation carbon stock in dead wood in stratum i ; t CO ₂ -e ha ⁻¹
$\Delta C_{LI,i}$	Baseline carbon stock change in litter in stratum i ; t CO ₂ -e ha ⁻¹
$C_{LI,bsl,i}$	Forest carbon stock in litter in stratum i ; t CO ₂ -e ha ⁻¹
$C_{LI,post,i}$	Post-deforestation carbon stock in litter in stratum i ; t CO ₂ -e ha ⁻¹
$\Delta C_{SOC,i}$	Baseline carbon stock change in soil organic carbon in stratum i ; t CO ₂ -e ha ⁻¹
$C_{SOC,bsl,i}$	Forest carbon stock in soil organic carbon in stratum i ; t CO ₂ -e ha ⁻¹
i	1, 2, 3, ... M strata

Note that non-tree vegetation/biomass, deadwood, litter and soil organic carbon for mineral soils are not included in the project. Soil organic carbon is not calculated for APWD-REDD projects under this methodology.

Stock changes in above ground biomass are emitted at the time of deforestation. Following deforestation, emissions from below ground biomass are calculated as being emitted at an annual rate of 10% of stock change for 10 years using equations 13 and 14 of VMD0006 BL-PL for mineral soils and peat soils, respectively.

For REDD project activities (non-wetland):

$$\begin{aligned} \Delta C_{BSL,i,t} = & AA_{planned,i,t} * (\Delta C_{AB_{tree,i}} - \Delta C_{WP,i} + \Delta C_{AB_{non-tree,i}} + \Delta C_{LI,i}) + \\ & (\sum_{t=10}^t AA_{planned,i,t}) * (\Delta C_{BB_{tree,i}} + \Delta C_{BB_{non-tree,i}} + \Delta C_{DW,i}) * \left(\frac{1}{10}\right) + \\ & (\sum_{t=20}^t AA_{unplanned,i,t}) * (C_{WP100,i} + \Delta C_{SOC,i}) * \left(\frac{1}{20}\right) \end{aligned} \quad (13)$$

For APWD-REDD project activities (terrestrial carbon pools):

$$\begin{aligned} \Delta C_{BSL,i,t} = & AA_{planned,i,t} \times (\Delta C_{AB_{tree,i}} - \Delta C_{WP,i} + \Delta C_{AB_{non-tree,i}} + \Delta C_{LI,i}) + \\ & (\sum_{t=10}^t AA_{planned,i,t}) \times (\Delta C_{BB_{tree,i}} + \Delta C_{BB_{non-tree,i}} + \Delta C_{DW,i}) * \left(\frac{1}{10}\right) + \\ & (\sum_{t=20}^t AA_{planned,i,t}) \times (C_{WP100,i}) * \left(\frac{1}{20}\right) \end{aligned} \quad (14)$$

Note that wood products pool, non-tree vegetation/biomass, deadwood, and litter are not included in the project. Soil organic carbon is not calculated for APWD-REDD projects under this methodology.

Per BL-PL, net carbon stock changes in the baseline are equal to pre-deforestation stocks minus the long-term average carbon stock in the post-deforestation land-use (acacia plantation), as defined in the following equation.

$$\Delta C_{ABtree,i} = C_{ABtree_{BSL},i} - C_{ABtree_{post},i}$$

Where:

$\Delta C_{ABtree,i}$ = Baseline carbon stock change in aboveground tree biomass in stratum i ; t CO₂-e ha⁻¹

$C_{ABtree_{BSL},i}$ = Forest carbon stock in aboveground tree biomass in stratum i ; t CO₂-e ha⁻¹

$C_{ABtree_{post},i}$ = Post-deforestation carbon stock in aboveground tree biomass in stratum i ; t CO₂-e ha⁻¹

Pre-deforestation stock is equal to the average carbon density estimated from biomass plots in the project area.

The long-term average carbon stock is based on the post deforestation land-use of *Acacia crassiparva* plantations. The long-term average carbon stock is calculated from the biomass dynamics of *Acacia crassiparva* in plantations with the rotation of 5 years. The growth assumptions were provided by Samling Group and supplied from their research and development division from long term growth plots and from their management division. These are summarized below:

Factor	Value	Unit	Comment
Final harvest quantity (Gross)	75.0	GMT/ha	Green metric tonnes inside bark
% area planted	90.0	%	
Final harvest quantity (Adjusted)	67.5	GMT/ha	
Stem wood logging waste	5	%	
Total stem wood	71.1	GMT/ha	Green metric tonnes inside bark
Green density	0.95	GMT/m3	
Total stem wood volume	74.79	m3/ha	Green metric tonnes outside bark
Basic wood density	0.60	t/m3	
Total stem wood biomass at harvest date	44.88	t/ha	
Branches	25	%	
Foliage	5	%	
Total ABG	58.34	t.dm/ha	
Harvest age	5	years	
Average total AGB annual increment	11.67	t.dm/ha	

Table 4-3 Emissions factors for plantation growth and yield

The long-term average carbon stock of *Acacia crassicarpa* is calculated using the methodology described in “AFOLU Guidance: Example for Calculating the Long-Term Average Carbon Stock for ARR Projects with Harvesting.” The calculation is shown in the table below:

Year	AGB	Unit
1	11.7	t.dm/ha
2	23.3	
3	35.0	
4	46.7	
5	58.3	
Average	29.2	t.C ha ⁻¹
	13.7	
	50.3	t.CO ₂ ha ⁻¹

Table 4-4 The long-term average carbon stocks for *Acacia crassicarpa* plantations

4.1.3.3 Emissions Calculations from Planned Deforestation (REDD)

The baseline net GHG emissions from terrestrial carbon pools for planned deforestation are calculated in equation 1 of module VMD0006 BL-PL as follows:

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

Where:

$\Delta C_{BSL,planned}$	= Net greenhouse gas emissions in the baseline from planned deforestation up to year t^* ; t CO ₂ -e
$\Delta C_{BSL,i,t}$	= Net carbon stock changes in all pools in the baseline stratum i in year t ; t CO ₂ -e
$GHG_{BSL-E,i,t}$	= Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i in year t ; t CO ₂ -e yr ⁻¹
i	= 1, 2, 3, ... M strata
t	= 1, 2, 3, ... t^* years elapsed since the projected start of the project activity

In this project, we do not include emissions from fossil fuel emissions or biomass burning. However, we assume that fertilizer will be applied to plantation areas in the baseline scenario only and assume that some N₂O emissions would occur. Nonetheless, as VM0007 in Table 7 at §5.4.2, indicates, we should include N₂O as a carbon pool, but it may be excluded from the accounting if it is “excluded from the baseline” so long as fertilizer use is not enhanced as a leakage avoidance mechanism. As such §5, Part 3 of PL-PL Green House Gas Emissions is not used.

To calculate emissions from deforestation we use the following approach:

Determine the annual area of planned plantation development and associated deforestation for REDD and REDD+CIW baseline scenarios by land cover strata. The land-use change and associated deforestation for the whole project area are summarized in the table below.

Land Cover Strata	Description	Area Beginning	Area Baseline	Land-Use Change
		(ha)		
Plantation	Plantation and associated infrastructure. This stratum represents typical <i>Acacia</i> plantations on peatland in Malaysia. For this stratum, drainage is required, and forest covers are removed if present. <i>Acacia</i> planting starts in the same year as deforestation. The development of drainage constructions is assumed to happen just before- or at the same year as the deforestation/planting.	0	21,410	21,410
Secondary Forest	Medium density natural forests. Most of this forest type is allocated for conversion to plantations.	1,606	0	-1,606
Degraded Forest	Low density / moderately degraded natural forests. Most of this forest type is allocated for conversion to plantations.	8,625	0	-8,625
Heavily Degraded Forest	Low density / highly degraded natural forests. Most of this forest type is allocated for conversion to plantations.	11,1179	0	-11,1179
Total		21,410	21,410	0

Table 4-5 Land-Use Change of all Stratum

1. We calculate the quantity of the average per hectare above ground biomass (AGB) and its CO₂ equivalent GHG emissions from the cleared forest using the forest inventory data. This is reported separately and summarized below. The conversion factor for biomass weight to molecular carbon weight is 0.47¹⁴ and the conversion factor for molecular carbon to CO₂E is 3.667¹⁵. The total above ground biomass emissions in CO₂E from deforestation are calculated by multiplying the area of each land cover stratum deforested each year by the average AGB for the stratum.

¹⁴ Intergovernmental Panel on Climate Change. 2016. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Table 4.3 Carbon Fraction of Aboveground Forest Biomass

¹⁵ *Supra Warren. et al. 2017.*

Land Cover Strata	Average AGB	
	(t.DM.ha ⁻¹)	(t.CO ₂ E.ha ⁻¹)
Secondary Forest	160.6	276.8
Degraded Forest	68.4	117.9
Heavily Degraded Forest	31.9	55.0
Non-Forest and Water Bodies	0.0	0.0

Table 4-6 Average AGB of all strata

- The baseline carbon stock change in aboveground tree biomass ($\Delta C_{AB\ tree,i}$) is calculated from the forest carbon in AGB minus the long-term average carbon stock of Acacia / Eucalyptus as per the table below.

Land cover	$C_{AB\ tree_BSL,i}$		$C_{AB\ tree_post,i}$		$\Delta C_{AB\ tree,i}$	
	t.dm ha ⁻¹	t.CO ₂ -e ha ⁻¹	t.dm ha ⁻¹	t.CO ₂ -e ha ⁻¹	t.dm ha ⁻¹	t.CO ₂ -e ha ⁻¹
Secondary Forest	104.7	180.4	29.2	50.3	75.5	130.1
Degraded Forest	64.2	110.6	29.2	50.3	35.0	60.3
Heavily Degraded Forest	35.7	61.5	29.2	50.3	6.5	11.2

Table 4-7 Baseline carbon stock change by land cover type

- The below ground biomass emissions in CO₂E are calculated by multiplying the above ground biomass estimate for each of the land cover stratum deforested by the appropriate root to shoot ratio. The 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories specifies the use of a root to shoot ratio for Tropical Rainforests in Asia of 21.2%.

Land cover	Mean AGB			Mean BGB			Mean BM		
	t.DM	t.C	t.CO ₂ E	t.DM	t.C	t.CO ₂ E	t.DM	t.C	t.CO ₂ E
Secondary Forest	160.6	75.5	276.8	34.0	16.0	58.7	194.6	91.5	335.5
Degraded Forest	68.4	32.2	117.9	14.5	6.8	25.0	82.9	39.0	142.9
Heavily Degraded Forest	31.9	15.0	55.0	6.8	3.2	11.7	38.7	18.2	66.7

Table 4-8 Average BM estimates of all Stratum

4.1.4 Methods for Quantifying Baseline Emissions from WRC (BL-PEAT)

The methods for estimating net carbon stock changes and assessing GHG emissions in the baseline scenario from WRC activities are described in Module BL-PEAT, 5.2 through §5.5, and are set forth below.

4.1.4.1 Area of peat drained by plantation development.

Internal studies conducted by the Project Developer, in consultation with plantation management professionals, has estimated that the quantity of canals required is shown in the table below:

Canal type	Density (m/ha)	Width (m)	Area (m ² /ha)
Main canal	1.87	12	22.14
Branch canal	12.12	7.64	92.57
Perimeter canal	0.50	5.42	2.71
Large field drains	12.50	2.00	25.00
Small field drains	53.33	1.2	64.00
Source: Samling Planning Department			

Table 4-9 The dimensions and density of new canals created during the baseline development.

When totaled, the area of land occupied by canals is approximately 2.06%.

Peatland degradation is modeled according to the following assumptions.

1. Peatland degradation will occur in conjunction with the plantation development program specified in the Tree Planting Plan.
2. It is assumed all the natural forest areas within the development area will be clear-felled and developed into either plantation or infrastructure.

The area of CIW is estimated as follows:

Activity	Areas of plantations by year on WRC-CIW areas (ha)						
	Planting Year						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
REDD+CIW	0	0	4,999	2,970	4,499	7,906	20,374
CIW	0	0	236	422	1,831	1,316	3,806
WRC-CIW Areas	0	0	5,236	3,392	6,330	9,222	24,180

Table 4-10 Baseline peatland degradation table

The area of plantation canals and drains is estimated as follows:

Activity	Areas of canals and drains by year on WRC-CIW areas (ha)						
	Planting Year						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
REDD+CIW	0.0	0.0	103.0	61.2	92.7	162.9	419.7
CIW	0.0	0.0	4.9	8.7	37.7	27.2	78.4
Canal Areas	0.0	0.0	107.9	69.9	130.4	190.0	498.1

Table 4-11 Baseline Plantation canals and Drains areas

4.1.4.2 Assessing Baseline Greenhouse Gas Emissions from Terrestrial Carbon Pools from Peatland Rewetting and Conservation Projects

The Project applies VMD0042 (BL-PEAT) in assessing GHG emissions in the baseline scenario according to §5.2 of the module for CIW activity.

The Project also notes that it has followed the requirements of VM0007 v1.8 § 5.4.2 and included N₂O as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting as suggested in Table 7, § 5.4.2 of VM0007 v1.8.

4.1.4.2.1 Total Baseline Emissions from Peatlands

The baseline net GHG emissions from peat in the baseline using equations 1 - 4 of VMD006 BL-PEAT are calculated as follows:

$$GHG_{BSL-PEAT} = \sum_{t=1}^{t^*} \sum_{i=1}^M (A_{peatsoil-BSL,i,t} \times GHG_{peatsoil-BSL,i,t} + A_{ditch-BSL,i,t} \times GHG_{peatditch-BSL,i,t} + A_{peatburn-BSL,i,t} \times GHG_{peatburn-BSL,i,t}) \quad (1)$$

Where:

$GHG_{BSL-PEAT}$	Net GHG emissions in the WRC baseline scenario on peatland up to year t^* (t CO ₂ e)
$GHG_{peatsoil-BSL,i,t}$	GHG emissions from the peat soil within the project boundary in the baseline scenario in stratum i at year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{peatditch-BSL,i,t}$	GHG emissions from water bodies in the baseline scenario in stratum i at year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{peatburn-BSL,i,t}$	GHG emissions from burning of peat in the base line scenario in stratum i at year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$A_{peatsoil-BSL,i,t}$	Area of peatland (not open water, not burnt) in stratum i in year t in the baseline scenario (ha)
$A_{ditch-BSL,i,t}$	Area of ditch and other open water in stratum i in year t in the baseline scenario (ha)
$A_{peatburn-BSL,i,t}$	Area of peat burnt in stratum i in year t in the baseline scenario (ha)
i	1, 2, 3 ... M strata in the baseline scenario (unitless)
t	1, 2, 3, ... t^* times elapsed since the project start (yr)

For all strata i where the project duration exceeds the peat depletion time (PDT or t_{PDT}), for $t > t_{PDT-BSL,i}$ the following applies:

$$GHG_{peatsoil-BSL,i,t} = 0 \quad (2)$$

$$GHG_{peatditch-BSL,i,t} = 0 \quad (3)$$

$$GHG_{peatburn-BSL,i,t} = 0 \quad (4)$$

Where:

$t_{PDT-BSL,i}$	Peat Depletion Time in the baseline scenario in stratum i in years elapsed since the project start; estimated in Module X-STR (yr)
$GHG_{peatsoil-BSL,i,t}$	GHG emissions from the peat soil within the project boundary in the baseline scenario in stratum i at year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{peatditch-BSL,i,t}$	GHG emissions from water bodies at year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{peatburn-BSL,i,t}$	GHG emissions from burning of peat in the base line scenario in stratum i at year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
i	1, 2, 3 ... M_{BSL} strata in the baseline scenario (unitless)
t	1, 2, 3, ... t^* time elapsed since the project start (yr)

In this baseline, we include net GHG emissions from peatland degradation and from ditches. We do not include emissions from peat burning because it is considered optional.¹⁶.

4.1.4.2.2 Baseline Emissions from Peat Drainage

GHG emissions from the peat soil per stratum because of drainage in the baseline scenario are estimated as per project equation 6 of VMD0042 BL-PEAT:

$$GHG_{proxy-BSL,i,t} = GHG_{proxy-CO_2,i,t} + GHG_{proxy-CH_4,i,t} \quad (6)$$

Where:

$GHG_{proxy-BSL,i,t}$	GHG emissions in relation to the chosen proxy in the baseline scenario in stratum i at year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{proxy-CO_2,i,t}$	Emission of CO ₂ in relation to the chosen proxy in stratum i at year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{proxy-CH_4,i,t}$	Emission of CH ₄ in relation to the chosen proxy in stratum i at year t ; can conservatively be omitted in the baseline scenario (t CO ₂ e ha ⁻¹ yr ⁻¹)
i	1, 2, 3 ... M_{BSL} strata ⁵ in the baseline scenario (unitless)
t	1, 2, 3, ... t^* time elapsed since the project start (yr)

The annual emissions of CO₂ and CH₄ from drained peat soil are estimated using the IPCC allometrics.

Land Use	GHG	Emission factor	
Fully drained peatland areas	CO ₂ -C	20	tonnes CO ₂ -C ha ⁻¹ yr ⁻¹
	CH ₄	2.7	kg CH ₄ ha ⁻¹ yr ⁻¹
Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].			

Table 4-12 Emission factors from drained peat soil

4.1.4.2.3 Baseline GHG emissions from ditches and other open water bodies in peatlands

GHG emissions from ditches and other water bodies in the baseline are derived based on the ditched area and area of open water combined with an emission factor as per equation 7 of VMD0042 BL-PEAT:

$$GHG_{peatditch-BSL,i,t} = GHG_{peatditch-CO_2,i,t} + GHG_{peatditch-CH_4,i,t} \quad (7)$$

¹⁶ VMD0042 ver. 1.1 §5.1.1 at bullet point 5 (p. 6) indicates that “In peatland rewetting and conservation projects, emissions from peat fires are always lower compared to the baseline emissions and emissions from peat fires can conservatively be neglected. Accounting for peat fires emissions in the baseline is therefore optional.

Where:

$GHG_{peatditch-BSL,i,t}$	GHG emissions from ditch and other open water stratum i at year t in the baseline scenario ($t\ CO_2e\ ha^{-1}yr^{-1}$)
$GHG_{peatditch-CO_2,i,t}$	Emission of CO_2 from ditch and open water stratum i at year t in the baseline scenario ($t\ CO_2e\ ha^{-1}yr^{-1}$)
$GHG_{peatditch-CH_4,i,t}$	Emission of CH_4 from ditch and open water stratum i at year t in the baseline scenario ($t\ CO_2e\ ha^{-1}yr^{-1}$)
i	1, 2, 3 ... M_{BSL} strata ⁶ in the baseline scenario (unitless)
t	1, 2, 3, ... t^* time elapsed since the project start (yr)

The annual emissions of dissolved organic carbon (DOC) and CH_4 from ditches and other open water bodies are estimated using IPCC allometrics.

Land Use	GHG	Emission factor		
Surface area of canals	Degradation	CH_4	2,259	$kg\ CH_4\ ha^{-1}\ yr^{-1}$
	Dissolved Organic Carbon	DOC	0.82	$tonnes\ C\ ha^{-1}\ yr^{-1}$
Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].				

Table 4-13 Emission factors from the surface area of canals

DOC is then converted to CO_2E by multiplication using the CO_2 to molecular C conversion factor of 3.667¹⁷.

¹⁷ Supra Indonesian National Carbon Accounting System. 2015:1

4.1.5 Baseline Emissions - REDD

4.1.5.1 Baseline emissions from deforestation

4.1.5.1.1 Area of land deforested in baseline

The REDD activity encompasses landscapes on mineral soils and will have planned deforestation under this scenario. The area of land planned for deforestation and conversion to plantations under REDD is 1,035,4 hectares.

Activity	Areas of plantations by year on REDD areas (ha)						
	Planting Year						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Secondary forest	0	0	110.4	0.0	0.0	0.0	110.4
Degraded forest	0	0	365.6	0.0	2.7	14.3	382.7
Heavily Degraded Forest	0	0	357.3	11.8	0.6	172.6	542.3
REDD Areas	0	0	833.3	11.8	3.4	186.9	1,035.4

Table 4-14 Areas converted to plantations by land cover and year in the baseline for REDD

4.1.5.1.2 Changes in terrestrial above ground tree carbon pools in the baseline

The carbon stock changes in above ground biomass are calculated according to the methods described in 4.1.3.2 and summarized in the table below.

Above ground tree carbon stock in the baseline ($C_{AB_tree_bsl,i}$)						
Year	Above ground tree biomass in baseline ($C_{AB_tree_bsl,i}$)			Baseline carbon stock change in above ground biomass		
	Secondary Forest	Degraded Forest	Heavily Degraded Forest	AGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{AB_tree_bsl,i}$)
Pre-2021	14,511	15,015	1,500			
2021	14,511	15,015	1,500	0	0	0
2022	14,511	15,015	1,500	0	0	0
2023	0	670	512	29,844	14,026	51,435
2024	0	670	479	33	15	56
2025	0	562	477	110	52	189
2026	0	0	0	1,040	489	1,792
Total				31,026	14,582	53,472

Table 4-15 Above ground tree carbon stock in the baseline for REDD

4.1.5.1.3 Changes in terrestrial below ground tree carbon pools in the baseline

The carbon stock changes in below ground biomass are calculated according to the methods described in 4.1.3.2 and summarized in the table below.

Below ground tree carbon stock in the baseline ($C_{AB_tree_bsl,i}$)						
Year	Below ground tree biomass in baseline ($C_{AB_tree_bsl,i}$)			Baseline carbon stock change in below ground biomass		
	Secondary Forest	Degraded Forest	Heavily Degraded Forest	BGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{BB_tree_bsl,i}$)
Pre-2021	3,076	3,183	318			
2021	3,076	3,183	318	0	0	0
2022	3,076	3,183	318	0	0	0
2023	0	142	108	6,327	2,974	10,904
2024	0	142	102	7	3	12
2025	0	119	101	23	11	40
2026	0	0	0	220	104	380
Total				6,577	3,091	11,336

Table 4-16 Below ground tree carbon stock in the baseline for REDD

The GHG emissions from depletion of BGB are shown in the table below.

Year	Below ground tree carbon stock depletion (CBB_tree_bsl,i)										Baseline carbon stock change in below ground biomass		
	Annual below ground biomass by depletion year ()										AGB (t)	CO ₂ -C (t)	CO ₂ -E (t) ($\Delta C_{BB_tree_bsl,i}$)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10			
2021	0										0	0	0
2022	0	0									0	0	0
2023	633	0	0								633	297	1,090
2024	1	633	0	0							633	298	1,092
2025	2	1	633	0	0						636	299	1,096
2026	22	2	1	633	0	0					658	309	1,134
2027	0	22	2	1	633	0	0				658	309	1,134
2028	0	0	22	2	1	633	0	0			658	309	1,134
2029		0	0	22	2	1	633	0	0		658	309	1,134
2030			0	0	22	2	1	633	0	0	658	309	1,134
2031				0	0	22	2	1	633	0	658	309	1,134
2032					0	0	22	2	1	633	658	309	1,134
2033						0	0	22	2	1	25	12	43
2034							0	0	22	2	24	11	42
2035								0	0	22	22	10	38
2036									0	0	0	0	0
2037										0	0	0	0
Total	658	658	658	658	658	658	658	658	658	658	6,577	3,091	11,336

Table 4-17 Below ground tree carbon stock depletion for REDD

Total carbon emissions from AGB and BGB ($C_{AB_tree_bsl,i} + C_{BB_tree_bsl,i}$)			
Year	Above ground tree biomass depletion in baseline ($C_{AB_tree_bsl,i}$)	Below ground tree biomass depletion in baseline ($C_{BB_tree_bsl,i}$)	Total biomass depletion in baseline
2021	0	0	0
2022	0	0	0
2023	51,435	1,090	52,525
2024	56	1,092	1,148
2025	189	1,096	1,285
2026	1,792	1,134	2,926
2027	0	1,134	1,134
2028	0	1,134	1,134
2029	0	1,134	1,134
2030	0	1,134	1,134
2031	0	1,134	1,134
2032	0	1,134	1,134
2033	0	43	43
2034	0	42	42
2035	0	38	38
2036	0	0	0
2037	0	0	0
Total	53,472	11,336	64,808

Table 4-18 Total carbon emissions from AGB and BGB for REDD

4.1.5.1.4 Greenhouse Gas Emissions from deforestation in the baseline

The Project has followed the requirements of VM0007 v1.8 § 5.4.2 and included N₂O as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting as suggested in Table 7, § 5.4.2 of VM0007 v1.8.

4.1.6 Baseline Emissions – CIW

4.1.6.1 Baseline emissions from peat soils

4.1.6.1.1 Areas of drained land and surface areas of drains in the baseline

The CIW activity encompasses landscapes that are undrained, and which will avoid drainage under the project. The area has no forest cover and is therefore ineligible for REDD.

Under the baseline, canals will be built, and the area drained resulting in peat soil GHG emissions from peatland degradation and GHG emissions from drains.

The area of avoided wetland drainage in the CIW activity is 3,805.6 hectares. The CIW area diminishes over time as the peatland is depleted

Calendar year of crediting period starting 15 th December	Drained area estimates (ha) ($A_{\text{peatsoil-BSL},t}$)
2021	0.0
2022	0.0
2023	236.2
2024	658.6
2025	2,489.5
2026	3,805.6
2027	3,805.6
2028	3,805.6
2029	3,805.6
2030	3,805.6
2031	3,805.6
2032	3,805.6
2033	3,805.6
2034	3,804.2
2035	3,801.2
2036	3,797.7
2037	3,793.6
2038	3,789.5
2039	3,785.4
2040	3,781.3
2041	3,777.2
2042	3,773.0
2043	3,768.9
2044	3,764.8
2045	3,760.0
2046	3,754.6
2047	3,748.3
2048	3,741.8
2049	3,735.4
2050	3,728.9
2051	3,722.4
2052	3,715.9
2053	3,709.5
2054	3,703.0
2055	3,696.6
2056	3,689.9
2057	3,681.4
2058	3,671.1
2059	3,660.5
2060	3,650.0
2061	3,639.4

2062	3,628.8
2063	3,618.2
2064	3,607.7
2065	3,597.1
2066	3,586.9
2067	3,575.4
2068	3,562.8
2069	3,549.6
2070	3,536.4
2071	3,523.2
2072	3,510.0
2073	3,496.7
2074	3,483.5
2075	3,470.3
2076	3,457.2
2077	3,444.8
2078	3,433.7
2079	3,423.8
2080	3,413.4

Table 4-19 Areas of drained land for CIW

The surface area of the canals in CIW activity is as follows:

Calendar year of crediting period starting 15 th December	Surface area of drainage canals (ha) ($A_{ditch-BSL,i,t}$)
2021	0.00
2022	0.00
2023	4.87
2024	13.57
2025	51.28
2026	78.39
2027	78.39
2028	78.39
2029	78.39
2030	78.39
2031	78.39
2032	78.39
2033	78.39
2034	78.37
2035	78.31
2036	78.23
2037	78.15
2038	78.06
2039	77.98
2040	77.89
2041	77.81
2042	77.72
2043	77.64
2044	77.56
2045	77.46
2046	77.35
2047	77.22
2048	77.08
2049	76.95
2050	76.82
2051	76.68
2052	76.55
2053	76.41
2054	76.28
2055	76.15

2056	76.01
2057	75.84
2058	75.62
2059	75.41
2060	75.19
2061	74.97
2062	74.75
2063	74.54
2064	74.32
2065	74.10
2066	73.89
2067	73.65
2068	73.39
2069	73.12
2070	72.85
2071	72.58
2072	72.31
2073	72.03
2074	71.76
2075	71.49
2076	71.22
2077	70.96
2078	70.74
2079	70.53
2080	70.32

Table 4-20 Canal surface area statistics for CIW

4.1.6.1.2 Baseline emissions from peat soil

Baseline emissions from peat soil Baseline GHG emissions from peat soils (GH _{proxy-BSL,i,t})			
Calendar year of crediting period starting 15 th December	Total GHG (t CO ₂ -E) (GHG _{proxy-BSL,i,t})	CO ₂ -C (t CO ₂ -E) (GHG _{proxy-CO2,i,t})	CH ₄ (t CO ₂ -E) (GHG _{proxy-CH4,i,t})
2021	0	0	0
2022	0	0	0
2023	17,343	17,326	18
2024	48,350	48,300	50
2025	182,770	182,581	188
2026	279,388	279,100	288
2027	279,388	279,100	288
2028	279,388	279,100	288
2029	279,388	279,100	288
2030	279,388	279,100	288
2031	279,388	279,100	288
2032	279,388	279,100	288
2033	279,388	279,100	288
2034	279,291	279,003	288
2035	279,069	278,782	287
2036	278,807	278,520	287
2037	278,510	278,223	287
2038	278,208	277,922	286
2039	277,906	277,620	286
2040	277,604	277,318	286
2041	277,302	277,017	286
2042	277,000	276,715	285
2043	276,698	276,413	285
2044	276,396	276,112	285
2045	276,041	275,757	284
2046	275,647	275,363	284
2047	275,185	274,901	283
2048	274,710	274,427	283
2049	274,234	273,952	282
2050	273,759	273,477	282
2051	273,283	273,002	281
2052	272,807	272,526	281
2053	272,332	272,051	280
2054	271,856	271,576	280
2055	271,387	271,107	279
2056	270,896	270,617	279
2057	270,275	269,997	278
2058	269,517	269,239	278
2059	268,740	268,464	277
2060	267,964	267,688	276
2061	267,188	266,913	275
2062	266,412	266,137	274
2063	265,635	265,362	274
2064	264,859	264,586	273
2065	264,083	263,811	272
2066	263,335	263,064	271
2067	262,491	262,221	270
2068	261,565	261,296	269
2069	260,599	260,331	268
2070	259,628	259,361	267
2071	258,657	258,391	266
2072	257,686	257,421	265
2073	256,716	256,451	264
2074	255,745	255,481	263
2075	254,774	254,511	262
2076	253,813	253,551	261

2077	252,901	252,641	260
2078	252,090	251,831	260
2079	251,358	251,099	259
2080	250,599	250,341	258

Table 4-21. Baseline GHG emissions from peat soils for CIW

4.1.6.1.3 Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline GHG emissions from ditches and other open water bodies in peatlands (GH _{peatditch-BSL,i,t})			
Calendar year of crediting period starting 15 th December	Total GHG (t CO ₂ -E) (GHG _{peatditch-BSL,i,t})	DOC (t CO ₂ -E) (GHG _{peatditch-CO2,i,t})	CH ₄ (t CO ₂ -E) (GHG _{peatditch-CH4,i,t})
2021	0.0	0.0	0.0
2022	0.0	0.0	0.0
2023	322.4	14.6	307.8
2024	898.9	40.8	858.1
2025	3,398.0	154.2	3,243.8
2026	5,194.3	235.7	4,958.6
2027	5,194.3	235.7	4,958.6
2028	5,194.3	235.7	4,958.6
2029	5,194.3	235.7	4,958.6
2030	5,194.3	235.7	4,958.6
2031	5,194.3	235.7	4,958.6
2032	5,194.3	235.7	4,958.6
2033	5,194.3	235.7	4,958.6
2034	5,192.5	235.6	4,956.9
2035	5,188.4	235.5	4,953.0
2036	5,183.5	235.2	4,948.3
2037	5,178.0	235.0	4,943.0
2038	5,172.4	234.7	4,937.7
2039	5,166.8	234.5	4,932.3
2040	5,161.2	234.2	4,927.0
2041	5,155.6	234.0	4,921.6
2042	5,150.0	233.7	4,916.2
2043	5,144.3	233.5	4,910.9
2044	5,138.7	233.2	4,905.5
2045	5,132.1	232.9	4,899.2
2046	5,124.8	232.6	4,892.2
2047	5,116.2	232.2	4,884.0
2048	5,107.4	231.8	4,875.6
2049	5,098.5	231.4	4,867.1
2050	5,089.7	231.0	4,858.7
2051	5,080.8	230.6	4,850.3
2052	5,072.0	230.2	4,841.8
2053	5,063.2	229.8	4,833.4
2054	5,054.3	229.4	4,824.9
2055	5,045.6	229.0	4,816.6
2056	5,036.5	228.6	4,807.9
2057	5,024.9	228.0	4,796.9
2058	5,010.8	227.4	4,783.4
2059	4,996.4	226.7	4,769.6
2060	4,982.0	226.1	4,755.9
2061	4,967.5	225.4	4,742.1
2062	4,953.1	224.8	4,728.3
2063	4,938.7	224.1	4,714.5
2064	4,924.2	223.5	4,700.8
2065	4,909.8	222.8	4,687.0
2066	4,895.9	222.2	4,673.7
2067	4,880.2	221.5	4,658.7
2068	4,863.0	220.7	4,642.3
2069	4,845.0	219.9	4,625.2
2070	4,827.0	219.1	4,607.9
2071	4,808.9	218.2	4,590.7
2072	4,790.9	217.4	4,573.5
2073	4,772.8	216.6	4,556.2
2074	4,754.8	215.8	4,539.0
2075	4,736.7	215.0	4,521.8
2076	4,718.9	214.1	4,504.7

2077	4,701.9	213.4	4,488.5
2078	4,686.8	212.7	4,474.1
2079	4,673.2	212.1	4,461.1
2080	4,659.1	211.4	4,447.7

Table 4-22 GHG emissions from ditches and other open water bodies in peatlands for CIW

4.1.6.1.4 Baseline Emissions from Peat Burning

Emissions from peat burning are excluded from the baseline assessment as there is no significant history or threat of peat or biomass burning in the baseline period. VM0007 Ver 1.8 at table 9 in section 5.4.4 also indicates that “it is conservative to exclude”.

4.1.7 Baseline Emissions - REDD+CIW

4.1.7.1 Baseline emissions from deforestation

4.1.7.1.1 Area of land deforested in baseline

The REDD+CIW activity encompasses landscapes on peatland soils and will have planned deforestation under this scenario. The area of land planned for deforestation and conversion to plantations under REDD+CIW is 20,374 ha.

Activity	Areas of plantations by year on REDD+CIW areas (ha)						
	Planting Year						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Secondary forest	0.0	0.0	494.9	0.0	406.2	594.0	1,495.2
Degraded forest	0.0	0.0	1,956.4	1,770.5	1,606.3	2,909.5	8,242.7
Heavily Degraded Forest	0.0	0.0	2,548.1	1,199.1	2,486.9	4,402.4	10,636.5
REDD+CIW Areas	0.0	0.0	4,999.4	2,969.7	4,499.4	7,905.9	20,374.4

Table 4-23 Areas converted to plantations by land cover and year in the baseline for REDD+CIW

4.1.7.1.2 Changes in terrestrial above ground tree carbon pools in the baseline

The carbon stock changes in above ground biomass are calculated according to the methods described in 4.1.3.2 and summarized in the table below.

Above ground tree carbon stock in the baseline ($C_{AB_tree_bsl,i}$)							
Year	Above ground tree biomass in baseline ($C_{AB_tree_bsl,i}$)				Baseline carbon stock change in above ground biomass		
	Primary Forest	Secondary Forest	Degraded Forest	Heavily Degraded Forest	AGB (t)	CO ₂ -C (t)	CO ₂ -E (t) ($\Delta C_{AB_tree_bsl,i}$)
Pre-2021	0	196,510	323,441	29,413			
2021	0	196,510	323,441	29,413	0	0	0
2022	0	196,510	323,441	29,413	0	0	0
2023	0	131,461	246,671	22,367	148,865	69,967	256,567
2024	0	131,461	177,196	19,051	72,791	34,212	125,454
2025	0	78,068	114,166	12,174	123,300	57,951	212,506
2026	0	0	0	0	204,409	96,072	352,296
Total					549,364	258,201	946,824

Table 4-24 Above ground tree carbon stock in the baseline for REDD+CIW

4.1.7.1.3 Changes in terrestrial below ground tree carbon pools in the baseline

The carbon stock changes in below ground biomass are calculated according to the methods described in 4.1.3.2 and summarized in the table below.

Below ground tree carbon stock in the baseline ($C_{AB_tree_bsl,i}$)						
Year	Below ground tree biomass in baseline ($C_{AB_tree_bsl,i}$)			Baseline carbon stock change in below ground biomass		
	Secondary Forest	Degraded Forest	Heavily Degraded Forest	BGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{BB_tree_bsl,i}$)
Pre-2021	41,660	68,570	6,236			
2021	41,660	68,570	6,236	0	0	0
2022	41,660	68,570	6,236	0	0	0
2023	27,870	52,294	4,742	31,559	14,833	54,392
2024	27,870	37,566	4,039	15,432	7,253	26,596
2025	16,551	24,203	2,581	26,140	12,286	45,051
2026	0	0	0	43,335	20,367	74,687
Total				116,465	54,739	200,727

Table 4-25 Below ground tree carbon stock in the baseline for REDD+CIW

The GHG emissions from depletion of BGB are shown in the table below.

Year	Below ground tree carbon stock depletion (CBB_tree_bsl,i)										Baseline carbon stock change in below ground biomass		
	Annual below ground biomass by depletion year ()										AGB (t)	CO ₂ -C (t)	CO ₂ -E (t) (ΔCBB_tree_bsl,i)
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10			
2021	0										0	0	0
2022	0	0									0	0	0
2023	3,156	0	0								3,156	1,483	5,439
2024	1,543	3,156	0	0							4,699	2,209	8,099
2025	2,614	1,543	3,156	0	0						7,313	3,437	12,604
2026	4,333	2,614	1,543	3,156	0	0					11,647	5,474	20,073
2027	0	4,333	2,614	1,543	3,156	0	0				11,647	5,474	20,073
2028	0	0	4,333	2,614	1,543	3,156	0	0			11,647	5,474	20,073
2029		0	0	4,333	2,614	1,543	3,156	0	0		11,647	5,474	20,073
2030			0	0	4,333	2,614	1,543	3,156	0	0	11,647	5,474	20,073
2031				0	0	4,333	2,614	1,543	3,156	0	11,647	5,474	20,073
2032					0	0	4,333	2,614	1,543	3,156	11,647	5,474	20,073
2033						0	0	4,333	2,614	1,543	8,491	3,991	14,633
2034							0	0	4,333	2,614	6,947	3,265	11,974
2035								0	0	4,333	4,333	2,037	7,469
2036									0	0	0	0	0
2037										0	0	0	0
Total	11,647	11,647	11,647	11,647	11,647	11,647	11,647	11,647	11,647	11,647	116,465	54,739	200,727

Table 4-26 Below ground tree carbon stock depletion for REDD+CIW

Total carbon emissions from AGB and BGB ($C_{AB_tree_bsl,i} + C_{BB_tree_bsl,i}$)			
Year	Above ground tree biomass depletion in baseline ($C_{AB_tree_bsl,i}$)	Below ground tree biomass depletion in baseline ($C_{BB_tree_bsl,i}$)	Total biomass depletion in baseline
2021	0	0	0
2022	0	0	0
2023	256,567	5,439	262,007
2024	125,454	8,099	133,553
2025	212,506	12,604	225,110
2026	352,296	20,073	372,369
2027	0	20,073	20,073
2028	0	20,073	20,073
2029	0	20,073	20,073
2030	0	20,073	20,073
2031	0	20,073	20,073
2032	0	20,073	20,073
2033	0	14,633	14,633
2034	0	11,974	11,974
2035	0	7,469	7,469
2036	0	0	0
2037	0	0	0
Total	946,824	200,727	1,147,550

Table 4-27 Total emissions reductions from AGB and BGB for REDD+CIW

4.1.7.1.4 Greenhouse Gas Emissions from deforestation in the baseline

The Project has followed the requirements of VM0007 v1.8 § 5.4.2 and included N₂O as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting as suggested in Table 7, § 5.4.2 of VM0007 v1.8.

4.1.7.2 Baseline emissions from peat soils

4.1.7.2.1 Areas of drained land and surface areas of drains in the baseline

The REDD+CIW activity encompasses landscapes that are undrained, and which will avoid drainage under the project. The area has forest cover and is therefore eligible for REDD.

Under the baseline, canals will be built, and the area drained resulting in peat soil GHG emissions from peatland degradation and GHG emissions from drains.

The area of avoided wetland drainage in the REDD+CIW activity is 21,122 hectares.

The drained area and the surface area of the canals from avoided wetland drainage in REDD+CIW activity is as follows:

Calendar year of crediting period starting 15 th December	Drained area estimates (ha) ($A_{\text{peatsoil-BSL},i,t}$)
	CIW+REDD
2021	0.0
2022	0.0
2023	4,999.4
2024	7,969.1
2025	12,468.5
2026	20,374.4
2027	20,374.4
2028	20,374.4
2029	20,374.4
2030	20,374.4
2031	20,374.4
2032	20,374.4
2033	20,374.4
2034	20,366.2
2035	20,347.4
2036	20,327.3
2037	20,306.5
2038	20,285.3
2039	20,264.1
2040	20,242.9
2041	20,221.7
2042	20,200.5
2043	20,179.3
2044	20,158.1
2045	20,128.8
2046	20,098.9
2047	20,066.4
2048	20,029.1
2049	19,991.5
2050	19,953.9
2051	19,916.2
2052	19,878.6
2053	19,840.9
2054	19,803.3
2055	19,760.8

2056	19,710.3
2057	19,657.2
2058	19,598.0
2059	19,534.7
2060	19,471.5
2061	19,408.2
2062	19,345.0
2063	19,281.7
2064	19,218.4
2065	19,155.2
2066	19,080.7
2067	19,002.5
2068	18,922.7
2069	18,835.5
2070	18,746.9
2071	18,658.4
2072	18,569.9
2073	18,481.4
2074	18,392.8
2075	18,304.3
2076	18,217.9
2077	18,135.6
2078	18,049.7
2079	17,957.6
2080	17,859.2

Table 4-28 Areas of drained land

Calendar year of crediting period starting 15 th December	Surface area of drainage canals (ha) (Aditch-BSL _{i,t})
2021	0.00
2022	0.00
2023	102.99
2024	164.16
2025	256.85
2026	419.71
2027	419.71
2028	419.71
2029	419.71
2030	419.71
2031	419.71
2032	419.71
2033	419.71
2034	419.54
2035	419.16
2036	418.74
2037	418.31
2038	417.88
2039	417.44
2040	417.00
2041	416.57
2042	416.13
2043	415.69
2044	415.26
2045	414.65
2046	414.04
2047	413.37
2048	412.60
2049	411.82
2050	411.05
2051	410.27
2052	409.50
2053	408.72
2054	407.95
2055	407.07
2056	406.03
2057	404.94
2058	403.72
2059	402.42
2060	401.11
2061	399.81
2062	398.51
2063	397.20
2064	395.90
2065	394.60
2066	393.06
2067	391.45
2068	389.81
2069	388.01
2070	386.19
2071	384.36

2072	382.54
2073	380.72
2074	378.89
2075	377.07
2076	375.29
2077	373.59
2078	371.82
2079	369.93
2080	367.90

Table 4-29 Canal surface area statistics

4.1.7.2.2 Baseline emissions from peat soil

Baseline emissions from peat soil Baseline GHG emissions from peat soils (GH _{proxy} -BSL _{i,t})			
Calendar year of crediting period starting 15 th December	Total GHG (t CO ₂ -E) (GHG _{proxy} -BSL _{i,t})	CO ₂ -C (t CO ₂ -E) (GHG _{proxy} -CO ₂ _{i,t})	CH ₄ (t CO ₂ -E) (GHG _{proxy} -CH ₄ _{i,t})
2021	0	0	0
2022	0	0	0
2023	367,037	366,659	378
2024	585,056	584,454	602
2025	915,383	914,441	943
2026	1,495,800	1,494,259	1,540
2027	1,495,800	1,494,259	1,540
2028	1,495,800	1,494,259	1,540
2029	1,495,800	1,494,259	1,540
2030	1,495,800	1,494,259	1,540
2031	1,495,800	1,494,259	1,540
2032	1,495,800	1,494,259	1,540
2033	1,495,800	1,494,259	1,540
2034	1,495,198	1,493,658	1,540
2035	1,493,819	1,492,281	1,538
2036	1,492,340	1,490,803	1,537
2037	1,490,816	1,489,280	1,535
2038	1,489,258	1,487,725	1,534
2039	1,487,701	1,486,169	1,532
2040	1,486,144	1,484,614	1,530
2041	1,484,587	1,483,058	1,529
2042	1,483,030	1,481,503	1,527
2043	1,481,473	1,479,947	1,526
2044	1,479,916	1,478,392	1,524
2045	1,477,770	1,476,248	1,522
2046	1,475,571	1,474,052	1,519
2047	1,473,186	1,471,669	1,517
2048	1,470,451	1,468,937	1,514
2049	1,467,687	1,466,176	1,511
2050	1,464,924	1,463,415	1,509
2051	1,462,160	1,460,655	1,506
2052	1,459,397	1,457,894	1,503
2053	1,456,633	1,455,133	1,500
2054	1,453,870	1,452,373	1,497
2055	1,450,753	1,449,260	1,494
2056	1,447,046	1,445,556	1,490
2057	1,443,143	1,441,657	1,486
2058	1,438,799	1,437,318	1,482
2059	1,434,155	1,432,678	1,477
2060	1,429,510	1,428,038	1,472
2061	1,424,866	1,423,399	1,467
2062	1,420,221	1,418,759	1,462
2063	1,415,577	1,414,119	1,458
2064	1,410,933	1,409,480	1,453
2065	1,406,288	1,404,840	1,448
2066	1,400,820	1,399,377	1,442
2067	1,395,077	1,393,640	1,437
2068	1,389,220	1,387,789	1,431
2069	1,382,818	1,381,394	1,424
2070	1,376,318	1,374,901	1,417
2071	1,369,819	1,368,409	1,411
2072	1,363,320	1,361,916	1,404

2073	1,356,821	1,355,423	1,397
2074	1,350,321	1,348,931	1,390
2075	1,343,822	1,342,438	1,384
2076	1,337,482	1,336,104	1,377
2077	1,331,435	1,330,064	1,371
2078	1,325,127	1,323,762	1,365
2079	1,318,365	1,317,007	1,358
2080	1,311,147	1,309,797	1,350

Table 4-30 Baseline GHG emissions from peat soils

4.1.7.2.3 Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline GHG emissions from ditches and other open water bodies in peatlands (GH _{peatditch-BSL,i,t})			
Calendar year of crediting period starting 15 th December	Total GHG (t CO ₂ -E) (GHG _{peatditch-BSL,i,t})	DOC (t CO ₂ -E) (GHG _{peatditch-CO2,i,t})	CH ₄ (t CO ₂ -E) (GHG _{peatditch-CH4,i,t})
2021	0	0	0
2022	0	0	0
2023	6,824	310	6,514
2024	10,877	494	10,384
2025	17,019	772	16,246
2026	27,810	1,262	26,548
2027	27,810	1,262	26,548
2028	27,810	1,262	26,548
2029	27,810	1,262	26,548
2030	27,810	1,262	26,548
2031	27,810	1,262	26,548
2032	27,810	1,262	26,548
2033	27,810	1,262	26,548
2034	27,799	1,262	26,537
2035	27,773	1,260	26,513
2036	27,745	1,259	26,486
2037	27,717	1,258	26,459
2038	27,688	1,257	26,432
2039	27,659	1,255	26,404
2040	27,630	1,254	26,376
2041	27,601	1,253	26,349
2042	27,572	1,251	26,321
2043	27,543	1,250	26,293
2044	27,514	1,249	26,266
2045	27,475	1,247	26,228
2046	27,434	1,245	26,189
2047	27,389	1,243	26,146
2048	27,338	1,241	26,098
2049	27,287	1,238	26,049
2050	27,236	1,236	26,000
2051	27,184	1,234	25,951
2052	27,133	1,231	25,902
2053	27,082	1,229	25,853
2054	27,030	1,227	25,804
2055	26,972	1,224	25,748
2056	26,903	1,221	25,682
2057	26,831	1,218	25,613
2058	26,750	1,214	25,536
2059	26,664	1,210	25,454
2060	26,577	1,206	25,371
2061	26,491	1,202	25,289
2062	26,405	1,198	25,206
2063	26,318	1,194	25,124
2064	26,232	1,190	25,041
2065	26,146	1,187	24,959
2066	26,044	1,182	24,862
2067	25,937	1,177	24,760
2068	25,828	1,172	24,656
2069	25,709	1,167	24,542
2070	25,588	1,161	24,427

2071	25,468	1,156	24,312
2072	25,347	1,150	24,196
2073	25,226	1,145	24,081
2074	25,105	1,139	23,966
2075	24,984	1,134	23,850
2076	24,866	1,128	23,738
2077	24,754	1,123	23,631
2078	24,637	1,118	23,519
2079	24,511	1,112	23,399
2080	24,377	1,106	23,270

Table 4-31 GHG emissions from ditches and other open water bodies in peatlands

4.1.7.2.4 Baseline Emissions from Peat Burning

Emissions from peat burning are excluded from the baseline assessment as there is no significant history or threat of peat or biomass burning in the baseline period. VM0007 Ver 1.8 at table 9 in section 5.4.4 also indicates that “it is conservative to exclude”.

4.1.8 Significant Sources of Baseline Emissions

Most exclusions were implemented based on conservatism which is permitted under VM0007. The Project has included all mandatory carbon pools, and all other required sources of GHG emissions have either been included or conservatively excluded.

Two sources of GHG emissions have been excluded for reasons of insignificance. These are the burning of woody biomass and peat combustion. These emission sources are excluded because of the complete absence of fire, or the drivers of fire which are occupation and deforestation, in the project area over the period of the baseline measurement period from 2012 to 2021. Because of the absence of fires, emissions from burning of woody biomass and peat combustion in the project are assumed to be zero and are conservatively omitted. The relative contribution (RE%) from woody biomass and peat combustion based on measured fire events is estimated as zero and less than the 5% threshold of their respective pools as specified in T-SIG. Note that fire events will be monitored and included in the project if they occur in the future.

Mineral soil carbon pool was excluded because this carbon pool will not significantly change under the baseline. Because mineral soil carbon is estimated to be zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the total terrestrial carbon pool as specified in T-SIG and can be excluded.

All sources of GHG emissions have been included or conservatively excluded and mandatory pools included.

4.2 Project Emissions

4.2.1 General Procedures and Assumptions

In the future, emissions from the Project Area (including any changes in those emissions) will be in part determined from specific site data. When no specific site data is available, necessary calculations can rely on IPCC default emissions factors, proxy analysis, and any national GHG allometrics based on published scientific research data.

Project scenario emissions accounted for were based on:

1. Water bodies,
2. Above ground stock changes in biomass due to REDD, and
3. Microbial peat decompositions.

Planned Project Activities in relation to climate were:

1. Undrained peatland conservation,
2. Deforestation and forest degradation avoidance, and
3. Fire control and prevention for zero burning.

Revegetation, fire control, and prevention in the Project are being operationally implemented. However, it is noted that these activities are not included in emissions reduction estimates. This is also conservative.

It is assumed that uncontrolled burning will not occur in the Project Area during the Project Period since rewetting and fire prevention are conducted - therefore no GHG emissions are expected.

Notwithstanding this, any emissions resulting from fires that do occur will be accounted for (using VMD0013 (E-BPB) ver. 1.3) under the established fire monitoring plan within the broader fire management activities. The Project assumes that zero non-human induced rewetting will form part of the Project Scenario.

N₂O emissions in the project are not accounted for because there will be no fertilizer applications. Furthermore, rewetting of organic soils decreases N₂O emissions rapidly and falls to virtually zero by the raising of the water table depth, in the event this depth is below the surface by <20cm. CH₄ emissions may be higher before stabilizing to levels seen in undrained or never-drained areas during the transient period immediately after rewetting activities. Emissions of CH₄ from rewetting activities in the relevant strata sites commencing from the Project Start Date will be monitored directly. Once sufficient data has been collected from those sites, emissions of CH₄ will be assessed again and any variability accounted for in quantifications of GHG emissions based on specific site data.

4.2.1.1 Project area

Emission Characteristics in Project Scenario

The Project Area under the Project Scenario has been stratified according to three classification categories:

- **Land cover** - including Secondary Forest, Degraded Forest, Heavily Degraded Forest, and Non-Forest.
- **Soil and soil depth** – Peat by 50cm peat depth classes; and,
- **Water body** - Water body and land.

The Project Scenario Map development process involved the following delineations as of Project Start Date:

- Existing water bodies such as rivers and lakes, and
- Forest and non-forest areas, with further stratification into land cover types.

4.2.1.2 Emission Characteristic Stratification for WRC Under Project Scenario

4.2.1.2.1 Emission Characteristic Stratification for REDD Under Project Scenario

During the Project Period, there is no deforestation or forest degradation anticipated under the Project Scenario in any area where there is planned deforestation.

Uncontrolled burning is assumed to be zero after project initiation, given the fire prevention programs. There is no significant history of unplanned deforestation and forest degradation from illegal land clearing and there is assumed to be no unplanned deforestation and forest degradation.

Carbon enhancement is likely to take place based on the Project Scenario because of forest regrowth expected in all forested areas following Project commencement. Measurements of biomass accumulation will be taken as part of periodic monitoring activities.

4.2.1.2.2 Emission Characteristic Stratification for ARR Under Project Scenario

The main ARR activities under the Project Scenario will be enrichment and reforestation planting aimed at restoring the natural forest to a primary forest condition. All emissions reductions from these activities are excluded from the project emissions calculation and ARR is not a GHG activity under the Project.

4.2.1.2.3 Emission Characteristic Stratification for WRC Under Project Scenario

The locations of WRC and REDD activities under the Project Scenario are mapped by considering:

- (1) Initial land use, land cover,
- (2) Historical timing of land-use changes and drainage status, and

(3) Peatland coverage:

Description of Strata	Area		Activity class
	(ha)	%	
Forested land with mineral soils and avoiding deforestation from plantation development: Mineral soils with forest cover present at the Project Start Date, planned for forest clearing and conversion to plantation.	1,035	4.1%	REDD
Non-forested peatland, undrained and avoiding peatland degradation from plantation development: Peatland without forest cover at Project Start Date due to prior logging and land clearing. Also, conservation areas that are adjacent to planned plantation areas which will be flooded when the planned plantations are developed in the baseline.	3,806	15.1%	CIW
Forested peatland, undrained and avoiding deforestation and avoiding peatland degradation, from plantation development: Peatland with forest cover present at Project Start Date, no drainage impact from human-made legacy canals, planned for forest clearing, drainage, and conversion to plantation.	20,374	80.8%	CIW+ REDD
Total	25,215	100%	

Table 4-32 Activity class of each stratum

Under the project, the Project Proponent plans to replant selected non-forest areas and restore degraded forest areas. The ARR activities are not included in the project emissions estimates and are not described in detail here.

The strata that are distinguished in the Project Scenario based on this analysis are undrained peatlands.

The quantum of GHG emissions resulting from microbial peat decomposition and loss of DOC via peatlands water bodies has been measured using an explicit temporal and spatial methodology.

4.2.2 Project Emissions Modelling Approach

Separate project emissions calculations have been prepared for 3 separate project activities:

1. REDD - Restoration of natural forest with avoiding planned deforestation.
2. CIW – Avoiding wetland degradation with no avoiding planned deforestation.
3. REDD+CIW - Avoiding wetland degradation with avoiding planned deforestation.

All the areas developed into plantations under the baseline are protected under the respective project activity. Existing legacy canals will be blocked over a period of 8 years under the project and the drained areas rewetted.

For each stratum in the Project Scenario has been subdivided into the smallest parcel units of land or water body and have relatively uniform spatial variables. Temporal variability for Project emissions is accounted for by organizing calculations into discrete timing 1-year units. The table below outlines each of the following:

- Variables that determine strata change sequences,
- Temporal variability of parameters for GHG emissions, and
- Temporal restrictions on GHG emissions.

This schematization provides the assurance that GHG emission parameters at the correct spatial location and the correct time have been appropriately used.

Variables	Description
(A) Spatial Variables	
(A1) Type of soil	Distinction between peat and non-peat. This is used to exclude all non-peat parcels from WRC GHG calculation.
(A2) Initial peat thickness available for microbial decomposition	Derived from DEM and Peat Thickness Map. This is used as the initial condition for subsequent calculations of the remaining available peat for microbial decomposition
(A3) Initial stratum within the peat area	The stratum of the corresponding parcel at the project start date before conversion into other (rewetted) stratum takes effect.
(B) Temporal Variables	
(B1) Remaining peat thickness available for microbial decompositions and burnings	Employed for determining whether Project Scenario PDT has been reached for the corresponding land parcel in the corresponding year.

Table 4-33 Variables adopted for the systematic organization of measurements for GHG emissions arising from microbial peat decomposition and dissolving organic carbon from peatlands under the Project Scenario

4.2.3 Emissions calculations for REDD

4.2.3.1 Total Project Emissions from REDD

For the project area of REDD project activities, the net GHG emissions in the project case is equal to the sum of stock changes due to deforestation and forest degradation plus the total GHG emissions minus any eligible forest carbon stock enhancement from VCS Module VMD0015 - M-PEAT equation 1:

$$\Delta C_{WPS-REDD} = \sum_{t=1}^{t^*} \sum_{i=1}^M (\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t}) \quad (1)$$

Where:

$\Delta C_{WPS-REDD}$ = Net GHG emissions in the REDD project scenario up to year t^* ; t CO₂-e)

$\Delta C_{P,DefPA,i,t}$ = Net carbon stock change as a result of deforestation in the project area in the project case in stratum i in year t ; t CO₂-e

$\Delta C_{P,Deg,i,t}$ = Net carbon stock change as a result of degradation in the project area in the project case in stratum i in year t ; t CO₂-e

$\Delta C_{P,DistPA,i,t}$ = Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum i in year t ; t CO₂-e

$GHG_{P-E,i,t}$ = Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum i in year t ; t CO₂-e

i = 1, 2, 3, ... M strata

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

Note under the project, it is assumed that all deforestation and forest degradation will be avoided and that no net carbon stock changes will occur as a result of natural disturbance. There are project contributors to greenhouse gas reductions. In previous versions of M-REDD, growth of secondary forest could be claimed but this sink has been removed from M-REDD. The net GHG emissions from REDD are calculated using this equation and reported separately for CIW-REDD and REDD.

4.2.3.2 Project Emissions from Deforestation and Forest Degradation

During the Project Period:

1. There will be no deforestation anticipated under the project scenario and no associated emissions,
2. There will be no forest degradation anticipated under the project scenario and no associated emissions, and
3. There will be no emissions from uncontrolled biomass burning.

Because the project assumes no fire and no uncontrolled burning, then the estimation of GHG emissions from biomass and peat burning as described in VCS Module VMD0013 – E-BPB does not apply for this project.

4.2.3.3 Project Emissions from Greenhouse Gases

The calculation of project GHG emissions using project equation 29, derived from equation 24 of VMD0015 M-REDD:

$$GHG_{P,E,i,t} = E_{FC,i,t} + E_{BiomassBurn,i,t} + N_2O_{direct-N,i,t} \quad (24)$$

Where:

$GHG_{P,E,i,t}$ = Greenhouse gas emissions as a result of deforestation activities within the project area in the project case in stratum i in year t ; t CO₂-e

$E_{FC,i,t}$ = Emission from fossil fuel combustion in stratum i within the project area in year t ; t CO₂-e

$E_{BiomassBurn,i,t}$ = Non-CO₂ emissions due to biomass burning in stratum i in year t ; t CO₂-e

$N_2O_{direct-N,i,t}$ = Direct N₂O emission as a result of nitrogen application on the alternative land use in stratum i within the project area in year t ; t CO₂-e

i = 1, 2, 3, ... M strata

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

No GHG emissions are included in the project. Note:

- There is no expectation of deforestation or forest degradation.
- There is no expectation of planned or unplanned forest fires.
- Fossil fuel combustion is not included.
- The project does not include any land use that uses fertilizers.

4.2.4 Emissions calculations for CIW

4.2.4.1 Total Project Emissions from Peatlands

The Project has followed §5.1 of M-Peat to determine the net CO₂-equivalent emissions resulting from microbial peat decompositions and water bodies for each land parcel within the Project Area (taking into consideration the temporal and spatial variability). They were estimated using equation 1 of VMD0046 M-PEAT, as shown below:

$$GHG_{WPS-PEAT} = \sum_{t=1}^{t^*} \sum_{i=1}^M (A_{peatsoil-WPS,i,t} \times GHG_{peatsoil-WPS,i,t} + A_{ditch-WPS,i,t} \times GHG_{peatditch-WPS,i,t} + A_{peatburn-WPS,i,t} \times GHG_{peatburn-WPS,i,t}) \quad (1)$$

Where:

$GHG_{WPS-PEAT}$	Net GHG emissions in the WRC project scenario on peatland up to year t^* (t CO ₂ e)
$GHG_{peatsoil-WPS,i,t}$	GHG emissions from microbial decomposition of the peat soil within the project boundary in the project scenario in stratum i in year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{peatditch-WPS,i,t}$	GHG emissions from water bodies within the project boundary in the project scenario in stratum i in year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{peatburn-WPS,i,t}$	GHG emissions from burning of peat within the project boundary in the project scenario in stratum i in year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$A_{peatsoil-WPS,i,t}$	Area of peatland (not open water, not burnt) in stratum i in year t in the project scenario (ha)
$A_{ditch-WPS,i,t}$	Area of ditch and other open water in stratum i in year t in the project scenario (ha)
$A_{peatburn-WPS,i,t}$	Area of peat burnt in stratum i in year t in the project scenario (ha)
i	1, 2, 3 ... M_{WPS} strata in the project scenario (unitless)
t	1, 2, 3, ... t^* time elapsed since the project start (years)

Note under the project, it is assumed that no fires will occur. The area of peat burnt and the GHG emissions emitted from peat soil fires will be assumed to equal zero. Therefore, the only contributor to net GHG emissions from CIW will be GHG emissions from:

- Microbial decomposition of peat soil
- Water bodies

The net GHG emissions from WRC are calculated using this equation and reported separately for CIW-REDD and REDD.

4.2.4.2 Project Emissions from Peat Soil Degradation

The Project assessed GHG emissions from soil degradation using Equation 2 of VMD0046 M-PEAT:

$$GHG_{peatsoil-WPS,i,t} = GHG_{proxy-WPS,i,t}$$

Where:

$GHG_{peatsoil-WPS,i,t}$	Greenhouse gas emissions from microbial decomposition of the peat soil within the project boundary in the project scenario in stratum i in year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{proxy-WPS,i,t}$	GHG emissions as per the chosen proxy in the project scenario in stratum i in year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
i	1, 2, 3 ... M_{WPS} strata in the project scenario (unitless)
t	1, 2, 3, ... t^* time elapsed since the project start (years)

Peat soil GHG emissions consist of CO₂ and CH₄, calculated employing equation 3 of VMD0046 M-PEAT as shown below:

$$GHG_{proxy-WPS,i,t} = GHG_{proxy-CO_2,i,t} + GHG_{proxy-CH_4,i,t} \quad (3)$$

Where:

$GHG_{proxy-WPS,i,t}$	GHG emissions as per the chosen proxy in the project scenario in stratum i in year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{proxy-CO_2,i,t}$	Emission of CO ₂ as per the chosen proxy in stratum i in year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{proxy-CH_4,i,t}$	Emission of CH ₄ as per the chosen proxy in stratum i in year t (t CO ₂ e ha ⁻¹ yr ⁻¹)
i	1, 2, 3 ... M_{WPS} strata ⁵ in the project scenario (unitless)
t	1, 2, 3, ... t^* time elapsed since the project start (years)

Processes for quantifying carbon stock dynamics and peat losses are like those applied to the baseline scenario (see §3.4). The only differences include 1) stratification, 2) strata sequence, and 3) the absence of burning in the Project Scenario that has been assumed.

4.2.4.3 Subsidence in relation to Peat Microbial Decomposition

For consistency between remaining peat carbon stock and yearly net CO₂-e emissions, yearly loss rates for peat and carbon stock under the Project Scenario were calculated on an annual basis, applying the following:

- The rate of emissions stemming from peat microbial decompositions (CO₂ and CH₄),
- Bulk peat density above the water table, and
- A conservative carbon content value of 42.2 kg.C/m³.

Equation 13 of VMD0016 X-STR was used for these calculations below was used for these calculations, it was acquired from equation 13 of VMD0016 X-STR:

$$Rate_{peatloss,i,t} = \frac{\sum_{i=1}^M (GHG_{peatsoil,i,t} + GHG_{peatburn,i,t})}{A_{i,t} \times C_{vol_lower,i,t}} \times 10 \times \frac{12}{44} \quad (13)$$

Where:

$Rate_{peatloss,i,t}$ = Rate of peat loss due to subsidence and fire in stratum i in year t (m yr⁻¹)

$GHG_{peatsoil,CO2,i,t}$ = CO₂ emissions from the peat soil in stratum i in year t (t CO₂e yr⁻¹)

$GHG_{peatburn,CO2,i,t}$ = CO₂ emissions from burning of peat in stratum i in year t (t CO₂e yr⁻¹)

$A_{i,t}$ = Area of stratum i in year t in baseline or project scenario ($A_{WPS,i,t}$ or $A_{BSL,i,t}$) (ha)

$C_{vol_lower,i,t}$ = Volumetric carbon content of the peat below the water table in stratum i in year t (kg C m⁻³)

$\frac{12}{44}$ = Factor to change from t CO₂e yr⁻¹ to t C yr⁻¹

10 = Conversion from kg m⁻² to t ha⁻¹

A yearly assessment for the duration of the Project's total lifetime was conducted for remaining peat thickness, based on the peat loss rate resulting from peat microbial decomposition, using equation 9 of VMD0016 X-STR:

$$Depth_{peat-WPS,i,t100} = Depth_{peat-WPS,i,t0} - \sum_{t=1}^{t=100} Rate_{peatloss-WPS,i,t} \quad (9)$$

Where:

$Depth_{peat-WPS,i,t100}$ = Average peat depth in the project scenario in stratum i at $t = 100$ (m)

$Depth_{peat-WPS,i,t0}$ = Average peat depth in the project scenario in stratum i at project start (m)

$Rate_{peatloss-WPS,i,t}$ = Rate of peat loss due to subsidence and fire in the project scenario in stratum i in year t ; alternatively, a conservative (high) value may be applied that remains constant over time (m yr⁻¹)

Assurance was if there are no GHG emissions that have been accounted for in all parcels of stratum by tracking yearly peat carbon stock and thickness in the baseline scenario once any available peat carbon stock has been depleted.

The below tables provide detail on the Project emission factors and stratification related to WRC:

Description	IPCC default emission factor for CO ₂	IPCC default emission factor for CH ₄	IPCC default emission factor for N ₂ O	IPCC default emission factor for DOC
	(t.CO ₂ -C ha ⁻¹ yr ⁻¹)	(kg.CH ₄ ha ⁻¹ yr ⁻¹)	(kg.N ₂ O ha ⁻¹ yr ⁻¹)	(t.CO ₂ -E ha ⁻¹ yr ⁻¹)
Undrained deforested peatland	0	0	0	Not Applicable
Drained deforested peatland	20	2.7	1.2	Not Applicable
Undrained peatland forest	0	0	0	Not Applicable
Drained peatland forest	20	2.7	5.3	Not Applicable
Water bodies (rivers and canals) on peatland present at project start date	Not Applicable	Not Applicable	Not Applicable	0.82

Table 4-34 Stratification employed for calculation of GHG emissions, the area (ha), and the CO₂ and CH₄ default factors used in each stratum for the specific land use.

4.2.4.4 Project GHG emissions from ditches and other open water bodies in peatlands

The Project assesses GHG emissions from ditches and other open water bodies pursuant to §5.4 of PL-PEAT. The emissions in the baseline are derived based on the ditched area and area of open water combined with an emission factor as per equation 4 of VMD0046 M-PEAT:

$$GHG_{peatditch-WPS,i,t} = GHG_{peatditch-CO_2,i,t} + GHG_{peatditch-CH_4,i,t} \quad (4)$$

Where:

$GHG_{peatditch-WPS,i,t}$	GHG emissions from ditch and other open water stratum i in year t in the project scenario (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{peatditch-CO_2,i,t}$	Emission of CO ₂ from ditch and open water stratum i in year t in the project scenario (t CO ₂ e ha ⁻¹ yr ⁻¹)
$GHG_{peatditch-CH_4,i,t}$	Emission of CH ₄ from ditch and open water stratum i in year t in the project scenario (t CO ₂ e ha ⁻¹ yr ⁻¹)
i	1, 2, 3 ... M_{WPS} strata ⁶ in the project scenario (unitless)
t	1, 2, 3, ... t^* time elapsed since the project start (years)

The annual emissions of dissolved organic carbon (DOC) and CH₄ from ditches and other open water bodies are estimated using IPCC allometrics.

Land Use	GHG	Emission factor		
Surface area of canals	Degradation	CH ₄	2,259	kg CH ₄ ha ⁻¹ yr ⁻¹
	Dissolved Organic Carbon	DOC	0.82	tonnes C ha ⁻¹ yr ⁻¹
Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].				

Table 4-35 Emission factors of surface area of canals

DOC is then converted to CO₂E by multiplication using the CO₂ to molecular C conversion factor of 3.667¹⁸.

¹⁸ Supra Indonesian National Carbon Accounting System. 2015:1

4.2.4.5 Emissions from Uncontrolled Peat Burning

Uncontrolled burning is assumed not to be present under the Project Scenario, since rewetting of peatland and best-practice fire management (such as fire control and prevention, zero burning policies, and others as determined by the relevant authorities) are implemented as Project Activities.

Since the Project Start Date, Samling has incorporated the project area within its comprehensive fire monitoring and fire-fighting program, they have implemented a comprehensive community-based program to mitigate fire risks from adjacent communities. Should uncontrolled burning occur during the Project lifetime, any area of fire scare and burn scar depth should be mapped within 3 months of the fire event. Historical hotspot tracking and direct observation data will determine the repetition of burning events in the Project Area, with maps generated of burning areas during the Project lifetime. Deductions from emissions reductions will be undertaken for equivalent and quantified GHG emissions from uncontrolled burning.

GHG emissions from peat burning will be calculated considering:

- dry mass loss based on burn scar,
- burn depths,
- combustion factors,
- peat bulk density, and
- GHG potential of specific GHG species.

GHG emissions from the loss of biomass because of burning are quantified based on:

- type of land cover,
- combustion factors, and
- GHG potential of specific GHG species.

Scar depths for repeated burnings in the first, second, and third (plus) instances of burning will be assumed as 18, 11, and 4cm in depth.

Procedures for the quantifying of peat burning GHG emissions are undertaken in line with the VCS methodology VM0007 and Module VMD0013 E-BPB.

4.2.4.6 Emissions reductions from peat combustion, using fire reduction premium.

Uncontrolled burning is assumed not to be present under the Project Scenario (or the Baseline Scenario for that matter), since rewetting of peatland and best-practice fire management (such as fire control and prevention, zero burning policies, and others as determined by the relevant authorities) are implemented as Project Activities. The emissions from this source from peat combustion are assumed to be zero.

4.2.5 Future approaches for calculating project emissions.

For determining GHG and carbon fluxes resulting from microbial decomposition of peat under the Project Scenario, different approaches will be used in the future. Within the Project lifetime, site-specific measurement approaches (IPCC TIER 2 and TIER 3) will be conducted, and data collected to minimize uncertainties in estimated emissions in relation to water table temporal and spatial variations. This will enable the gathering of site-specific data sets for quantifying Project emissions for all non-forest strata and strata with the most dynamic water table. For stratum that remains unaffected by deforestation and drainage, the IPCC factors approach will be applied throughout the Project lifetime since water table depths are less dynamic unless substantial changes in emission characteristics are observed.

In the future, estimates of Project emissions will be calculated using two TIER 3 methods. As these methods are complementary, they can be used effectively to minimize uncertainty and allow cross-checking.

- Method 1: Monitoring soil subsidence - over the long-term, soil subsidence provides a reliable proxy for the estimation of peat soil carbon losses.
- Method 2: Measuring direct CO₂ emissions (CH₄ to follow) - data will be used to establish empirical models specific to site and strata by combining proxies such as soil temperature, soil moisture, and water table depth.

Water table depths and soil subsidence will be monitored from 2024 in the Project Area and will continue through the Project lifetime over the next 60 years.

4.2.6 Project Emissions - REDD

The planned areas of deforestation for REDD activities are:

Activity	Areas of plantations by year on REDD areas (ha)						
	Planting Year						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Secondary forest	0	0	110.4	0.0	0.0	0.0	110.4
Degraded forest	0	0	365.6	0.0	2.7	14.3	382.7
Heavily Degraded Forest	0	0	357.3	11.8	0.6	172.6	542.3
REDD Areas	0	0	833.3	11.8	3.4	186.9	1,035.4

Table 4-36 Eligible area for deforestation in the baseline

This is the extent of the “avoiding deforestation” area. There are no expected emissions from the avoided deforestation areas in the Project Scenario.

4.2.7 Project Emissions - CIW

4.2.7.1 Project emissions from peat soils

4.2.7.1.1 Areas of drained land and surface areas of drains in the baseline

There are no legacy canals in CIW+REDD project activity area and all the landscape is fully wetted.

4.2.7.1.2 Project Emissions from Peat Soil

Because the landscape is fully wetted, there are no peat soil emissions in the CIW+REDD project activity area.

4.2.7.1.3 Project GHG emissions from ditches and other open water bodies in peatlands

Because there are no legacy canals in CIW+REDD project activity area, there are no GHG emissions from ditches in the CIW+REDD project activity area.

4.2.7.1.4 Project Emissions from Peat Burning

Emissions from peat burning are excluded from the project.

4.2.8 Project Emissions – REDD+CIW

4.2.8.1 Project emissions reductions from REDD

The planned areas of deforestation for REDD+CIW activities are:

Land Cover	Eligible area for deforestation ($A_{\text{plannedEnh,PL,i,t}}$)						
	Planned areas for deforestation						Total
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Secondary forest	0.0	0.0	494.9	0.0	406.2	594.0	1,495.2
Degraded forest	0.0	0.0	1,956.4	1,770.5	1,606.3	2,909.5	8,242.7
Heavily Degraded Forest	0.0	0.0	2,548.1	1,199.1	2,486.9	4,402.4	10,636.5
REDD+CIW Areas	0.0	0.0	4,999.4	2,969.7	4,499.4	7,905.9	20,374.4

Table 4-37 Eligible area for deforestation in the baseline

This is the extent of the “avoiding deforestation” area. There are no expected emissions from the avoided deforestation areas in the Project Scenario.

4.2.8.2 Project emissions from peat soils

4.2.8.2.1 Areas of drained land and surface areas of drains in the baseline

There are no legacy canals in CIW+REDD project activity area and all the landscape is fully wetted.

4.2.8.2.2 Project Emissions from Peat Soil

Because the landscape is fully wetted, there are no peat soil emissions in the CIW+REDD project activity area.

4.2.8.2.3 Project GHG emissions from ditches and other open water bodies in peatlands

Because there are no legacy canals in CIW+REDD project activity area, there are no GHG emissions from ditches in the CIW+REDD project activity area.

4.2.8.2.4 Project Emissions from Peat Burning

Emissions from peat burning are excluded from the project.

4.3 Leakage Emissions

VM0007 identifies 5 leakage modules that may potentially be used in a project. This project only considered 2 leakage modules which are applicable:

- VMD0009 Estimation of emissions from activity shifting for avoided planned deforestation (LK-ASP)
- VMD0044 Estimation of emissions from ecological leakage (LK-ECO)

The other 3 leakage modules are not applied in the project:

- VMD0010 Estimation of emissions from activity shifting for avoided unplanned deforestation (LK-ASU), This module provides methods for estimating emissions from displacement of unplanned deforestation and unplanned wetland degradation (leakage due to activity shifting). The baseline does not displace any unplanned degradation activities and therefore this module does not apply.
- VMD0011 Estimation of emissions from market-effects (LK-ME), This module allows for estimating GHG emissions caused by the market-effects leakage related to extraction of wood for timber, fuelwood, or charcoal in the baseline for carbon projects. As per the VCS AFOLU Requirements consideration of international market leakage is not required. The baseline agent of deforestation, Samling, does not intend to shift the lost production from the project area to other locations. Therefore, VMD0011 does not apply.
- VMD0043 Estimation of emissions from displacement of pre-project agricultural activities (LK-ARR), This module is listed in VM0007 as potentially applicable. However, VERRA has now listed VM0043 as inactive and as such it does not apply to this project.

4.3.1 Leakage from Activity Shifting for Avoided Planned Deforestation and Planned Degradation (LK-ASP)

Module LK-ASP is the applicable methodology for estimating the leakage emissions due to activity shifting from forest lands that are legally authorized and documented to be converted to non-forest land, including activity shifting to forested peatland that is drained because of project implementation. Under these situations, displacement of baseline activities can be controlled and measured directly by monitoring the baseline deforestation agents or class of agents. This tool must be used for projects in areas where planned deforestation happens on forested peatlands, regardless of the absence of peatland within the Project Area boundaries.

Section 5.1 of LK-ASP describes the applicability of the module:

“Where the specific deforestation agent can be identified, leakage does not need to be considered where it can be demonstrated that the management plans and/or land-use designations of the deforestation agent’s other lands (which must be identified by location) have not materially changed as a result of the project¹ (e.g., the deforestation agent has not designated new lands as timber concessions, increased harvest rates in lands already managed for timber, cleared intact forests for agricultural production or increased fertilizer use to enhance agricultural yields).

Further, in this module, leakage does not to be considered where only the agent class has been identified but verifiable information exists to demonstrate that the management plans and/or land use designations of the whole class of deforestation agent's other lands have not materially changed due to the project activities.

Likewise, leakage does not need to be accounted for where it can be demonstrated that it is unrelated to the project and responds to factors outside the control of Project Proponents (e.g., markets, policies, etc.). Project Proponents must present verifiable information demonstrating this situation, such as official documents, market analysis, peer-reviewed literature and other relevant sources, as well as an assessment showing how and to what extent it affected their leakage accounting."

A specific agent of deforestation has been identified, Samling, the holder of the Marudi LPF/0008 plantation license. Samling currently manages eight Licensed Plantation Forests, listed in the table below:

Licensed Plantation Forest	Gross area (ha)	Planted and potentially planted (ha)
Kuala Baram LPF/0004	40,650	8,497
Kanaya LPF/0005	66,685	48,071
Lana LPF/0006	81,900	6,442
Jelalong LPF/0007	68,700	38,115
Marudi LPF/0008	See the detailed baseline plan in this report for Marudi.	
Segan LPF/0014	10,332	5,638
Layun LPF/0020	2,454	2,287
Paong LPF/0021	24,834	13,640

Table 4-38List of active plantation licenses operated by Samling

In applying LK-ASP, the following conditions have been considered:

- The specific deforestation agent for the Project Area has been identified (Samling).
- Each of their License for Planted Forest areas are identified and have Forest Plantation Management Plans.
- The deforestation agent has no plans to change the management of its remaining LPF due to the implementation of the Project in Marudi LPF/0008.
- Deforestation will be occurring in the local landscape, but outside of Samling's properties and unrelated to Samling, through palm plantation development and perhaps forest plantation development.

Because of these conditions above, leakage from activity shifting from planned deforestation does not need to be considered for the estimation of project emissions reductions and removals. However, factors associated with leakage need to be monitored during project implementation and accounted for if it becomes significant. The monitoring requirements for LK-ASP are discussed further in section 5.3.2 of this report.

4.3.2 Ecological Leakage (LK-ECO)

VMD0044 Module LK-ECO requires that ecological leakage affecting the soil (peat) carbon pool does not occur, by ensuring that the effect of hydrological connectivity with adjacent areas is insignificant.

The peatland areas in the Project Area are in Marudi, Marau, and Tasong blocks. There are several conditions that severely limit the possibility of ecological leakage in these landscapes:

1. Rivers and other waterways provide natural boundaries to most of Marau and Tasong blocks. There is no hydrological connectivity between the project areas and those areas on the other side of the waterways. Any soil drainage activities adjacent lands that are on the other side of a waterway, will have no significant impact on the water table levels in the project area.
2. The extent of peatland in the landscape is largely contained within the boundaries of Marudi, Marau, and Tasong blocks.
3. The villages bordering the project area have little agricultural cultivation areas, except for the southern and lower southeastern boundaries of Marau block.

A block level summary description of boundary conditions is given below:

1. Marudi block is bounded by mineral soil areas in the south, in the north by the IBZ, and in the west by waterways.
2. Tasong block is entirely bounded by waterways to the west and south. The northern boundary of the block is bounded by mineral soil areas.
3. Marau block is almost entirely bounded by waterways except along the southern and southeastern boundaries where there is some existing palm oil plantation development. The land cover situation in areas adjacent to the southern and lower southeastern boundaries of the Marau block is stable. Analysis of historical imagery on Google Earth indicates that there have been no significant changes to the neighboring oil palm plantation boundaries since 2012.

It is assumed that ecological leakage does not occur in the Project for the following reasons:

1. The Project will not change the hydrological status of the Project Area – there is no drainage or rewetting of drained areas in the Project and therefore no impact on adjacent areas.
2. There is little hydrological connectivity between the Project area and the adjacent lands. In many areas, the project is bounded by waterways which hydrologically isolate the project. In other areas, the peatland areas in the project change into mineral soils at the boundary.
3. The southern and southeastern boundaries of Marau might be susceptible to leakage if neighboring blocks were converted into oil palm plantations in the future. However, there has not been significant palm oil plantation development in these areas in over 10 years, but this should be monitored in the future.

Because of these conditions above, leakage does not need to be considered for the estimation of project emissions reductions and removals. However, parameters associated with leakage from need to be monitored during project implementation and accounted for if it becomes significant. The monitoring requirements for LK-ASP are discussed further in section 5.3.2 of this report.

4.3.3 Estimation of Net Emissions from Leakage

Leakage from activity shifting from planned deforestation does not need to be considered for the estimation of project emissions reductions and removals under (LK-ASP).

Leakage from ecological leakage from peatland degradation does not need to be considered for the estimation of project emissions reductions and removals under (LK-ECO).

In conclusion, the total emissions for the Project from Leakage is “0”.

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

Estimates of potential carbon emissions reductions based on the proposed Project have been prepared and summarized in the table below.

Category	Metric	Estimated by the end of the Project Lifetime
GHG Emissions Reductions or Removals	Net estimated emissions removals in the Project Area, measured against the without project scenario.	0
	Net estimated emissions reductions in the Project Area, measured against the without project scenario.	99,009,535
	Net estimated emissions removals and reductions in the Project Area, measured against the without project scenario.	99,009,535
	Net estimated annual emissions removals and reductions in the Project Area, measured against the without project scenario.	1,650,159

Table 4-39 GHG Emissions Reduction by Year for the Project

The net emissions annual reductions and removals, leakage, risk buffer and VCU estimates for each year in the project period starting 15 December 2021 are shown below. The emissions over the 60 year project period totaled 99,009,535tonnes CO₂e for the baseline and 0 tonnes CO₂e for the project with total net emissions of 99,009,535 tonnes CO₂e. These emissions will generate an estimated 87,128,391 tonnes CO₂e of Verified Carbon Units (VCUs).

Annual vintage period starting 15 th December	Estimated baseline emissions (tCO ₂ e)	Estimated project emissions (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated reduction VCU (tCO ₂ e)	Estimated removal VCU (tCO ₂ e)	Estimated total VCUs (tCO ₂ e)
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	706,059	0	0	706,059	0	621,332
2024	779,882	0	0	779,882	0	686,297
2025	1,344,964	0	0	1,344,964	0	1,183,569
2026	2,183,486	0	0	2,183,486	0	1,921,467
2027	1,829,397	0	0	1,829,397	0	1,609,870
2028	1,829,397	0	0	1,829,397	0	1,609,870
2029	1,829,397	0	0	1,829,397	0	1,609,870
2030	1,829,397	0	0	1,829,397	0	1,609,870
2031	1,829,397	0	0	1,829,397	0	1,609,870
2032	1,829,397	0	0	1,829,397	0	1,609,870
2033	1,822,868	0	0	1,822,868	0	1,604,124
2034	1,819,496	0	0	1,819,496	0	1,601,156
2035	1,813,356	0	0	1,813,356	0	1,595,754
2036	1,804,076	0	0	1,804,076	0	1,587,587
2037	1,802,221	0	0	1,802,221	0	1,585,954
2038	1,800,327	0	0	1,800,327	0	1,584,288
2039	1,798,433	0	0	1,798,433	0	1,582,621
2040	1,796,540	0	0	1,796,540	0	1,580,955
2041	1,794,646	0	0	1,794,646	0	1,579,289
2042	1,792,752	0	0	1,792,752	0	1,577,622
2043	1,790,859	0	0	1,790,859	0	1,575,956
2044	1,788,965	0	0	1,788,965	0	1,574,289
2045	1,786,418	0	0	1,786,418	0	1,572,048
2046	1,783,777	0	0	1,783,777	0	1,569,724
2047	1,780,877	0	0	1,780,877	0	1,567,171
2048	1,777,607	0	0	1,777,607	0	1,564,294
2049	1,774,307	0	0	1,774,307	0	1,561,390
2050	1,771,008	0	0	1,771,008	0	1,558,487
2051	1,767,709	0	0	1,767,709	0	1,555,584
2052	1,764,409	0	0	1,764,409	0	1,552,680
2053	1,761,110	0	0	1,761,110	0	1,549,777
2054	1,757,810	0	0	1,757,810	0	1,546,873
2055	1,754,158	0	0	1,754,158	0	1,543,659
2056	1,749,882	0	0	1,749,882	0	1,539,896
2057	1,745,274	0	0	1,745,274	0	1,535,841
2058	1,740,077	0	0	1,740,077	0	1,531,268
2059	1,734,555	0	0	1,734,555	0	1,526,409
2060	1,729,034	0	0	1,729,034	0	1,521,550
2061	1,723,512	0	0	1,723,512	0	1,516,691
2062	1,717,991	0	0	1,717,991	0	1,511,832
2063	1,712,469	0	0	1,712,469	0	1,506,973
2064	1,706,948	0	0	1,706,948	0	1,502,114
2065	1,701,426	0	0	1,701,426	0	1,497,255
2066	1,695,095	0	0	1,695,095	0	1,491,683
2067	1,688,386	0	0	1,688,386	0	1,485,779
2068	1,681,476	0	0	1,681,476	0	1,479,699
2069	1,673,971	0	0	1,673,971	0	1,473,095
2070	1,666,362	0	0	1,666,362	0	1,466,399
2071	1,658,753	0	0	1,658,753	0	1,459,703
2072	1,651,144	0	0	1,651,144	0	1,453,007
2073	1,643,535	0	0	1,643,535	0	1,446,311
2074	1,635,926	0	0	1,635,926	0	1,439,615
2075	1,628,317	0	0	1,628,317	0	1,432,919
2076	1,620,879	0	0	1,620,879	0	1,426,374

2077	1,613,792	0	0	1,613,792	0	1,420,137
2078	1,606,540	0	0	1,606,540	0	1,413,756
2079	1,598,907	0	0	1,598,907	0	1,407,038
2080	1,590,782	0	0	1,590,782	0	1,399,888

State the non-permanence risk rating (%)	12%
Has the non-permanence risk report been attached as either an appendix or a separate document?	☒ Yes ☐ No
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?	☐ Yes ☒ No If no, provide justification.
State, in tCO ₂ e, the expected total GHG benefit to date.	706,059 t.CO ₂ e for 2023.
Is the number of GHG credits issued below the LTA?	☐ Yes ☒ No No credits issued to date.

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$\Delta C_{BSL,planned}$
Data unit	t CO ₂ e
Description	Net greenhouse gas emissions in the baseline from planned deforestation
Source of data	Module BL-PL
Value applied	1,212,359 (CAB_tree + CBG_tree)
Justification of choice of data or description of measurement methods and procedures applied (Justification)	Derived and justified in §4.1 of the PDD in which the baseline is set and calculated as required by BL-PL.
Purpose of Data	Calculation of baseline emissions
Comments	The parameter is from REDD-MF

Data / Parameter	GHG _{BSL-WRC}
Data unit	t CO ₂ e
Description	Net greenhouse gas emissions in the WRC baseline scenario up to year t*
Source of data	Module BL-PL
Value applied	97,797,176
Justification	See Module BL-PL.
Purpose of Data	Calculation of baseline emissions
Comments	The parameter is from REDD-MF

Data / Parameter	Project Forest Cover Monitoring Map
Data unit	Dimensionless
Description	Map showing the location of forest land within the project area at the beginning and end of each monitoring period. The monitoring will generate a table of areas by land cover type at start and end of period, and a table of land use change. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Source of data	Remote sensing in combination with GPS data collected during ground truthing.
Value applied	
Justification	The minimum map accuracy must be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and

	ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
	Frequency: Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Purpose of Data	Calculation of forest cover
Comments	Where forest land contains more than one forest class, the map must be stratified into forest classes using module X-STR. The parameter is from M-REDD
Data / Parameter	CF
Data unit	t C t d.m. ⁻¹
Description	Carbon fraction of dry matter in t C t ⁻¹ d.m.
Source of data	Values from the literature (e.g., IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3) shall be used if available, otherwise default value of 0.47 t C t ⁻¹ d.m. can be used
Value applied	0.47
Justification	Globally accepted default value derived from IPCC 2006GL
Purpose of Data	Calculation of carbon stock
Comments	The parameter is found in modules M-REDD and CB-AB
Data / Parameter	D _j
Data unit	t d.m. m ⁻³
Description	The density of wood by species from World Wood Database
Source of data	See wood density allometrics attached
Value applied	
Justification	Derived from World Wood Database. See also Module CP-AB
Purpose of Data	Calculation of wood density
Comments	The parameter is from M-REDD
Data / Parameter	D _{MN}
Data unit	t d.m. m ⁻³
Description	Mean wood density of commercially harvested species.
Source of data	See wood density allometrics attached
Value applied	
Justification	Derived from World Wood Database. See also Module CP-AB
Purpose of Data	Calculation of wood density of commercially harvested species.
Comments	The parameter is from M-REDD
Data / Parameter	f _j (X,Y)
Data unit	t d.m. tree ⁻¹
Description	The allometric equation for species <i>j</i> linking measured tree variable(s) to aboveground biomass of living trees, expressed as t d.m. tree ⁻¹
Source of data	Chave, J., C. Andalo, S. Brown, M. A. Cairns, J. Q. Chambers, D. Eamus, H. Folster, F. Fromard, N. Higuchi, T. Kira, J.-P. Lescure, B. W. Nelson, H. Ogawa, H. Puig, B. Riera, T. Yamakura. 2005. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. <i>Oecologia</i> 145: 87-99. The formula is: AGB = 0.0776*(WOOD DENSITY)*(DBH)*(DBH)*(Estimated Height) ^{0.94} .

	Diameter at breast height (DBH) and Estimated Height are generated from forest inventory. Wood density uses the World Wood Database
Value applied	Module CP-AB – see also the reference
Justification	Derived from Chave, J., C. Andalo, S. Brown, M. A. Cairns, J. Q. Chambers, D. Eamus, H. Folster, F. Fromard, N. Higuchi, T. Kira, J.-P. Lescure, B. W. Nelson, H. Ogawa, H. Puig, B. Riera, T. Yamakura. 2005. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. <i>Oecologia</i> 145: 87-99.
Purpose of Data	Calculation of aboveground biomass
Comments	It is necessary to validate the applicability of the equations used. Source data from which equation was derived should be reviewed and confirmed to be representative of the forest type/species and conditions in the project and covering the range of potential independent variable values. The parameter is found in modules M-REDD and CB-AB

Data / Parameter	Aplanned,i
Data unit	ha
Description	Total area of planned deforestation over the fixed baseline period for stratum i
Source of data	GPS coordinates and/or Remote Sensing data and/or legal parcel records
Value applied	21,410
Justification	Derived and justified in §4.1 of the PDD in which the baseline is set and calculated as required by BL-PL.
Purpose of Data	Calculation of baseline planned deforestation
Comments	Parameter from module M-REDD

Data / Parameter	CBSL,i,t100
Data unit	t C ha-1
Description	Peat carbon stock in the baseline scenario in peat depth stratum i at t=100
Source of data	Module X-STR
Value applied	17,854,155 t.C total and 1,128 t.C/ha
Justification	Derived and justified in §4.1 of the PDD in which the project emissions are described.
Purpose of Data	Calculation of peat carbon stock
Comments	Parameter from module M-REDD

Data / Parameter	CAB_tree,peatdome
Data unit	t CO ₂ e ha ⁻¹
Description	Mean aboveground tree biomass carbon stock of trees in peat dome forest.
Source of data	Module CP-AB
Value applied	117.6 t.CO ₂ E.ha ⁻¹
Justification	Derived from and justified in §3.3 of the PDD.
Purpose of Data	Calculation of carbon stock
Comments	Parameter from module M-REDD

Data / Parameter	CAB_tree,secondary forest
Data unit	t CO ₂ e ha ⁻¹
Description	Mean aboveground tree biomass carbon stock of trees in secondary forest
Source of data	Module CP-AB
Value applied	276.8
Justification	Derived from and justified in §3.3 of the PDD.
Purpose of Data	Calculation of carbon stock
Comments	Parameter from module M-REDD

Data / Parameter	CAB_tree,degraded forest
Data unit	t CO ₂ e ha ⁻¹
Description	Mean aboveground tree biomass carbon stock of trees in degraded forest
Source of data	Module CP-AB
Value applied	117.9
Justification	Derived from and justified in §3.3 of the PDD.
Purpose of Data	Calculation of carbon stock
Comments	Parameters from module M-REDD and BL-PL

Data / Parameter	CAB_tree,heavily degraded forest
Data unit	t CO ₂ e ha ⁻¹
Description	Mean aboveground tree biomass carbon stock of trees in heavily degraded forest
Source of data	Module CP-AB
Value applied	55.0
Justification	Derived from and justified in §3.3 of the PDD.
Purpose of Data	Calculation of carbon stock
Comments	Parameters from module M-REDD and BL-PL

Data / Parameter	N ₂ O _{direct-N_i,t}
Data unit	t CO ₂ e
Description	Direct N ₂ O emission because of nitrogen application on the alternative land use within the project boundary in stratum i in year t
Source of data	Module E-NA
Value applied	Not Applicable
Justification	Justified in § 4.2 of the PDD. See also Module E-NA
Purpose of Data	Calculation of N ₂ O emissions on the alternative land use
Comments	Parameter from module M-REDD

Data / Parameter	R
Data unit	t root d.m. t ⁻¹ shoot d.m.
Description	Root to shoot ratio is appropriate to species or forest type / biome; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area:above ground biomass per unit area (not on a per stem basis)
Source of data	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories - Volume 4: Agriculture, Forestry and Other Land Use

Value applied	21.2%
Justification	See also Module CP-AB
Purpose of Data	Calculation of below ground biomass from above ground biomass
Comments	See Module CP-AB Parameter is found in modules M-REDD and CB-AB
Data / Parameter	$ABSL_{i,t}$ or $A_{i,t}$
Data unit	ha
Description	Area of baseline stratum i in year t
Source of data	Own assessment
Value applied	Area of REDD = 1,035 Area of REDD+CIW = 20,374 Area of CIW = 3,806 Total area = 25,215
Justification	Delineation of strata is preferably done using a Geographical Information System (GIS), which allows for integrating data from different sources (including GPS coordinates and remote sensing data). Applied techniques follow international standards of application or local standards as laid out in pertinent scientific literature or handbooks.
Purpose of Data	Calculation of peat carbon stock
Comments	Parameter from module X-STR
Data / Parameter	$Depth_{peat-BSL,i,t0}$
Data unit	m
Description	Average peat depth in the baseline scenario and the project scenario in stratum i at the project start
Source of data	Existing peat depth maps and/or field assessment and/or in combination with remote sensing data.
Value applied	Average peat depth at start date = 5.74 m
Justification	Procedures for monitoring peat depth are given in Module <i>M-PEAT</i> and in this module. Peat depths can be derived from - Existing peat depth maps - Literature datasets involving the project or similar areas. - Field measurements, e.g., using a peat corer. Remote sensing to derive the height of the peat surface above datum. To determine the PDT, where relevant, peat depth may be determined as the depth of the peat layer down to a level where no further oxidation or other losses occur (e.g., the average water table depth).
Purpose of Data	Calculation of baseline emissions
Comments	In the absence of peer-reviewed data sources, the Project Proponent must justify that the data used is representative and that standard methods have been used. Parameter from module X-STR

Data / Parameter	$Depth_{peat-WPS,i,t0}$
Data unit	m
Description	Average peat depth in the baseline scenario and the project scenario in stratum i at project start
Source of data	Existing peat depth maps and/or field assessment and/or in combination with remote sensing data.
Value applied	Average peat depth for the project = 5.74 m
Justification	Procedures for monitoring peat depth are given in Module <i>M-PEAT</i> and in this module. Peat depths can be derived from - Existing peat depth maps - Literature datasets involving the project or similar areas. - Field measurements, e.g., using a peat corer. Remote sensing to derive height of the peat surface above datum. For determining the PDT, where relevant, peat depth may be determined as the depth of the peat layer down to a level where no further oxidation or other losses occur (e.g., the average water table depth).
Purpose of Data	Calculation of baseline emissions
Comments	In the absence of peer-reviewed data sources, the Project Proponent must justify that the data used is representative and that standard methods have been used. Parameter from module X-STR

Data / Parameter	$Sub_{initial-BSL,i}$
Data unit	m yr ⁻¹
Description	Subsidence in the initial years after drainage in stratum i
Source of data	Default factor from scientific literature or field assessments in peatland areas in the same region that underwent equal land use development as projected for the baseline scenario.
Value applied	0.0474
Justification	Deemed 0 for RDP projects. Procedures for measuring soil subsidence are described in Module <i>M-PEAT</i>
Purpose of Data	Calculation of baseline GHG emissions
Comments	Parameter from module X-STR

Data / Parameter	$Rate_{peatloss-BSL,i,t}; Rate_{peatloss-BSL,i}$
Data unit	m yr ⁻¹
Description	Rate of peat loss due to subsidence and fire in the baseline scenario in stratum i in year t ; a conservative (low) value may be applied that remains constant over time; Subsidence in the initial years after drainage is not included in this rate. Rate of peat loss due to subsidence and fire in the baseline scenario in stratum i ; a conservative (high) value must be applied that remains constant over the time from $t = 0$ to PDT
Source of data	Default factor from scientific literature or field assessments in peatland areas that are like the project area (proxy area)
Value applied	0.0474 m yr ⁻¹
Justification	See VMD0016 X-STR Section 5.4. Subsidence in the initial years after drainage is not included in this rate. Also, there is no fire modelled in the baseline and the losses are estimated as 0.

Purpose of Data	Calculation of baseline emissions
Comments	Parameter from module X-STR

Data / Parameter	$C_{vol_lower,BSL,i,t}$; $C_{vol_lower,WPS,i,t}$
Data unit	kg C m ⁻³
Description	Volumetric carbon content of the peat below the water table in the project scenario in stratum <i>i</i> in year <i>t</i>
Source of data	Module M-PEAT
Value applied	42.2 kg C m ⁻³ based on bulk density (0.078 g cm ⁻³), carbon content 54.3% derived from laboratory analysis of soil samples.
Justification	See also Module M-PEAT
Purpose of Data	Calculation of project emissions
Comments	See Module M-PEAT Parameter from module X-STR

Data / Parameter	GHG _{peatsoil,CO2,i,t}
Data unit	t CO ₂ e yr ⁻¹
Description	CO ₂ emissions from microbial decomposition of the peat soil in stratum <i>i</i> in year <i>t</i>
Source of data	Module BL-PEAT
Value applied	63,402,200
Justification	Justified in §4.1 of the PDD. See also module BL-PEAT
Purpose of Data	Calculation of baseline emissions
Comments	Parameter from module X-STR

Data / Parameter	VC
Data unit	kg C m ⁻³
Description	Volumetric organic carbon content
Source of data	Direct measurements and/or literature involving the project area or similar areas
Value applied	42.2 kg C m ⁻³ based on bulk density (0.078 g cm ⁻³), carbon content 54.3% derived from laboratory analysis of soil samples.
Justification	See also Module M-PEAT
Purpose of Data	Calculation of baseline emissions Calculation of the maximum quantity of GHG emission reductions that may be claimed by the project
Comments	Parameter from module X-STR

Data / Parameter	EREDD_BSL,SS,I,Pool#
Data unit	t CO ₂ e
Description	Carbon stock or GHG sources (e.g., trees, down dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the REDD baseline scenario
Source of data	The terms denoting significant carbon stocks, GHG sources or leakage emissions used in calculating net emission reductions from the following relevant modules: CP-AB, E-NA.
Value applied	1,212,359
Justification	See relevant modules noted above in Source of Data.
Purpose of Data	Calculation of uncertainty
Comments	The ex-ante estimation must be derived directly from the estimations originating in the relevant modules: CP-AB, E-NA. Parameter from module X-UNC

Data / Parameter	U _{REDD_BSL,SS,i,pool#}
Data unit	%
Description	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the REDD baseline scenario (1, 2...n represent different carbon pools and/or GHG sources)
Source of data	Calculations arising from field measurement data
Value applied	17.1
Justification	Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the t value for the 95% confidence level. For wood products the uncertainty should be the confidence interval around the volume of timber extracted from the forest. For emission sources conservative parameters should be used sufficient to allow the uncertainty to be set as zero.
Purpose of Data	Calculation of uncertainty
Comments	Baseline stocks and sources are estimated ex ante for each baseline period. Parameter from module X-UNC

Data / Parameter	$U_{*,i,t}$
Data unit	t CO ₂ e ha ⁻¹ yr ⁻¹
Description	Uncertainty in parameter * in stratum i in year t * = parameters E_{proxy-CO₂,t}, E_{proxy-CH₄,t}, E_{peatditch-CO₂,t}, E_{peatditch-CH₄,t} and E_{peatburn-BSL},
Source of data	Module X-UNC
Value applied	
Justification	Where regression models are used to estimate emissions from oxidation of peat from proxy parameters, uncertainty is calculated by referencing the 95% confidence limits of the regression model, calculated using standard regression analysis techniques. For the value of the referenced proxy in year t, the half-width of the 95% confidence interval for the dependent variable (emissions) is calculated to produce parameters U*t. Where emissions are estimated applying a discrete default factor, uncertainty, U*t, is simply calculated by referencing the 95% confidence limit of the default factor estimate or assigned as zero if an indisputably conservative factor is used.
Purpose of Data	Calculation of uncertainty
Comments	Parameter from module X-UNC

Data / Parameter	Yr _{Spn}
Data unit	years
Description	Number of years over which deforestation occurred in land parcel pn in proxy area
Source of data	Module BL-PL
Value applied	Not Applicable
Justification	Justified in §4.1 of the PDD. See also Module BL-PL
Purpose of Data	Calculation of uncertainty
Comments	Parameter from module X-UNC

Data / Parameter	$C_{vol_upper,i,t}$ and $C_{vol_lower,i,t}$
Data unit	g C cm ⁻³
Description	The average volumetric carbon content of the peat above and below the water table in stratum i at year t
Source of data	Own measurements
Value applied	0.0421
Justification	Estimates using laboratory analysis of soil cores.
Purpose of Data	Calculation of project emissions.
Comments	M-PEAT Section 5.6.5 - if subsidence is chosen as a proxy. Parameter from module M-PEAT

Data / Parameter	$D_{peatburn,i,t}$
Data unit	m yr ⁻¹
Description	The peat fire depth, or fire scar depth per year
Source of data	Data sources or own measurements
Value applied	0
Justification	Not applicable
Purpose of Data	Calculation of project emissions.
Comments	See M-PEAT Section 5.6.8 Parameter from module M-PEAT

Data / Parameter	CC
Data unit	%
Description	The carbon concentration of the peat
Source of data	Estimates using laboratory analysis of soil cores.
Value applied	54.3
Justification	Sampling using national default factors
Purpose of Data	Calculation of project emissions
Comments	See M-PEAT Section 5.6.5 - if subsidence is chosen as a proxy. Parameter from module M-PEAT

Data / Parameter	A_p
Data unit	ha
Description	Total area of peat in the project area (in case of rewetting projects) or proxy area (in case of conservation projects)
Source of data	Module X-STR
Value applied	24,180
Justification	Justified in §4.2 of the PDD. See also Module X-STR
Purpose of Data	Calculation of project emissions
Comments	Parameter from module M-PEAT

Data / Parameter	$A_{peatburn-BSL,i,t}$
Data unit	ha
Description	Area of peat burnt in stratum i in year t in the project scenario
Source of data	Module X-STR
Value applied	Not Applicable
Justification	Justified in §4.1 of the PDD. See also Module X-STR. Also, the area of peat burnt can be assessed using field observations and/or remote sensing using best-practice methods (see e.g., Congalton 1991; Congalton et al., 2008). Remote sensing-based data on burnt peat areas must be validated by field observations or other, higher resolution remote sensing data.

	When using remote sensing, data must be georeferenced into a common geodetic system, for example using the UTM system using best-practice methods in remote sensing (see e.g., Congalton 1991; Congalton et al., 2008). Semi-automated image classification approaches may be applied. Strata must be validated by reference data collected in the field, other official documentation or from recent independent higher resolution remote sensing imagery. See Module X-STR for procedures to delineate all peat strata
Purpose of Data	Calculation of baseline emissions
Comments	Parameter from module M-PEAT & BL-PEAT

Data / Parameter	$GHG_{peatsoil,BSL,i,t}$
Data unit	$t\ CO_2e\ y^{-1}$
Description	CO_2 emissions from microbial decomposition of the peat soil within the project boundary in the baseline scenario in stratum i in year t
Source of data	Module BL-PEAT
Value applied	96,012,130
Justification	See Module BL-PEAT
Purpose of data	Calculation of baseline emissions
Comments	Parameter from module M-PEAT

Data / Parameter	$L-D_i$
Data unit	%
Description	Likelihood of deforestation in stratum i
Source of data	Module BL-PL
Value applied	1
Justification	For all areas not both under Government control and zoned for deforestation, $L-D_i$ must be equal to 1. For areas under Government control and zoned for deforestation $L-D_i$ must be calculated as the summed proxy areas in the appropriate stratum divided by the areas within these proxy areas that have been deforested within the previous five years.
Purpose of Data	Calculation of projected deforestation
Comments	Alternatively, BCEF, where not directly available, can be calculated as wood density (t dry mass m^{-3} green volume) * BEF (Biomass Expansion Factor = ratio of aboveground biomass to biomass of the commercial volume). If using BCEFs developed outside the project country (cases (c) and (d) above under Source of data), it is necessary to validate the applicability of BCEFs used. Parameter is found in BL-PL

Data / Parameter	$GHG_{BSL-PEAT}$
Data unit	$t\ CO_2e$
Description	Net GHG emissions in the WRC baseline scenario up to year t^*
Source of data	Module BL-PEAT
Value applied	97,797,176
Justification	Derived and justified in §4.1 of the PDD in which the baseline is set and calculated as required by BL-PEAT
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PL A

Data / Parameter	$GHG_{peatburn-BSL,i,t}$
Data unit	$t\ CO_2e\ ha^{-1}\ y^{-1}$
Description	GHG emissions from burning of peat in the baseline scenario in stratum i at year t
Source of data	(IPCC) default factors, literature values or direct measurements
Value applied	Not Applicable
Justification	Justified in §4.1 of the PDD. Procedures for assessing GHG emissions from burning of biomass and peat are provided in Module E-BPB.
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	$GHG_{proxy-CO2,i,t}$
Data unit	$t\ CO_2e\ ha^{-1}\ y^{-1}$
Description	Emission of CO_2 in relation to the chosen proxy in stratum i at year t
Source of data	(IPCC) default factors, literature values or direct measurements IPCC (2013) Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Value applied	73.34
Justification	Justified in §4.1 of the PDD. See also Module M-PEAT
Purpose of Data	Calculation of baseline emissions
Comments	Proxies must comply with VCS requirements on proxies. It must be demonstrated that the proxy used is strongly correlated with CO_2 emissions by referring to IPCC, literature, or own data. When referring to own data, comparison with literature values must be made. Parameter is found in module BL-PEAT

Data / Parameter	$GHG_{proxy-CH4,i,t}$
Data unit	$t\ CH_4\ ha^{-1}\ y^{-1}$
Description	Emission of CH_4 in relation to the chosen proxy in stratum i at year t
Source of data	IPCC (2013) Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Value applied	0.0756
Justification	Justified in §4.1 of the PDD. See also Module M-PEAT
Purpose of Data	Calculation of baseline emissions
Comments	Proxies must comply with VCS requirements on proxies. It must be demonstrated that the proxy used is strongly correlated with CO_2 emissions by referring to IPCC, literature, or own data. When referring to own data, comparison with literature values must be made. Parameter is found in module BL-PEAT

Data / Parameter	$GHG_{peatditch-CO2,i,t}$
Data unit	$CO_2e\ ha^{-1}\ y^{-1}$
Description	Emission of CO_2 from ditch and open water stratum i at year t

Source of data	Source: Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES]. Table 2.2.
Value applied	See Module M-PEAT
Justification	See Module M-PEAT
Purpose of Data	3.01 t CO ₂ e ha ⁻¹ y ⁻¹ . This is derived from a DOC estimate of 0.82 t C ha ⁻¹ y ⁻¹ .
Comments	Parameter is found in module BL-PEAT

Data / Parameter	GHG _{peatditch-CH₄,i,t}
Data unit	t CO ₂ e ha ⁻¹ y ⁻¹
Description	Emission of CH ₄ from ditch and open water stratum i at year t
Source of data	Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Value applied	63.25
Justification	Justified in §4.1 of the PDD. See also Module M-PEAT and IPCC 2013GL.
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	A _{peatsoil-BSL,i,t}
Data unit	ha
Description	Area of peatland (not open water, not burnt) in stratum i in year t in the project scenario
Source of data	Module X-STR
Value applied	24,180
Justification	Justified in §4.1 of the PDD. See also Module X-STR
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	A _{ditch-BSL,i,t}
Data unit	ha
Description	Total area of ditch and other open water stratum i in year t in the baseline scenario
Source of data	Module X-STR
Value applied	78.4
Justification	Justified in §4.1 of the PDD. See also Module X-STR
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	t _{PDT-BSL,i}
Data unit	yr
Description	Peat depletion time (PDT) in the baseline scenario in stratum i in years elapsed since the project start
Source of data	Module X-STR
Value applied	>100 years
Justification	Justified in §4.1 of the PDD. See also Module X-STR

Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT and in LK-ASP

Data / Parameter	Hist _{Hai}
Data unit	ha
Description	Average annual area of deforestation by the baseline agent of deforestation in stratum i for the 5 years prior to project implementation
Source of data	Data sources or own measurements
Value applied	0
Justification	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation.
Purpose of Data	Calculation of annual deforestation by the baseline agent
Comments	Must be re-evaluated whenever the baseline is revised. The parameter is found in module LK-ASP

Data / Parameter	GHG _{LK-ECO}
Data unit	t CO ₂ e
Description	Net GHG emissions due to ecological leakage from the WRC project activity up to year t
Source of data	On the ground observations, remotely sensed data, and GIS.
Value applied	0
Justification	Under the applicability conditions of this methodology, ecological leakage affecting the soil (peat) carbon pool does not occur, by ensuring that the effect of hydrological connectivity with adjacent areas is insignificant, as outlined in §5 of LK-ASP.
Purpose of Data	Calculation of Leakage
Comments	All the Project's areas where blocking canals occur are a significant distance from any adjacent area, thus the risk of ecological is insignificant.

5.2 Data and Parameters Monitored

Data / Parameter	$\Delta C_{WPS-REDD}$
Data unit	t CO ₂ e
Description	Net greenhouse gas emissions within the project area under the project scenario;
Source of data	M-REDD
Description of MM&P	See Module M-REDD
Frequency	Upon each verification event. See also Module M-REDD
Value applied	0
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	Calculation of project emissions
Calculation method	See Module M-REDD
Comments	The parameter is found in REDD-MF

Data / Parameter	$\Delta CLK-AS,planned$
Data unit	t CO ₂ e
Description	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation
Source of data	Public records of Indonesian HTI concessions from MoEF. See also Module LK-ASP
Description of MM&P	See Module LK-ASP
Frequency	Upon each verification event. See also Module LK-ASP
Value applied	0
Monitoring equipment	GIS and remote sensing images. See also Module LK-ASP
QA/QC	See Module LK-ASP
Purpose of data	Calculation of leakage
Calculation method	See Module LK-ASP
Comments	The parameter is found in REDD-MF

Data / Parameter	$GHG_{WPS-WRC}$
Data unit	t CO ₂ e
Description	Net GHG emissions in the WRC project scenario up to year t*
Source of data	Module M-PEAT
Description of MM&P	See Module M-PEAT
Frequency	Upon each verification event. See also Module M-PEAT
Value applied	0
Monitoring equipment	See Module M-PEAT
QA/QC	See Module M-PEAT
Purpose of data	Calculation of project emissions
Calculation method	See Module M-PEAT
Comments	The parameter is found in REDD-MF

Data / Parameter	GHG_{LK-ECO}
Data unit	t CO ₂ e
Description	Net GHG emissions due to ecological leakage from the WRC project activity up to year t
Source of data	Module LK-ECO

Description of MM&P	See Module LK-ECO
Frequency	See Module LK-ECO
Value applied	0
Monitoring equipment	See Module LK-ECO
QA/QC	See Module LK-ECO
Purpose of data	Calculation of leakage
Calculation method	See Module LK-ECO
Comments	The parameter is found in REDD-MF

Data / Parameter	Project Forest Cover Monitoring Map
Data unit	Dimensionless
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area, some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event.
Source of data	Remote sensing in combination with GPS data collected during ground truthing
Description of MM&P	See Module M-REDD
Frequency	See Module M-REDD
Value applied	Maps provided for 2016 to 2020. No evidence or indication of deforestation or forest degradation.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	The minimum map accuracy must be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy. Frequency: Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Calculation method	See Module M-REDD
Comments	Where forest land contains more than one forest class, the map must be stratified into forest classes using module X-STR. The parameter is from module M-REDD

Data / Parameter	A _{DefPA,i,u,t}
Data unit	Ha
Description	Area of recorded deforestation in the project area in stratum i converted to land use u at time t
Source of data	Remote sensing imagery
Description of MM&P	See Module M-REDD
Frequency	Frequency: Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	0 ha. There is no deforestation or forest degradation detected during the monitoring period.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	Calculation of deforestation
Calculation method	See Module M-REDD
Comments	Ex-ante, an estimation shall be made of deforestation in the with-project case. If the belief is that zero deforestation will occur within

	the Project Area boundaries then this parameter may be set to zero if clear infrastructure, hiring, and policies are in place to prevent deforestation. The parameter is from module M-REDD
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Data / Parameter	FLU
Data unit	Dimensionless
Description	Land use factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Description of MM&P	See Module M-REDD
Frequency	See Module M-REDD
Value applied	Factor = 1. No FLU because there is no skid trail creation detected during the monitoring period.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	"Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock. The management factor after conversion can be conservative
Calculation method	See Module M-REDD
Comments	The parameter is from module M-REDD

Data / Parameter	F _{MG}
Data unit	Dimensionless
Description	Management factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Description of MM&P	See Module M-REDD
Frequency	See Module M-REDD
Value applied	Factor = 1. No FMG because there is no skid trail creation detected during the monitoring period.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	"Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock.
Calculation method	See Module M-REDD
Comments	The parameter is from module M-REDD

Data / Parameter	F _I
Data unit	Dimensionless
Description	Input factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Description of MM&P	See Module M-REDD
Frequency	See Module M-REDD
Value applied	Factor = 1.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	"Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock.

Calculation method	The land use factor after conversion can be conservatively assumed to equate 1, the default value for medium input.
Comments	The parameter is from module M-REDD
Data / Parameter	$A_{planned,i}$
Data unit	Ha
Description	Total area of planned deforestation over the entire project lifetime for stratum i
Source of data	Data sources or own measurements
Description of MM&P	GPS coordinates and/or remote sensing data and/or legal parcel records. Ex ante, $A_{planned,i}$ must be determined as described in Module BL-PL
Frequency	Must be examined at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	21,410 ha of planned deforestation
Monitoring equipment	See Module BL-PL
QA/QC	See section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of baseline deforestation
Calculation method	See Module BL-PL
Comments	See Module BL-PL The parameter is from modules M-REDD, BL-PL & LK-ASP

Data / Parameter	$\Delta C_{BSL,i}$
Data unit	t CO ₂ e ha ⁻¹
Description	Net carbon stock changes from planned deforestation in all pools in the baseline stratum i
Source of data	Module BL-PL
Description of MM&P	See Module BL-PL
Frequency	See Module BL-PL
Value applied	1,212,359
Monitoring equipment	See Module BL-PL
QA/QC	See Module BL-PL
Purpose of data	Calculation of leakage emissions, analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation.
Calculation method	See Module BL-PL
Comments	Must be re-evaluated whenever the baseline is revised. The parameter is found in modules M-REDD & LK-ASP

Data / Parameter	C_{AB_tree} , Secondary forest
Data unit	t CO ₂ e /ha
Description	Carbon stock in aboveground biomass of trees in plot spa in stratum i
Source of data	Samling forest inventories, 2023
Description of MM&P	See Module CP-AB
Frequency	See Module CP-AB
Value applied	276.8 t CO ₂ e /ha
Monitoring equipment	See Module CP-AB

QA/QC	See Module CP-AB
Purpose of data	Calculation of aboveground biomass
Calculation method	See Module CP-AB
Comments	The parameter is from module M-REDD

Data / Parameter	CAB_tree,degraded forest
Data unit	t CO ₂ e /ha
Description	Carbon stock in aboveground biomass of trees in plot sp in stratum i
Source of data	Samling forest inventories, 2023
Description of MM&P	See Module CP-AB
Frequency	See Module CP-AB
Value applied	117.9 t CO ₂ e /ha
Monitoring equipment	See Module CP-AB
QA/QC	See Module CP-AB
Purpose of data	Calculation of aboveground biomass
Calculation method	See Module CP-AB
Comments	The parameter is from module M-REDD

Data / Parameter	CAB_tree,heavily degraded forest
Data unit	t CO ₂ e /ha
Description	Carbon stock in aboveground biomass of trees in plot sp in stratum i
Source of data	See Module CP-AB
Description of MM&P	See Module CP-AB
Frequency	See Module CP-AB
Value applied	55.0 t CO ₂ e /ha
Monitoring equipment	See Module CP-AB
QA/QC	See Module CP-AB
Purpose of data	Calculation of aboveground biomass
Calculation method	See Module CP-AB
Comments	The parameter is from module M-REDD

Data / Parameter	$A_{WPS,i,t}$ Or $A_{i,t}$
Data unit	Ha
Description	Area of project stratum i in year t
Source of data	Own assessment
Description of MM&P	GIS coverages, ground survey data and/or remote imagery (satellite or aerial photographs), as outlined in Section 5. The area of peat burnt ($A_{peatburn-WPS,i,t}$ for the project scenario from Module M-PEAT and $A_{peatburn-BSL,i,t}$ for the baseline scenario from Module BL-PEAT) and area of peatland (not open water, not burnt) ($A_{peatsoil-WPS,i,t}$ for the project scenario from Module M-PEAT and $A_{peatsoil-BSL,i,t}$ for the baseline scenario from Module BL-PEAT) determine the difference between the remaining carbon stock in the project scenario and baseline scenarios after 100 years. In the procedures in Section 5.4 these areas are together referred to as $A_{WPS,i,t}$ and $A_{BSL,i,t}$.
Frequency	At each monitoring event
Value applied	25,215 ha
Monitoring equipment	See Module M-PEAT

QA/QC	See Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of project emissions
Calculation method	See Module M-PEAT
Comments	the area for $AWPS_{i,t100}$ must be used. The parameter is from module X-STR

Data / Parameter	$Rate_{peatloss-WPS,i,t}$
Data unit	$m\ yr^{-1}$
Description	Rate of peat loss due to subsidence and fire in the project scenario in stratum i in year t
Source of data	Module M-PEAT
Description of MM&P	See Module M-PEAT
Frequency	See Module M-PEAT
Value applied	$0.0474\ m\ yr^{-1}$
Monitoring equipment	See Module M-PEAT
QA/QC	Calculation of baseline emissions
Purpose of data	See Module X-STR
Calculation method	See Module X-STR
Comments	The parameter is from module X-STR

Data / Parameter	$GHG_{peatsoil,CO2,i,t}$
Data unit	$t\ CO_2e\ yr^{-1}$
Description	GHG emissions from microbial decomposition of the peat soil in stratum i in year t
Source of data	Module M-PEAT
Description of MM&P	See Module M-PEAT
Frequency	See Module M-PEAT
Value applied	$63,402,200\ t\ CO_2e.$
Monitoring equipment	See Module BL-PEAT
QA/QC	See Module BL-PEAT
Purpose of data	Calculation of project emissions. See module M-PEAT
Calculation method	See Module M-PEAT
Comments	The parameter is from module X-STR

Data / Parameter	$E_{REDD,WPS,SS,i, Pool\#}$
Data unit	$t\ CO_2e$
Description	Percentage of uncertainty of Carbon stock or GHG sources (e.g., trees, down dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the project scenario
Source of data	The terms denoting significant carbon stocks, GHG sources or leakage emissions used in calculating net emission reductions from the following relevant modules: CP-AB, CP-D, CP-L, CP-S, CP-W, E-BB, E-FFC, E-NA.
Description of MM&P	See Module X-UNC
Frequency	See Module X-UNC
Value applied	0% we are using IPCC parameters for the WPS peatland emissions estimates.
Monitoring equipment	See Module X-UNC

QA/QC	See Module X-UNC
Purpose of data	Calculation of uncertainty
Calculation method	See Module X-UNC
Comments	The ex-ante estimation shall be derived directly from the estimations originating in the relevant modules: CP-AB, CP-D, CP-L, CP-S, CP-W, E-BB, E-FFC, E-NA. The parameter stems from module X-UNC

Data / Parameter	UREDD,WPS,SS,i,pool#
Data unit	%
Description	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the project case (1, 2...n represent different carbon pools and/or GHG sources)
Source of data	Calculations arising from field measurement data
Description of MM&P	See Module X-UNC
Frequency	See Module X-UNC
Value applied	The calculated uncertainty in the peat soil carbon stock inventory was 5.69%. The calculated uncertainty in the AGB carbon stock inventory was 17.15%. The calculated uncertainty for combined peatland and AGB stocks inventory is 5.00%.
Monitoring equipment	See Module X-UNC
QA/QC	See Module X-UNC
Purpose of data	"Calculation of uncertainty. Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the t value for the 95% confidence level.
Calculation method	For wood products, the uncertainty should be the confidence interval around the volume of timber extracted from the forest. For emission sources, conservative parameters should be used sufficient to allow the uncertainty to be set as zero."
Comments	The ex-ante estimation shall be derived directly from the estimations originating in the relevant modules: CP-AB, CP-D, CP-L, CP-S, CP-W, E-BB, E-FFC, E-NA. The parameter stems from module X-UNC

Data / Parameter	GHG _{peatburn-WPS,i,t}
Data unit	t CO ₂ e ha ⁻¹ y ⁻¹
Description	CO ₂ emissions from burning of peat within the project boundary in the project scenario in stratum <i>i</i> in year <i>t</i>
Source of data	IPCC default factors, literature, or direct measurements
Description of MM&P	See Module M-PEAT
Frequency	At each monitoring period
Value applied	0 t CO ₂ e ha ⁻¹ y ⁻¹ . No fire or burning of peat detected during the monitoring period.
Monitoring equipment	GIS and remote sensed images; see also Module M-PEAT
QA/QC	See Module M-PEAT
Purpose of data	Calculation of project emissions
Calculation method	See Module M-PEAT
Comments	The parameter is found in M-PEAT

Data / Parameter	$\text{GHG}_{\text{proxy-CO}_2,i,t}$
Data unit	$\text{t CO}_2\text{e ha}^{-1}\text{y}^{-1}$
Description	Soil emission of CO_2 as per the chosen proxy in stratum i at year t
Source of data	(IPCC) default factors, literature values or direct measurements
Description of MM&P	The estimation of GHG emissions in rewetted (for RPD projects) or undrained or partially drained (for CUPP projects) peat follows similar procedures as described in Module <i>BL-PEAT</i> .
Frequency	At each monitoring period
Value applied	Soil emission of CO_2 in rewetted peat was estimated to be $0 \text{ t CO}_2\text{e ha}^{-1}\text{y}^{-1}$.
Monitoring equipment	See Module <i>BL-PEAT</i>
QA/QC	See Section 9.3 of <i>REDD+ MF</i> or other VCS methodology that uses this module
Purpose of data	Calculation of baseline emissions.
Calculation method	See Module <i>BL-PEAT</i>
Comments	Proxies must comply with VCS requirements on proxies. ¹¹ It must be demonstrated that the proxy used is strongly correlated with CO_2 emissions by referring to IPCC, literature, or own data. When referring to our own data, a comparison with literature values must be made. The parameter is found in <i>M-PEAT</i>

Data / Parameter	$\text{GHG}_{\text{proxy-CH}_4,i,t}$
Data unit	$\text{t CH}_4 \text{ ha}^{-1}\text{y}^{-1}$
Description	Soil emission of CH_4 as per the chosen proxy in stratum i at year t
Source of data	(IPCC) default factors, literature values or direct measurements
Description of MM&P	The estimation of GHG emissions in rewetted (for RPD projects) or undrained or partially drained (for CUPP projects) peat follows similar procedures as described in Module <i>BL-PEAT</i> .
Frequency	At each monitoring period
Value applied	Soil emission of CH_4 in rewetted peat was estimated to be $0 \text{ t CH}_4 \text{ ha}^{-1}\text{y}^{-1}$.
Monitoring equipment	See Module <i>BL-PEAT</i>
QA/QC	See Section 9.3 of <i>REDD+ MF</i> or other VCS methodology that uses this module
Purpose of data	Calculation of project emissions
Calculation method	See Module <i>BL-PEAT</i>
Comments	Proxies must comply with VCS requirements on proxies. ¹² It must be demonstrated that the proxy used is strongly correlated with CO_2 emissions by referring to IPCC, literature, or own data. When referring to own data, comparison with literature values must be made. The parameter is found in <i>M-PEAT</i>

Data / Parameter	$A_{\text{peatsoil-WPS},i,t}$
Data unit	ha
Description	Area of peatland (not open water, not burnt) in stratum i in year t in the project scenario
Source of data	Module <i>X-STR</i>
Description of MM&P	See Module <i>X-STR</i>
Frequency	See Module <i>X-STR</i>
Value applied	24,180 ha
Monitoring equipment	See Module <i>M-PEAT</i>
QA/QC	See Section 9.3 of <i>REDD+ MF</i> or other VCS methodology that uses this module

Purpose of data	Calculation of baseline emissions. Module X-STR
Calculation method	See Module X-STR
Comments	The parameter is found in M-PEAT

Data / Parameter	Aditch-WPS,i,t
Data unit	Ha
Description	Total area of ditch and other open water stratum i in year t in the baseline scenario
Source of data	Module X-STR
Description of MM&P	See Module X-STR
Frequency	See Module X-STR
Value applied	0 ha at the end of the monitoring period.
Monitoring equipment	See Module X-STR
QA/QC	See Section 9.3 of REDD+ MF or other VCS methodology that uses this module
Purpose of data	Calculation of project emissions. Module X-STR
Calculation method	See Module X-STR
Comments	The parameter is found in M-PEAT

Data / Parameter	Apeatburn-WPS,i,t
Data unit	ha
Description	Area of peat burnt in stratum i in year t in the project scenario
Source of data	Module X-STR
Description of MM&P	The area of peat burnt can be assessed using field observations and/or remote sensing using best-practice methods (see e.g., Congalton 1991; Congalton <i>et al.</i> , 2008). Remote sensing-based data on burnt peat areas must be validated by field observations or other, higher resolution remote sensing data. When using remote sensing, data must be georeferenced into a common geodetic system, for example using the UTM system using best-practice methods in remote sensing (see e.g., Congalton 1991; Congalton <i>et al.</i> , 2008). Semi-automated image classification approaches may be applied. Strata must be validated by reference data collected in the field, other official documentation or from recent independent higher resolution remote sensing imagery.
Frequency	See Module X-STR
Value applied	Area = 0 hectares. No peat burning was detected during the monitoring period.
Monitoring equipment	See Module X-STR
QA/QC	See Section 9.3 of REDD+ MF or other VCS methodology that uses this module
Purpose of data	Calculation of project emissions.
Calculation method	See Module M-PEAT
Comments	The parameter is found in M-PEAT

Data / Parameter	GHG _{peatditch-CO2,i,t}
Data unit	CO ₂ e ha ⁻¹ y ⁻¹
Description	Emission of CO ₂ from ditch and open water stratum i at year t
Source of data	Source: Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES]. Table 2.2.

Description of MM&P	See Module M-PEAT
Frequency	See Module M-PEAT
Value applied	3.01 t CO ₂ e ha ⁻¹ y ⁻¹ . This is derived from a DOC estimate of 0.82 t C ha ⁻¹ y ⁻¹ .
Monitoring equipment	See Module M-PEAT
QA/QC	See Module M-PEAT
Purpose of data	Calculation of baseline emissions. See Module M-PEAT
Calculation method	See Module M-PEAT
Comments	The parameter is found in M-PEAT

Data / Parameter	GHG _{peatditch-CH₄,i,t}
Data unit	CO ₂ e ha ⁻¹ y ⁻¹
Description	Emission of CH ₄ from ditch and open water stratum i at year t
Source of data	Project-specific values; appropriate literature sources
Description of MM&P	See Module M-PEAT
Frequency	See Module M-PEAT
Value applied	2,259 kg CH ₄ ha ⁻¹ yr ⁻¹ equivalent to 63.2 t CO ₂ e ha ⁻¹ y ⁻¹ . Source: Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Monitoring equipment	See Module BL-PEAT
QA/QC	See Module M-PEAT
Purpose of data	Calculation of baseline emissions. See Module X-STR
Calculation method	See Module M-PEAT
Comments	The parameter is found in M-PEAT

Data / Parameter	N
Data unit	Dimensionless
Description	Number of sample points
Source of data	Recording and archiving of the number of sample points
Description of measurement methods and procedures to be applied (Description of MM&P)	See Module CP-AB
Frequency of monitoring/recording (Frequency)	Monitoring must occur at least every ten years for baseline renewal. Where carbon stock enhancement is included, monitoring shall occur at least every five years
Value applied	Not Applicable
Monitoring equipment	See Module CP-AB
QA/QC procedures to be applied (QA/QC)	See Module CP-AB
Purpose of data	Monitoring
Calculation method	See Module CP-AB
Comments	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known <i>ex-ante</i> . Where part of project monitoring, <i>ex-ante</i> the number of sample plots shall be estimated based on projected sample

Data / Parameter	DBH
Data unit	cm
Description	Diameter at breast height of a tree in cm
Source of data	Field measurements in sample plots
Description of MM&P	Typically measured 1.3m aboveground. Measure all trees above some minimum DBH in the sample plots. The minimum DBH varies depending on tree species and climate; for instance, the minimum DBH may be as small as 2.5 cm or as high as 20 cm, but for humid tropical forests 10 cm is commonly used. Minimum DBH employed in inventories is held constant for the duration of the project.
Frequency	Monitoring must occur at least every ten years for baseline renewal. Where carbon stock enhancement is included, monitoring shall occur at least every five years
Value applied	Not Applicable
Monitoring equipment	See Module CP-AB
QA/QC	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or from the IPCC GPG LULUCF 2003, is recommended.
Purpose of data	Carbon stock in AGB
Calculation method	See Module CP-AB
Comments	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known <i>ex-ante</i> . Where part of project monitoring, <i>ex-ante</i> DBH shall be estimated based on projections of growth.

Data / Parameter	H
Data unit	m
Description	Total height of tree
Source of data	Field measurements in sample plots
Description of MM&P	See Module CP-AB
Frequency	Monitoring must occur at least every ten years for baseline renewal. Where carbon stock enhancement is included, monitoring shall occur at least every five years
Value applied	Not Applicable
Monitoring equipment	See Module CP-AB
QA/QC	See Module CP-AB
Purpose of data	See Module CP-AB
Calculation method	See Module CP-AB
Comments	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known <i>ex-ante</i> . Where part of project monitoring, <i>ex-ante</i> height shall be estimated based on projections of growth.

Data / Parameter	Ecological leakage process as described in Table 5.1
Data unit	Not Applicable
Description	Not Applicable
Source of data	On the ground observations, remote sensed data, and GIS
Description of MM&P	See Module LK-ECO
Frequency	At each monitoring
Value applied	0
Monitoring equipment	See Module LK-ECO
QA/QC	See Module LK-ECO and REDD+ MF

Purpose of data	Assessing avoidance of leakage emissions
Calculation method	See Module LK-ECO for process – not calculations
Comments	Not Applicable

5.2.1 Contribution towards SDG

The above parameters to be monitored to substantiate the Carbon sequestration also demonstrate the Project's contribution towards SDG 13 Climate Action and the preservation of the Natural Forest contributes toward SDG 15 Life on Land. The preservation of the wetland environment and the protection of the Natural River ecosystem Contributes towards SDG 14- Life in Water

5.2.2 Community-Related Parameters to be Monitored:

Data / Parameter	Total Number of grievances recorded by the Grievance Redress Process
Data unit	Percentage
Description	The Project will monitor the total number of grievances filled.
Source of data	Community Relations Team
Description of measurement methods and procedures to be applied (Description of MM&P)	A record of the number of grievances filled
Frequency of monitoring/recording (Frequency)	Quarterly
Value applied	Not Applicable
Monitoring equipment	Report by Community Team
QA/QC procedures to be applied (QA/QC)	Project SOP's
Purpose of data	Monitoring Community Relations Program
Calculation method	N/A
Comments	The Project Proponent intends to maintain cordial relations with the local community and conforming to the agreed upon Grievance mechanism is confirmation of their intent.

Data / Parameter	Percentage of Grievances dealt with within Parameters of Grievance redress procedure.
Data unit	Percentage
Description	The Project will monitor the performance of the Grievance redress procedure for the Project.
Source of data	Community Relations Team
Description of measurement methods and procedures to be applied (Description of MM&P)	A record of the success of the grievance redress procedure
Frequency of monitoring/recording (Frequency)	Quarterly
Value applied	Not Applicable
Monitoring equipment	Report by Community Team
QA/QC procedures to be applied (QA/QC)	Project SOP's
Purpose of data	Monitoring Community Relations Program
Calculation method	N/A
Comments	The Project Proponent intends to maintain cordial relations with the local community and conforming to the agreed upon Grievance mechanism is confirmation of their intent.

Data / Parameter	Number of Local Community Members Employed as permanent Staff
Data unit	Units
Description	The Project will monitor the total number of permanent staff employed by the Project who are members of the local communities.
Source of data	Human Resources
Description of measurement methods and procedures to be applied (Description of MM&P)	A record of employees from local communities who are either permanent employees or on a contract with a duration of one year or longer
Frequency of monitoring/recording (Frequency)	Quarterly
Value applied	Not Applicable
Monitoring equipment	Quarterly Report by Human Resources
QA/QC procedures to be applied (QA/QC)	Project SOP's
Purpose of data	Monitoring Community Relations Program
Calculation method	N/A
Comments	The Project Proponent intends to share the benefits of the project with the local community.

Data / Parameter	Number of Local Community Members Employed as Temporary staff
Data unit	Units
Description	The Project will monitor the total number of permanent staff employed by the Project who are members of the local communities.
Source of data	Human Resources
Description of measurement methods and procedures to be applied (Description of MM&P)	Short term employees employed as temporary workers as needed
Frequency of monitoring/recording (Frequency)	Quarterly
Value applied	Not Applicable
Monitoring equipment	N/A
QA/QC procedures to be applied (QA/QC)	Project SOP's
Purpose of data	Monitoring Community Relations Program
Calculation method	N/A
Comments	The Project Proponent intends to share the benefits of the project with the local community.

Data / Parameter	Project Spending at local community business
Data unit	Ringgit
Description	The Project will monitor the total expenditure made by the Project at local community business
Source of data	Accounting Department
Description of measurement methods and procedures to be applied (Description of MM&P)	A record of the amount of expenditure with local community business
Frequency of monitoring/recording (Frequency)	Quarterly
Value applied	Not Applicable
Monitoring equipment	Annual Report by Community Team
QA/QC procedures to be applied (QA/QC)	Project SOP's
Purpose of data	Monitoring Community Relations Program
Calculation method	N/A
Comments	The Project Proponent intends to share the benefits of the project with the local community.

5.3 Monitoring Plan

5.3.1 Monitoring Methods

The Project is required to undertake periodic monitoring of the Project and leakage area.

The Project Monitoring Reporting and Verification (MRV) system is part of the Adaptive Management Plan for the project that is a dynamic system that seeks to identify, assess, and create a mitigation plan for potential risks that might arise concerning the Project. The system is established to ensure a process for monitoring Project progress and documenting lessons learned or corrections that may be needed and incorporating them into Project decision-making for future monitoring periods. The Project adopts the systems that are already in place and implemented for Samling.

The company (i.e., Samling) activity in Sarawak, has *in situ*, a set of procedures and systems in place that regulate the management of documents, the procedures for verification and validation, etc. These are systems that SaraCarbon and Samling management and staff are used to working with. The quality assurance and quality control (QA/QC) systems already in place will serve as a “backbone” for the Project QA/QC system, for example, to manage complaints or non-conformities, etc.

The MRV Plan will be prepared during the project implementation; it is based on 10 main activities:

1. Remote Sensed Monitoring – Natural Disturbances/Anthropogenic Disturbances
2. Field Monitoring
 - a. Permanent Sample Plot (PSP) Inventory
 - b. Illegal Activities and Fire
 - c. Ground Water Table & Subsidence Monitoring
 - d. Changes of Peat Carbon Stock (i.e., bulk density and carbon contents) & Peat Depth
 - e. Weather Monitoring
3. Leakage Monitoring
4. Uncertainty Monitoring
5. Non-Permanence Risk Assessment
6. Quality Assurance/ Quality Control
7. Training
8. Data and Document Management
9. VCU Calculations
10. Stakeholder Access to Online Selected Documents

i. General Approaches for Monitoring

The monitoring plan incorporates the latest scientific findings and new technologies as they become available to increase effectiveness of existing practices systematically.

The monitoring plan includes monitoring changes in land cover, peat thickness and water table level, as per the latest VCS VM0007 REDD+ Methodology Framework (REDD+ MF) requirements.

ii. MRV Plan Content

Remotely Sensed Monitoring

Prior to verification and at least every 5 years, satellite images will be acquired by the Project of the Project Area. Those images will be analyzed to determine any evidence of forest loss or forest changes, either from natural disturbances or from human-induced changes.

Field Monitoring

Permanent Sample Plot Inventory

The Project has established a network of 40 Permanent Sample Plots that will be monitored upon verification but at least every 5 years. In practice, at least 50% of the plots will be measured at each monitoring event.

Prior to plot measurement, the labels on each tree will be checked. In-growth (trees that have attained 5cm DBH since the previous plot measurement) will be identified and labelled for measurement. Trees that have died since the previous plot measurement will be identified – these should be measured in the current measurement event. Trees that were declared dead in the previous measurement event should be checked to confirm the “dead” status – these trees can be confirmed as dead and permanently removed from the live tree list for subsequent PSP measurements.

The parameters and forest dynamics will then be measured, analyzed, and compiled to estimate the carbon stock changes for above-ground biomass and regrowth of the forest.

Illegal Activities and Fire

Illegal logging is not considered a viable threat of the Project as there are no communities that reside directly in the Project Area. Furthermore, the closest communities have limited means to access the Project Area (i.e., by boat or on foot without roads). Nonetheless, on-the-ground conditions can change rapidly in Sarawak.

The Project will maintain guard posts at strategic locations in the Project Area. The Project staff will determine the number and best locations for the guard posts and establish them in the first 3 years of the project. The guard posts will record and monitor all access into the Project Area. Regular field patrols by boat and foot will occur in the project area both for unauthorized activity and for fire.

The Project, in conjunction with Samling, will monitor all areas for fires.

Ground Water Table & Subsidence Monitoring

The Project will install several *in situ* automatic level-loggers, dip wells and subsidence poles to monitor the peat characteristics. SaraCarbon will seek advice about the design of peat monitoring systems and install water monitoring systems within 2 years of project commencement. These will be used to monitor water conditions and assess ecological leakage issues.

Changes of Peat Carbon Stock & Peat Depth

In line with water table levels, changes in carbon stocks must also be monitored. Monitoring is required at least every 10 years, but the Project is committed to monitoring at least once every 5 years. Peat depth will also be reassessed at least every 10 years at the baseline review event. The sample size of the peat depth in line with the current methodological requirements unless a methodological deviation is agreed to with the VCS. It can be assumed that the sample size will be at least as intensive as past efforts.

All resampling will be conducted in transects that cross the concessions in line with the current methodological requirements to ensure a new depth map can be generated. The Project will also work with the VCS to consider the appropriateness of the above considering the updated requirements in VCS VMD046 (M-PEAT)¹⁹. The change of carbon stocks in peats indicate the rate of peat accumulation if the change is positive. On the other hand, the negative change of carbon stock indicates peat as a source of carbon. The ratio of carbon and nitrogen indicates the potential peat decomposition.

Weather Monitoring

Currently, the Project has access to weather data from Samling which operates several weather stations in the area. Rainfall, temperature, wind speed and humidity are essential variables for assessing the health of peatlands and will be monitored in an ongoing fashion. Weather monitoring is also important to assist with monitoring water balance, anticipating dry seasons and documenting when rain deficit occurs.

Leakage Monitoring

Appropriate production and water table data from the Project Area and Project Zone will be collected, analyzed, and compiled upon each verification event to estimate activity shifting and ecological leakage.

Uncertainty Monitoring

Uncertainty linked to the parameters monitored will be automatically calculated using excel models.

¹⁹ VMD0016 v1.2 (X-STR) requires 4 measurements per km², which effectively means 5,200 depth point measurements in the 130,000 ha (1,300 km²) Project area. The methodological requirement of VMD0016 at §5.3.1 is neither reasonable nor necessary to produce an accurate peat depth map.

Non-Permanence Risk Assessment

The non-permanence risk tool will be reviewed upon each verification event and updated with respect to any relevant data collected.

Quality Assurance/Quality Control

The Project via Samling implements a rigorous QA/QC system to ensure the long-term accuracy of the data that is collected, to ensure a robust data storage system and to create a systematic data management structure. This QA/QC system is entirely integrated into the already existing Samling QA/QC system that has been implemented for PEFC certification. This system is reviewed annually during PEFC Verification audits, to guarantee the quality and dynamic nature of the QA/QC system.

Internal Audit Function

The Project Proponents put in place an Audit committee to perform an annual audit of all the systems and the performance of the Project in meeting the stated objectives of the Project as described in this document. The findings of the Audit team will be utilized in the Adaptive Management Plan (AMP) to adjust the procedures and policies of the Project Proponent with the intention of improving the Project's overall performance.

Training

All new personnel participating in PSPs inventory/control, water table monitoring, etc. will be trained in following PSP Inventory/Control/Monitoring Procedures specifications and standard Samling practices, as much as is reasonably possible. Training will be provided to ensure consistent data collection of all monitoring equipment and techniques.

Data and Document Management

All data and documents are reviewed and controlled, managed, and stored in a manner that complies with standard Samling practices, or as much as is reasonably possible. Data will be stored and managed following Samling's Data Management procedures and will be kept for at least 10 years.

VCU Calculation

For each verification event, VCU vintage is estimated and updated based on the parameters monitoring results.

Stakeholder Access to Online Selected Documents

The role of stakeholders is significant for contributing to the performance of the Project. Having access to selected monitoring documents would help stakeholders to participate in the monitoring platform. The Project will report to stakeholders at least annually, including the local community through annual

reporting which will be available online. The Community teams will also provide reporting directly to the local communities.

iii. Sampling Approach

The sampling approaches for the two Project Categories, REDD & WRC. In general terms though, the overarching goal of monitoring is to ensure the accurate scientific description of the changes to the landscape over time. The Project therefore aims to achieve a target precision level for its monitoring at a 95% confidence interval, +/- 10%, which is sufficient for the requirements of VCS and GHG project level monitoring. Should the monitoring not achieve the target precision requirements, then additional monitoring will be conducted until the targets are met.

REDD Project Category

For each monitoring period, the Project will acquire appropriate data from remote sensing platforms to determine if there are obvious changes in land cover, if there are obvious areas of disturbance, this will be investigated and sampled for AGB. Otherwise, AGB and regrowth of the project area where GHG crediting takes place will be conducted by remeasurement of PSPs. Any areas that might have been subject to fire disturbance will also be sampled for loss of AGB and loss of peat.

Remote Sensing Monitoring

The project will collect remote sensing imagery on a continuous basis in conjunction with Samling (plantation based) planning team. Images acquired are for the entirety of the project area and from multiple satellite sources, primarily Landsat 8 (30 m resolution) and Sentinel (10 m resolution) and others as required.

Above ground biomass

40 AGB inventory plots have been established. It is assumed that these plots will be completely remeasured for the baseline reassessment prior to 2031

Illegal Activities and Fire

The project will monitor the potential for illegal activities and fires on a 7 day a week basis. Additionally, security rangers man guard-posts on the boundary of the Project area on river access ways and roadways. All movements of people into the Project Area will be recorded and reported, and suspicious activities are managed through security SOP and protocols.

Samling utilizes a sophisticated hotspot fire monitoring program across all their estates and SaraCarbon is also covered by this program. SaraCarbon will receive regular reports on fire risks and fires within their boundaries and within the project. A procedure is in place to determine fire management activities in response to the daily fire risk assessment.

WRC Project Category

For each monitoring period the Project will assess the effectiveness of the WRC program and its ability to maintain a natural water table level. This will be done by regular monitoring of water table levels (via dip wells or level-loggers) and potential increase or decrease of the peat (via subsidence poles). The project will also monitor rainfall daily to correlate the water table with natural precipitation.

Ground Water Table & Subsidence Monitoring

The project will maintain an extensive network of ground water and subsidence monitoring stations.

Peat Carbon Stock

Peat Carbon stock will be resampled at each baseline event. Peat sampling is conducted for depth and carbon content pursuant to the respective SOPs. Ongoing sampling will be done to at least the same level of intensity that was originally undertaken for the Project. However, as the sampling requirements for peat have altered with the latest methodological updates in September of 2020, sampling will be conducted in transects crossing the Project Area at the sampling rate noted above in §5.3.2.1. It is assumed that these Peat Carbon stock and depth will be completely remeasured for the baseline reassessment prior to December 2031.

iv. Organizational structure, responsibilities, and competencies of the personnel

SaraCarbon will develop an organizational structure to meet the specific operational needs and functions of the project. A generic process and governance diagram has been prepared and shown in the following section. The Samling HR division is now in the process of defining roles, responsibilities and competencies required for SaraCarbon and is actively recruiting staff.

v. Governance and Implementation Structures

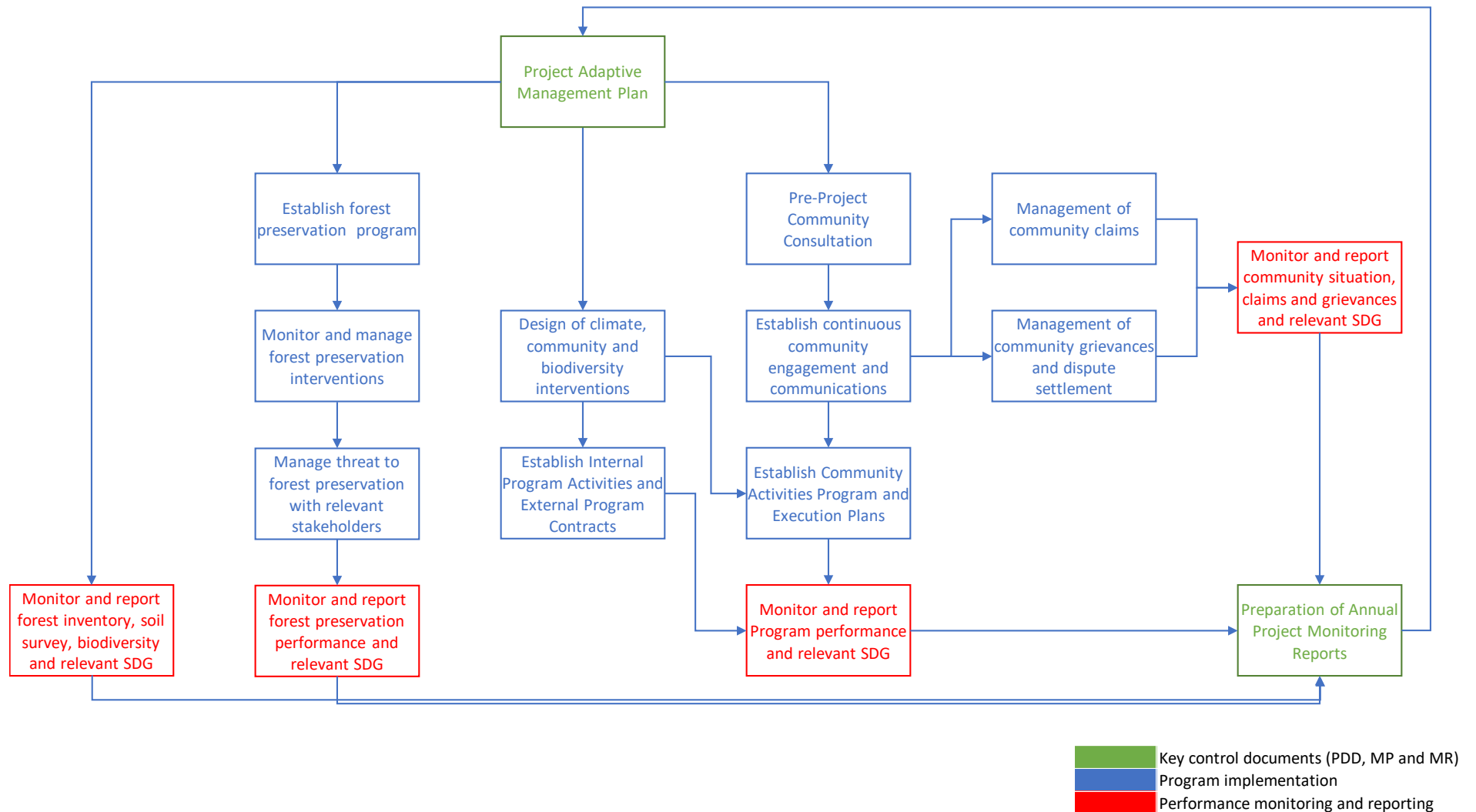


Figure 4-1 Project Reporting and Monitoring Process

SaraCarbon plans to implement the above process and monitoring systems (See diagram above). With the responsibilities for each team/ division as follows.

Division	Responsibilities
Carbon General Management Team	Preparation of adaptive management and quality assurance plan
	Preparation of monitoring report
	Maintain program Quality assurance plan
Forest Preservation and Monitoring Division	Managing and reporting forest security program
	Monitoring forest, climate, and biodiversity status
Community Engagement Division	Community ongoing consultation and engagement
	Negotiation of community agreements
	Management of community engagement
	Management of claims and grievances
Operations Management Division	Design of climate, community, and biodiversity programs
	Management of field interventions, data compilation, processing for progress reporting and quality control
Administration Division	Financial accounts, human resources

Table 4-40 Project roles and responsibilities

vi.Procedures for handling non-conformances with the validated monitoring plan.

The project-Carbon Project maintains a method to manage internal auditing and non-conformities that are addressed through Samling's SOPs that incorporate multiple QA/QC measures. All QA/QC systems are based on ISO certified systems that are in place throughout all Samling's concessions. All data is collected, recorded, stored, and reported. All data is subject to review and approval by team leaders or project managers concerning specific written SOPs, which cover different levels of operations and data management. SOPs will be developed and made available to validators on request.

APPENDIX I: COMMERCIALLY SENSITIVE INFORMATION

Section	Information	Justification
<u>N/A</u>	N/A	N/A

APPENDIX II: COMMUNITY ENGAGEMENT MARUDI LPF/0008

Community Engagement for Verified Carbon Standard Project at Marudi LPF0008

UNIMAS & SaraCarbon Sdn.Bhd.

Outcome/Summaries of Meeting

Date	Stage/Meeting Held	Attendees	Outcome/Summaries of Meeting
30 June – 7 July 2022	RECCE TRIP Community Engagement for Verified Carbon Standard at LPF0008	Cluster 1: 1. Long Maro, Sg Tinjar 2. Long Sepiling, Sg Tinjar 3. Lubok Kulat, Sg Tinjar 4. Rh Jipun, Tanjung Upar 5. Rh Phillip & Rh Mugang, Tanjung Upar 6. Rh Vincent, Tanjung Upar	Objectives: 1. To familiarize yourself with the physical environment (identification and verification of geographical landscape in the concession area) with the affected communities. 2. To gather important and available information for preparing and devising sufficient plan and survey activities. Methods: 1. Decide route and issues. Plan a route which covers the issues under consideration (e.g., land use changes, development pressure, hazards). The route may be walked or toured by FWD vehicle.

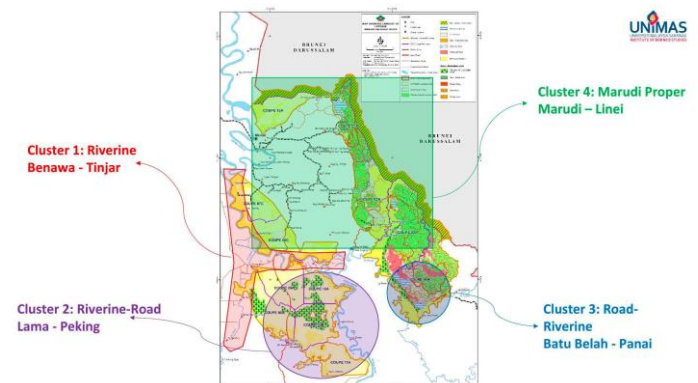
		Cluster 2: 7. Rh Banyah 8. Rh Jemat 9. Long Banyok 10. Long Ikang 11. Kampung Logan Sibong 12. Long Puak 13. Rh Chaing, Kampung Rambutan, Sg Peking 14. Rh Ludan, Pangkalan Pauh, Sg Peking 15. Rh Tengah, Sg Peking 16. Rh Wat, Sg Peking 17. Rh Tadong, Sg Peking Cluster 3: 18. Long Pahlo & Long Patan 19. Long Panai Cluster 4A: 20. Rh Lalo 21. Rh Adam 22. Rh Gawong	2. Split into smaller groups, perhaps taking different routes and comparing notes afterwards. 3. Viewing from a hill is particularly useful. Or use a drone. 4. Walk the route making sketches, taking notes, holding informal interviews, taking photos. 5. Construct profile. Compile all notes and sketches. Prepare a profile in map or diagram form. This will be an important basis for consultation and planning. 6. Make notes, sketches, take photos and talk informally to people in their setting. They may check existing plans for accuracy. 7. Photos surveys help groups to develop and design ideas by taking and discussing photos in their existing environment. They can be used as part of a wider community profiling and later stage of action planning events. 8. At the end of the trip, a debriefing is held, and the notes and other materials are compiled into a form useful to the next stage of the planning process. Process of Engagement: 1. Discussion at the Institute of Borneo Studies (IBS) 2. Briefing at Wisma Samling, Miri 3. Journey from Miri to Marudi 4. Discussion among UNIMAS and Samling team at Pusat
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		23. Rh Adam 24. Rh Ganing 25. Rh Matan 26. Rh Gerinang, Logan Tasong 27. Kpg Kuala Tutoh 28. Kpg Benawa 29. Kpg Kuala Tinjar 30. Rh Tanjong, Sg Stapang B 31. Rh Gau, Sg Stapang D 32. Rh Mapan, Sg Stapang C 33. Rh Blalang, Sg Sengkabang 34. Rh Nanta, Sg Melikat 35. Rh Umbar, Sg Melikat 36. Rh Henry, Logan Tungga 37. Rh Mullin, Padang Kerbau B, Lubok Nibong 38. Rh Joseph, Lobang Kompeni	Khidmat Masyarakat, Marudi. 5. First meeting with Pemancar and Penghulus at Marudi. 6. Community Leaders meeting with Pemancar, Penghulus, TRs at Pusat Khidmat Masyarakat, Marudi. 7. Meeting with the Marudi District Office. 8. Visiting of villages at Marudi Proper, riverine villages (Btg Baram, Sg Tinjar and Sg Tutoh) 9. Discussion at Samling HQ Outcome of Engagement: <u>30 June 2022 Wisma Samling, Miri</u> : All potential villages are divided into two categories: land-based and river-based which make up to 4 clusters. This was to prepare and devise how to get to the village based on its geographical landscape. <u>1 July 2022 Pusat Khidmat Masyarakat, Marudi</u>: First engagement and meeting with Pemanca and all Penghulu in Marudi. This was to introduce the purpose of visiting and building rapport with UNIMAS and Samling team members before allowing the teams to enter the villages. Penghulu Keir of Rh Gawong was the first to invite UNIMAS and Samling team to Sungai Selejau longhouses (Rh Lalo, Rh Anja and Rh Gawong).
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		39. Rh Sator, Lubok Nibong 40. Rh Entawan 41. Rh Luyoh, Sg Brit Asal 42. Rh Michael, Sg Brit Baru 43. Rh Siggan, Sg Muam 44. Rh Kiam, Sg Muam Cluster 4B: 45. Rh Asong, Bukit Linei 46. Rh Sumping, Linei 47. Rh Anthony, Linei 48. Rh Rok, Linei	4 July 2024 Pusat Khidmat Masyarakat, Marudi: First engagement and meeting with <i>Tuai Rumah</i>, including Pemanca and all Penghulus. This was to introduce the purpose of the visit and introduce UNIMAS and Samling team members. Every Tuai Rumah has filled in a short survey that includes - Name of Village, Name of Penghulu, Name of Tuai Rumah, Ethnic Group, Number of Population, Number of Household/<i>Bilik</i>, and Contact Number of Tuai Rumah. The purpose of the survey was to collect information for the next trip in Stage 2. 4 July 2024 Marudi District Office: First meeting with Mr. Belayong the then-district office. An official letter was presented by UNIMAS to the District Officer to state the purpose of the visit and the upcoming Community Engagement. 7 July 2024 Wisma Samling, Miri: Meeting between UNIMAS and Samling team to summarize findings from recce fieldwork and planning for Stage 2.
	STAGE 2 Understanding the communities through Village Profiling and In-depth Interviews.	Cluster 1: 1. Rumah Jipun, Tanjung Upar 2. Rumah Vincent, Tanjung Upar 3. Rumah Phillip & Rumah Mugang, Tanjung Upar 4. Rumah Gerinang,	Objectives: 1. The aims of this stage were to identify: • who have Native Customary Rights titles within the concession boundaries. • who are immediately adjacent to the concession area • who have rights to access the concession area for traditional activities or collection of non-timber forest products. • Identify communities involved in shifting cultivation within the concession area.

		Logan Tasong, Baram 5. Kampung Benawa & Kampung Kuala Tinjar, Baram 6. Kampung Kuala Tutoh, Baram 7. Long Maro, Sg Tinjar 8. Lubok Kulat, Sg Tinjar 9. Long Sepiling, Sg Tinjar Cluster 2: 10. Kampung Logan Sibong 11. Long Ikang 12. Rh Duri, Sungai Pudan Rian 13. Long Banyok 14. Long Puak 15. Rumah Banyah, Sungai Sebatu 16. Rumah Wat, Sungai Peking 17. Rumah Tadong, Sungai Peking 18. Rumah Jampang, Sungai Peking 19. Rumah Chaing, Sungai Peking 20. Rumah Ludan,	2. Existing profile of the actual population of the communities living around/in LPF 0008. Descriptions of the location, ethnicity, population, livelihoods of the village/longhouse area. 3. Existing socio-economic profiles of the targeted communities. 4. Existing profile of the livelihood and current economic activities of the communities living around/in LPF 0008. 5. Expectations of the communities concerning their future, and the issues such as social change. Methods and Instruments: Drawing from findings and observations gained from Stage 1, Geographical Territorial approach (GTA) was employed to design stage 2. Two instruments were designed to capture information and as part of the consultation process: 1. Village Profile 2. In-depth Interview Process of Engagement: 1. The District Office (Telang Usan, Marudi and Beluru) for every district were informed through an official letter. 2. With the clustering method based on Geographical Territorial Approach, the team was divided into 2 groups: Group A and Group B.
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		Sungai Peking 21. Rumah Mathias, Sungai Peking 22. Rumah Eddie & Rumah Marcus, Sungai Peking Cluster 3: 23. Long Panai 24. Long Patan 25. Long Pahlo 26. Long Ukok Cluster 4A: 27. Rh Adang, Sg Ridan 28. Rh Dee, Sg Ridan 29. Rh Matan, Sg Ridan 30. Rh Siggan, Sungai Muam 31. Rh Joseph, Lubang Kompeni 32. Rh Mullin & Rh Entawan, Pdg Kerbau 33. Rh Sator, Lubok Nibong 34. Rh Ubie, Kuala Ridan 35. Rh Entika, Puyot 36. 37. Rh Ganing, Sg Gudang	- Group A mainly covered the riverine communities in Benawa-Tinjar area (26-30 July 2022) and land-based communities in Marudi-Linei area (31 July-3 August 2022). - While Group B covered only the land-based communities in Lama-Peking (26-29 July 2022), Batu Belah-Panai (30 July 2022 in Telang Usan Hotel Miri), and Marudi-Linei (31 July-3 August 2022). Outcome of Engagement: From the two instruments implemented, there are 5 main findings obtained: 1. Village Profiles based on Clusters From the 58 villages, in Stage 2 using the Geographical Territorial Approach, we have determined space that leads to localized external economies - these villages are categorized into 4 main clusters: Cluster 1: Riverine-based (Benawa-Tinjar) Cluster 2: Riverine - Road based (Lama-Peking) Cluster 3: Road - Riverine based (Batu Belah-Panai) Cluster 4: Marudi Proper (Marudi-Linei).
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		38. Rh Adang, Sg Gudang 39. Rh Telajan, Sungai Brit 40. Rh Anja, Sg Selejau 41. Rh Lalo, Sg Selejau 42. Rh Gawong, Sg Selejau 43. Rh Saut 44. Sg Stapang: 5 rumah 45. Sg Melikat: Rh Umbar & Rh Nanta 46. Sg Belasoi: Rh Nyala & Rh Jugah 47. Rumah Henry, Logan Tungga Cluster 4B: 49. Rh Asong, Bukit Linei 50. Rh Sumping, Linei 51. Rh Anthony, Linei 52. Rh Rok, Linei 53. Rh Lajang, Linei 54. Rh Sunang, Linei 55. Rh Gawong, Linei	 2. Community Profiles based on locality: Riverine and Land-based Communities. In continuation from Stage 1, each village are profiled based on the following information covering; Location outside/inside the LPF0008, Accessibility, Village History, Health and Sanitation, Communication, Education, Economic Employment, Land Ownership Pattern, Cultural Practices (Cultural Sites/Burial Ground), Government Support, Issues, Employment, Usage of Forest and Rivers, Status of Settlement, Relationship with LPF0008, and Vision of the Community/Village. 3. Villages located inside and outside within 1-2km, 3-4 km, 5-7 km and 7-10km of the coupe were determined. There are 7 villages identified inside the coupe: Rh Gerinang Logan Tasong, Long Pahlo, Long Patan, in Linei (Rh Anthony, Rh Rok, and Rh Sumping), and in Logan Entassan (Rh Kiam and Rh Michael).
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			The remaining 51 villages are located outside 1-2km, 3-4 km, 5-7 km and 7-10km of the coupe. 4. General observation which includes the overall findings from Stage 2. Breakdown of findings that were based on riverine and land-based communities around/in LPF0008. Prominent issues from riverine and land-based communities were obtained from the In-depth Interviews - covered the issues pertaining to the environment, employment, income opportunities, facility development, types of development and perception of development. 5. Native Customary Rights and Land The issue pertaining to Native Customary Rights and Land were highlighted in Stage 2 during the In-depth Interviews. It was found that besides the NCRL, the concept of territory (Menoa) and 'Pemakai Menoa' was an important de facto to consider during the upcoming implementations of Forest Carbon Area in LPF0008.
2-9 October 2022	STAGE 3 Focus-group Discussion with IPLCs	Cluster 1: 1. Rh Jipun, Tg Upar 2. Rh Vincent, Tg Upar 3. Rh Phillip & Rh	Objectives: 1. To gauge communities' understanding of climate change and identify IPLCs concerns about climate change 2. To understand local strategies to mitigate change in weather

		Mugang, Tg Upar 4. Rh Gerinang, Btg Baram 5. Kpg Benawa & Kpg Kuala Tinjar, Btg Baram 6. Long Maro 7. Lubok Kulat 8. Long Sepiling, Sg Tinjar 9. Kpg Kuala Tutoh Cluster 2: 10. Kpg Logan Sibong 11. Long Ikang 12. Rh Duri, Sg Pudan Rian 13. Rh Banyah, Sg Sebatu 14. Rh Jemat, Sg Sebatu 15. Long Banyok 16. Long Puak 17. Rh Jampang, Sg Peking 18. Rh Wat, Sg Peking 19. Rh Tadong, Sg Peking 20. Rh Eddie, Sg Peking 21. Rh Diana, Sg Peking 22. Rh Ludan (Pangkalan Rambutan), Sg	patterns 3. To explore communities' perceptions, readiness, response to conservation initiatives 4. To gauge the economic development activities acceptable (for instance ranking of Logging, Forest Plantation, Conservation/Carbon) to the local communities 5. To map existing leadership patterns and decision making mechanisms 6. To understand how development issues are managed and how decisions are made regarding them 7. To observe and potentially identify NFTP's (Non-Forest Timber Products) Methods: 1. The approach for engagement during Stage 3 were done through Focus-Group Discussion (FGD) activities with the communities. 2. The adoption of FPIC and preliminary community engagement on the Project was also conducted using a rapid community relations assessment. Process of Engagement: 1. The District Office (Telang Usan, Marudi and Beluru) for every district were informed through an official letter. 2. The schedule of engagement was decided based on the route and venue prior to findings from Stage 2. ● Cluster 3 was conducted on 3 October 2022 and held in Miri.
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		Peking 23. Rh Marcus (Tengah), Sg Peking 24. Rh Chaing, Sg Peking Cluster 3: 25. Long Panai 26. Long Patan 27. Long Pahlo 28. Long Ukok Cluster 4A: 29. Rh Dee, Sg Ridan 30. Rh Matan, Sg Ridan 31. Rh Adang, Sg Ridan 32. Rh Mullin, Pdg Kerbau A 33. Rh Entawan, Pdg Kerbau B 34. Rh Sator, Lubok Nibong 35. Rh Puyot, Lubok Nibong 36. Rh Joseph, Lubok Kompeni 37. Rh Ganing, Sg Gudang 38. Rh Adam, Sg Gudang 39. Rh Entika, Puyot 40. Rh Ubie, Kpg Kuala	- Cluster 4 was conducted for 2 days, villages were divided into 2 groups, and the session was held in Dewan Masyarakat Marudi. The first group was on 5 October 2022, and second group was 6 October 2022. - Cluster 1 was conducted on 7 October 2022 and held in Dewan Kampung Benawa. - Cluster 2 was conducted for 2 days, villages were divided into 2 groups, and the session was held in the Long Lama District Office. The first group was on 7 October 2022 and the second group was on 8 October 2022. During the FGD, there were 4 exercises conducted with the communities to understand and obtain the following. Exercise 1: - To gauge communities' understanding of climate change and identify IPLCs concerns about climate change and effects of climate change on IPLC (if any). - To understand local strategies to mitigate change in weather patterns. Exercise 2: - To explore communities' perceptions, readiness, response to conservation initiatives. - To gauge the economic development activities acceptable (for instance ranking of Logging, Forest Plantation, Conservation - Eco Tourism) to the local communities.
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		Ridan 41. Rh Telajan, Sg Brit Asal 42. Rh Micheal, Sg Brit Baru 43. Rh Siggan, Sg Muam 44. Rh Rok, Linei 45. Rh Anthony, Linei 46. Rh Sumping, Linei 47. Rh Lajang, Linei 48. Rh Sunang, Linei 49. Rh Asong, Linei 50. Rh Gawong, Sg Selejau 51. Rh Lalo, Sg Selejau 52. Rh Anja, Sg Selejau 53. Rh Jamet, Stapang A 54. Rh Tanjong, Stapang B 55. Rh Mapan , Stapang C 56. Rh Gau, Stapang D 57. Rh Nyala, Sg Belasoi 58. Rh Jugah, Sg Belasoi 59. Rh Umbar, Sg Melikat 60. Rh Nanta, Sg Melikat 61. Logan Tungga 62. Rh Blalang, Sg Sengkabang	Exercise 3: 1. To map existing leadership patterns and decision making mechanism. 2. To understand how development issues are managed and how decisions are made regarding them Exercise 4: 1. To observe and potentially identify NTFPs (Non-Timber Forest Products) 2. To make recommendations to the Company and other stakeholders on the challenges and opportunities for people in that area regarding job and food security. During the adoption of FPIC, the UNIMAS consultant team had gathered the communities for the focus group discussions/ workshops. Outcome of Engagement: From the exercises conducted during the FGDs, there were 3 main outcomes/ findings. 1. The communities (IPLCs) understanding of climate change, their concerns about climate change and local strategies to mitigate weather patterns. 2. The communities' perceptions, readiness, response to conservation initiatives and order of importance of economic
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		Cluster 4B: 63. Rh Asong, Bukit Linei 64. Rh Sumping, Linei 65. Rh Anthony, Linei 66. Rh Rok, Linei 67. Rh Lajang, Linei 68. Rh Sunang, Linei 69. Rh Gawong, Linei	activities acceptable. 3. Community Leadership and Decision-making mechanisms.
9-13 March 2023	STAGE 4 Data Presentation and Briefing - sharing information with IPLCs and to comply with FPIC	All villages from Cluster 1, 2, 3 and 4.	Objectives: 1. To present main findings from Stage 1-3 to the communities. This is in response to requests from the communities themselves and deemed an important entry point to introduce Forest Carbon Area. 2. To ensure FPIC observed and attained preliminary community engagement in the Forest Carbon Area. It is expected that communities will give consent (in principle) to their involvement in the conservation project at the Marudi site. Process of Engagement: 1. Date of meeting: ● Cluster 1 was held on 10 March 2023 in Dewan Masyarakat Kampung Benawa. ● Cluster 4 was held on 10 March 2023 in Dewan Suarah Marudi. ● Cluster 3 was held on 11 March 2023 in Grand Palace Hotel Miri.

			- Cluster 2 was held on 12 March 2023 in the Long Lama District Office. - Presentation of data collected stage from 1 to 3. This is in response to requests made by community leaders - Penghulu and Ketua Kampung - during Stage 2 and 3 of the study for the study group to present the main findings of the research. - The communities were introduced and briefed on Marudi Forest Carbon Area and SaraCarbon Sdn. Bhd to the communities. It was explained that the FPIC forms were made available for the participants to sign. It was read in English, translated into Bahasa Malaysia and to Iban. Outcome of Engagement: - Main findings from Stage 1-3 of the study were presented to the communities. This is an important entry into the introduction of the Marudi Carbon Initiative. - Briefings on the Marudi Carbon Project were conducted. This includes the introduction of SaraCarbon Sdn. Bhd. - FPIC observed to attain preliminary community engagement on Forest Carbon Area in Marudi. For the FPIC session, the consultant introduced the purpose of the community engagement and obtained an informed-consent signature from village representatives.
24 July- 1 August 2023	STAGE 5.1 Baseline Study and Target Assessment for LPF0008 (Part 1)	All villages from Cluster 1, 2, 3 and 4.	Objectives: - Collect household socio-economic data for Project Design Document with target number of 311 respondent - Obtain prior informed consent, and

			3. Identify and evaluate social HCVs - HCV 5 and HCV 6. Methods: Household Survey Process of Engagement: 1. The design and approval of the household survey for data collection were collective contributions and vetting between UNIMAS consultants and the external consultant, Mr. Achille. 2. The District Office (Telang Usan, Marudi and Beluru) for every district were informed through an official letter. 3. A pilot study was conducted on 8 July 2023 by 4 UNIMAS consultants. The teams are divided into 2 teams and 2 locations in Miri and Kpg Benawa. 4. Enumerators training was conducted twice: in UNIMAS on 21 July 2023, and a day before the survey on 25 July 2023 in Marudi. Outcome of Engagement: 1. During Stage 1, 2, and 3, a total of 58 villages were identified. During Stage 5, there are 10 additional villages who are interested in being part of the Marudi community engagement. Reasons for the increase in the number of villages: split and emergence of new villages (the Iban longhouse), new interest from neighboring villages, and villages that were missed during engagement of Stage 1-3.
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			List of new Iban longhouses: 1. Rh Diana, Sg Peking 2. Rh Sunang, Linei 3. Rh Galang, Linei 4. Rh Jawe, Linei List of new interest from neighboring village: 1. Rh Engga, Sungai Peking 2. Uma Akeh (the original settlement of Long Puak). List of villages that were missed: 1. Rh Gumbang, Sungai Stapang E 2. Rh Micheal, Logan Tassan B 3. Rh Jugah, Sg Belasoi 4. Rh Nyala, Sg Belasoi 2. A total of 331 household surveys were obtained.
17-18 August 2023	STAGE 5.2 Social Facilities Visit	1. Long Lama Health Clinic 2. District Office of Telang Usan 3. SK Morek Primary School, Long Banyok	Objectives: 1. To observe and survey status of related social facilities: schools, hospitals, water treatment plants, etc. 2. To interview ‘respondents’ who are one way or another connected to these facilities as government officials who oversee the implementation, maintenance, operations and management of the facilities.

		4. District Education Office of Marudi (PPD Marudi) 5. Sahabat Alam Malaysia (SAM), Marudi Office 6. Marudi Department of Rural Water Supply (JBALB) 7. Marudi District Office 8. SK Kuala Tutoh primary school 9. Marudi Hospital 10. Sarawak Energy Berhad (SEB) / SESCO Marudi 11. Giatmara Training Centre, Baram (Vocational college) 12. Rubbish dumping site in Long Lama 13. Rubbish dumping site in Marudi town 14. Rural water supply (JBALB) Long Lama	3. To take photos of the social facilities. Methods: 1. Discussion with the District Officers, the heads of the departments and local NGO. 2. Site visits / discussion with staff /technicians on-sites. 3. Taking pictures of the facilities. Process of Engagement: 1. The District Office (Telang Usan , Marudi and Beluru) for every district were informed through an official letter. 2. A letter of notice to inform of UNIMAS team visit and schedule was sent to all people-in-charge of the facilities. Outcome of Engagement: 1. The 7 main social facilities visited: Education, Health, Water, Electricity, Waste Management, NGO, and Training Centre.
18 April 2024	Meeting with the Kiput community and Marudi DO	<i>(List of attendees to be obtained from Marudi District Office)</i>	<i>(Detailed Minutes of Meeting to be obtained from Marudi District Office)</i>

			Outcome of Meeting: The Kiput communities were briefed about the Marudi study and the purpose of Community Engagement - they have agreed to accept UNIMAS team for the next visit of Baseline Study and Target Assessment.
18-24 May 2024	STAGE 5.3 Baseline Study and Target Assessment for LPF0008 (Part 2)	1. Kpg Benawa Hijrah 2. Kpg Benawa & Kuala Tinjar 3. Rh Adang, Ulu Ridan 4. Rh Matan/Rh Dee, Sungai Ridan 5. Rh Kiam/Rh Michael, Logan Entassan 6. Kpg Kuala Tutoh 7. Rh Gerinang, Logan Tasong 8. Kpg Lubok Nibong	Objective: 1. Continuation of household socio-economic data collection for Project Design Document with target number of 122 respondents. Respondents from these villages are: • The two villages that refused to participate in the previous survey (July 2023). • Villages located directly in the LPF0008 • Village of the Kiput community that were previously omitted during Stage 1 and 2. Outcome of Engagement: 1. The total number of respondents obtained was 81. 2. Some villages from Cluster 3 and Cluster 4B refused to participate in the household survey (to be verified and updated in coming report)

APPENDIX III GRIEVANCE PROCEDURES>

Rev.2 (10/05/2022)



PROCEDURE FOR CONFLICT RESOLUTION

Document reference : FMC/PRO-002
Previous document reference : SFM/GL 001
Document title : Conflict Resolution
Approved by : Chief Operating Officer Date : 12 January 2022
Effective date : 7 February 2022
Revision : 2 (10/05/2022)

1.0 PURPOSE

To provide practical guidance to forest managers and stakeholders to identify and resolve conflicts arising from forest operations activities.

2.0 SCOPE

This procedure applies to all principal, criteria and indicators stipulated in MTCS (MC&I SFM).

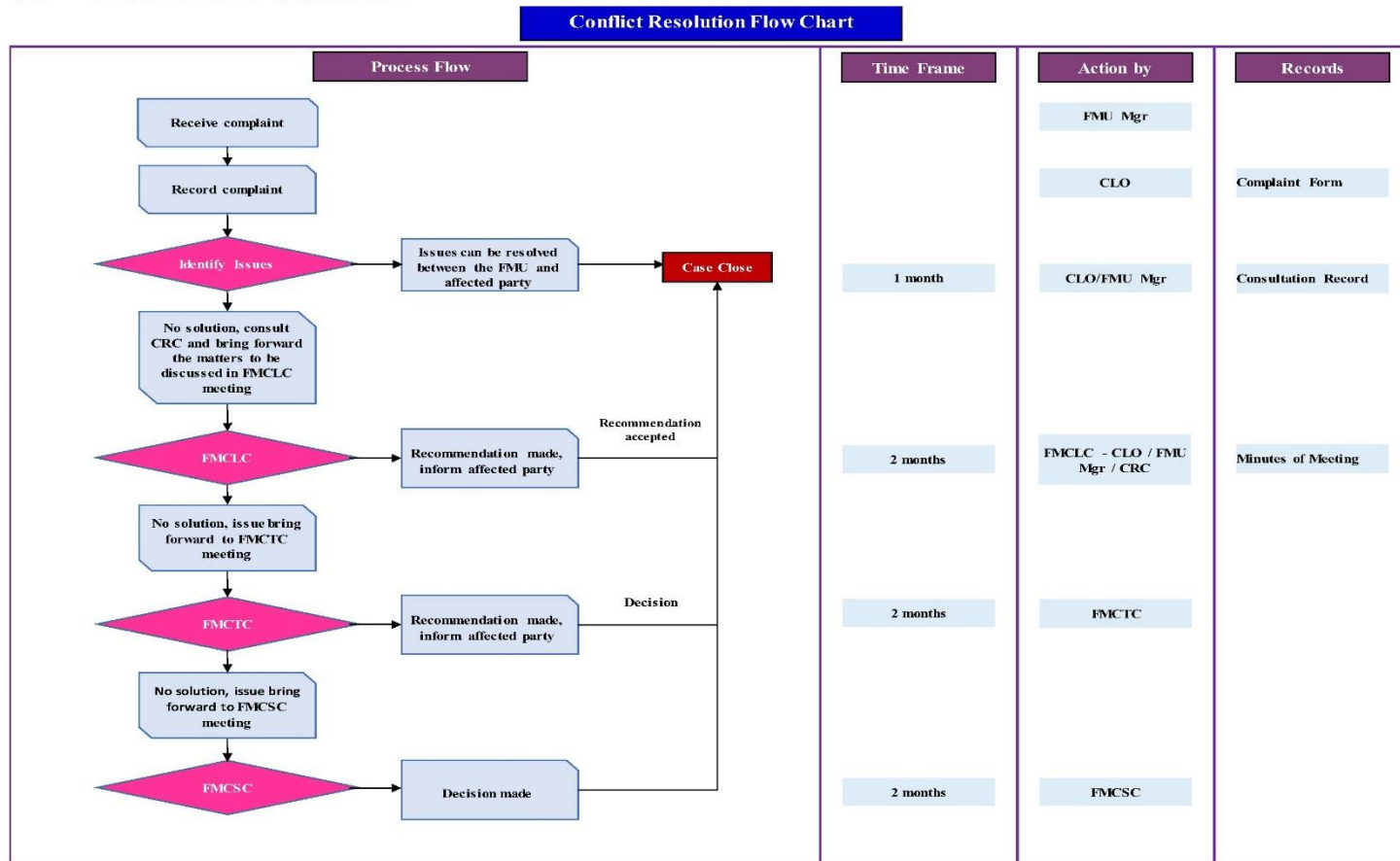
3.0 RESPONSIBILITY AND AUTHORITY

The Chief Operating Officer (COO) has overall responsibility and authority for this procedure.

4.0 DEFINITIONS/ABBREVIATIONS

COO	Chief Operating Officer
FMU Mgr	FMU Manager
CLO	Community Liaison Officer
CRC	Community Representative Committee
FMCLC	Forest Management Certification Liaison Committee
FMCTC	Forest Management Certification Technical Committee
FMCS	Forest Management Certification Steering Committee
FMU	Forest Management Unit
MTCS	Malaysian Timber Certification Scheme
MC&I SFM	Is the national forest management certification standard under the MTCS.

5.0 FLOW CHART SUMMARY



6.0 STEPS OF CONFLICT RESOLUTION

Description	Time Frame
Step 1 When a dispute is brought up to the attention of FMU Manager either from a report or from a complainant, the FMU Manager forward or inform CLO: - If the FMU Manager received any unauthorized report, he is to forward the report to CLO. - If the complainant involved local community, the FMU Manager to advise the complainant to CLO so that his complaint could be recorded in the Complaint Form (appendix 1)	1 month
Step 2 The issue raised by complainant or report to be recorded by CLO in the Complaint Form (see appendix 1). He/she and FMU Manager shall find, record and assess fact involving: - All parties concerned - Witness and evidences produced by parties concerned	
Step 3 CLO / FMU Manager to identify and assess the issues – whether within jurisdiction of the FMU or to be assigned to the right party. - If the issue is within the jurisdiction of FMU, based on the information gathered, the Camp Manager / CLO to try to solve the issues informally with the affected parties through consultation, negotiation of fair and equitable compensation related with traditional knowledge and practices together with CRC and to come to an agreement. - All the information on the consultation to be recorded accordingly. - If the FMU fail to reach any solution, the issues would be brought forward to FMCLC meeting.	
Step 4 FMU CLO to initiate consultation meeting through FMCLC prior to the meeting, the following information to be made available: - Clarification from individuals and/or elders with background knowledge of the issue - Consulting knowledgeable individuals (who may and may not be the same individuals as in (i), if necessary - Developing a summary of findings. - Based on all the information obtained from the consultation, FMCLC recommend actions or solutions to address the issue. - If decisions cannot be made or the issues cannot be solved under FMCLC, the matter would be brought up to higher committee, FMCTC. The Committee Chairman is Director of Forest.	2 months

Step 5	If the matters settle at FMCTC level, the decision is to be conveyed to FMU / FMCLC. i. In the event the matter cannot be settled, then the issues would be handled by FMCSA.	2 months
Step 6	FMCSA to make decision, recommendation and suitable solutions.	2 months
	Case close	

6.1 Community Representatives Committee (CRC)

A CRC is a committee that local communities from within and adjacent to the FMU that are directly or indirectly affected by the FMU's forest operation may set up should they wish to do so.

The chairman and members of the committee are determined by the communities themselves.

6.2 Forest Management Certification Liaison Committee (FMCLC)

FMCLC is a consultative framework involving multi-stakeholder representatives from local communities residing within or surrounding the FMU that are directly or indirectly affected by the forest operation, FMU representatives, FDS as well as other relevant government agencies as and when required. The Committee Chairman is the Regional Forest Officer.

6.3 Forest Management Certification Technical Committee (FMCTC)

FMCTC was set up to address issues related to technical issues on the ground with regards to the implementation of SFM and FMC. One of the main task of this committee is to evaluate Forest Management Plan and provide a recommendation for approval. The committee members are expert in various field from relevant agencies related to forestry sector (FDS, SFC, NREB, STIDC). The Chairman for this committee is the Director of Forests.

6.4 Forest Management Certification Steering Committee (FMCSA)

FMCSA was set up to address issues related to policy, laws or regulation and management issues at the Ministry level. Chaired by Permanent Secretary of Ministry for Urban Development and Natural Resources. Members of the committee are representatives from various agencies under the jurisdiction of the Ministry (Forest Department Sarawak (FDS), Sarawak forestry Corporation (SFC), Sarawak Timber Development Corporation (STIDC), Natural Resources and Environment Board (NREB), Land and Survey (L&S) and Sarawak Biodiversity Centre (SBC).

7.0 REFERENCE DOCUMENTS

1. MC&I SFM 1/2020.
2. Complaint Form.

Rev. 4 (16/2/2022)



Complaint Form

Borang Aduan

Name of Complainant / Nama Pengadu	
Contact No. / No. Telefon	
Village / Kampung	
Complaint Information / Maklumat Aduan (If the space provided is insufficient, a separate attachment may be enclosed/ Jika ruang yang disediakan tidak mencukupi, lapiran yang berasingan boleh disertakan).	
Signature of Complainant Tandatangan Pengadu	
To be filled by CLO / Untuk kegunaan CLO	
Date received / Tarikh diterima	
Recorded by / Direkod oleh	
Name of CLO / Nama CLO	
CLO contact no. / No. telefon CLO	
Signature / Tandatangan	
Particulars of Action Taken / Maklumat Tindakan yang Diambil	
Name & Signature / Nama & Tandatangan	
Designation / Jawatan	
Date of action taken / Tarikh tindakan diambil	
Office contact no. / No. telefon pejabat	
Acknowledgement / comment from complainant (Diterima / komen oleh pengadu)	
Signature / Tandatangan	
Date / Tarikh	

CC:
Head of Department / Operating Unit / FMCU

Notes
CLO = Community Liaison Officer