SILUK PEATLAND CONSERVATION PROJECT

Project title	Siluk Peatlands Conservation Project (SPCP)
Project ID	5695
Crediting period	01-January-2023 to 25-October -2051
Project lifetime	The project's first crediting period runs from 01-January-2023 to 25-October-2051, covering a 28.75-years. Subsequent to the first crediting period, a license extension will be sought to extend the project's lifetime to 25-October-2141, giving a 100 year project lifetime.
(CCB) GHG accounting period	Changes in GHG emission reductions resulting from project activities will be monitored from 01-January-2023 to 25-October-2051 corresponding to the 28.75-year first crediting period.
Original date of issue	-
Most recent date of issue	-
Version	1.0
VCS Standard version	4.7
CCB Standards version	3.1
Project location	Indonesia, West Kalimantan Province, Kapuas Hulu District

Project proponent(s)	PT. Annisa Surya Kencana Jl. Gunung Gede No.6, Kota Bogor, Jawa Barat, 16153 Indonesia Contact Name: Iwan Tricahyo Wibisono, President Director Email: yoyok.itc@annisasuryakencana.com Phone: +62 81314666879
Validation/verification body	Earthood Services Limited, info@earthood.in, +91 124 4204599
History of CCB status	N/A
Gold Level criteria	**Climate Change Adaptation Benefit**. The project is committed to protecting peatlands and forests from disturbances while supporting communities in adopting sustainable livelihood practices. Key efforts include implementing Zero Burning Agriculture Practices, implementing a Sustainable Community Enterprise Program, and promoting eco-friendly livelihoods. An integrated fire prevention and forest protection system will also be established, engaging communities and key stakeholders. In addition, the project will conduct awareness-raising campaigns and capacity-building programs to strengthen local knowledge and awareness in forest and peatlands conservation. Through these initiatives, the project aims to balance ecological conservation with long-term economic sustainability for local communities. **Exceptional Community Benefits**. The project zone of SPCP qualifies as a rural area where more than 50% of households live below the national poverty line, thereby meeting the eligibility criteria for CCB Gold Level. Communities will receive support to transition from environmentally harmful practices toward climate-smart agriculture, aquaculture, and sustainable non-timber forest product (NTFP) harvesting, thereby reducing pressure on ecosystems. The project will also create employment opportunities in ecosystem restoration, providing inclusive and sustainable alternatives to environmentally degrading activities. Together, these interventions enhance the community's long-term adaptive capacity, strengthen socio-economic resilience, and improve well-being across all social groups **Exceptional Biodiversity Benefits**. SPCP meets the Gold Level biodiversity criteria as the project area is located within a critical peat ecosystem and is known to support populations of 12 critically endangered species, 14

	species with endangered status, 38 vulnerable species, and 38 species categorized as near threatened/almost threatened per the IUCN Red List (See Section 5). The project aims to maintain and/or enhance the population of all these species through reducing threats with habitat protection and restoration and through reducing unsustainable use. Project implement multispecies population and species diversity monitoring system to ensure the biodiversity long-term survival.
Expected verification schedule	Q4-2025
Prepared by	PT. Annisa Surya Kencana (ASK)

CONTENTS

1 SUMMARY OF PROJECT BENEFITS 6
1.1 Unique Project Benefits 6
1.2 Standardized Benefit Metrics 7
2 PROJECT DETAILS 11
2.1 Project Goals, Design and Long-Term Viability 11
2.2 Without-project Land Use Scenario and Additionality 45
2.3 Safeguards and Stakeholder Engagement 46
2.4 Management Capacity 62
2.5 Legal Status and Property Rights 66
2.6 Additional Information Relevant to the Project 77
3 CLIMATE 77
3.1 Application of Methodology 77
3.2 Quantification of Estimated GHG Emission Reductions and Removals 114
3.3 Monitoring 211
3.4 Optional Criterion: Climate Change Adaptation Benefits 215
4 COMMUNITY 217
4.1 Without-Project Community Scenario 217
4.2 Net Positive Community Impacts 225
4.3 Other Stakeholder Impacts 232
4.4 Community Impact Monitoring 233
4.5 Criterion: Exceptional Community Benefits 238
5 BIODIVERSITY 246
5.1 Without-Project Biodiversity Scenario 246
5.2 Net Positive Biodiversity Impacts 251
5.3 Offsite Biodiversity Impacts 261
5.4 Biodiversity Impact Monitoring 262
5.5 Optional Criterion: Exceptional Biodiversity Benefits 269
REFERENCE 276
APPENDIX 1 PROJECT RISKS TABLE 285
APPENDIX 2: PROJECT ACTIVITIES AND THEORY OF CHANGE TABLE 295
APPENDIX 3: LIST OF LAWS AND REGULATION RELEVANT TO THE PROJECT 302
APPENDIX 4: STAKEHOLDER DESCRIPTION TABLE 321
APPENDIX 5: LIST OF CONSULTATION MEETINGS 328

Appendix 5.1 Informational meetings with communities and local government 328
Appendix 5.2 Informational meetings with related stakeholders.....331
APPENDIX 6: LIST OF MID-LARGE MAMMALS IN THE PROJECT AREA 333
APPENDIX 7: LIST BIRDS FOUND WITHIN PROJECT AREA..... 336
APPENDIX 8: LIST REPTILES AND AMPHIBIANS FOUND WITHIN PROJECT AREA 343
Appendix 8.1 List Reptiles Found Within Project Area 343
Appendix 8.2 List Amphibians found within project area.....344
APPENDIX 9: LIST FISHES FOUND WITHIN PROJECT AREA 347
APPENDIX 10: LIST FLORA FOUND WITHIN PROJECT AREA 352
APPENDIX 11: BIODIVERSITY MONITORING PLAN..... 373
APPENDIX 12: DATA AND PARAMETERS AVAILABLE AT VALIDATION FOR REDD (APDEG AND APD) 379
APPENDIX 13: DATA AND PARAMETERS MONITORED FOR REDD..... 386
APPENDIX 14: DATA AND PARAMETERS AVAILABLE AT VALIDATION FOR WRC.... 391
APPENDIX 15: DATA AND PARAMETERS MONITORED FOR WRC..... 399

1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

Outcome or impact estimated by the end of project lifetime	Section reference
1) **Climate Outcome** The project aims to conserve and restore approximately 28,506 hectares of tropical peatlands and forests by preventing planned degradation, planned deforestation, and peatland degradation within the project area. By implementing conservation and restoration efforts, the project is expected to prevent the release of over 37,829,938.71 metric tons of CO_2 equivalent (tCO2e) in greenhouse gas emissions over the crediting periods.	3
2) **Community Outcome** The project strives to enhance community livelihoods by promoting sustainable forest and peatland management with a focus of fostering income-generating, community-based enterprises tied to environmental conservation. The project is committed to enhancing the livelihoods and overall well-being of communities residing within and surrounding the project area. The project is expected to benefit up to 5,350 people, with direct livelihood improvement of 1,700 people within 14 neighboring villages.	4
3) **Biodiversity Outcome** The project will protect and enhance biodiversity within the project area by preserving key habitats and reducing threats to the Critically Endangered Bornean Orangutan and other threatened wildlife. The project further aims to prevent habitat loss, support species survival, and strengthen ecosystem resilience for long-term conservation.	5

1.2 Standardized Benefit Metrics

Category	Metric	Estimated by the end of project lifetime	Section reference
GHG emission reductions or carbon dioxide removals	Net estimated removals in the project area, measured against the without-project scenario	N/A	N/A
	Net estimated reductions in the project area, measured against the without-project scenario	37,829,938.71 tCO2e	3.2.4
Forest cover	For REDD-projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	5,756.20 ha	3.2.1
	For ARR projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	N/A	N/A
Improved land management	Number of hectares of existing production forest land in which IFM practices are expected to occur as a result of project activities, measured against the without-project scenario	20,719.90 ha	3.2.1
	Number of hectares of non-forest land in which improved land management practices are expected to occur as a result of project activities, measured against the without-project scenario	215 ha	3.2.1
Training	Total number of community members who are expected to have improved skills and/or	1,660 people	4.5.2

	knowledge resulting from training provided as part of project activities		
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	500 people	4.5.2
Employment	Total number of people expected to be employed in project activities[1], expressed as number of full-time employees[2]	40 people	4.5.2
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	20 people	4.5.2
Livelihoods	Total number of people expected to have improved livelihoods[3] or income generated as a result of project activities	1,660 people	4.5.2
	Number of women expected to have improved livelihoods or income generated as a result of project activities	500 people	4.5.2
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	880 people	4.5.2

[1] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.
[2] Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from the UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28])
[3] Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. The Sustainable Livelihood Approach to Poverty Reduction. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	440 people	4.5.2
Education	Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	600 people	4.5.2
	Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	300 people	4.5.2
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	2,100 people	4.5.2
	Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	1,050 people	4.5.2
Well-being	Total number of community members whose well-being[4] is expected to improve as a result of project activities	5350 people	4.5.2

[4] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Livelihoods, Health, Education and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.

	Number of women whose well-being is expected to improve as a result of project activities	2680 people	4.5.2
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation[5], measured against the without-project scenario	28,510 Ha	5.4.1
	Expected number of globally Critically Endangered or Endangered species[6] benefiting from reduced threats as a result of project activities[7], measured against the without-project scenario	26 species	5.4.1

[5] Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species
[6] Per IUCN's Red List of Threatened Species
[7] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 PROJECT DETAILS

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (VCS, 3.2, 3.6, 3.10, 3.11, 3.13, 3.14)

The Siluk Peatlands Conservation Project (SPCP) is dedicated to the protection and restoration of 28,506 hectares within the concession area managed by PT ASK in Kapuas Hulu District-West Kalimantan Province. This project is expected to generate 37,829,938.71 tCO2e (1,304,480.65 tCO2/year) in carbon emission reductions by preventing planned forest disturbance (deforestation and degradation), avoiding peatland conversion, and by conducting restoration activities.

In 2021, the Ministry of Environment and Forestry granted PT ASK a forest utilization license through Decree No. SK.965/MENLHK/SETJEN/HPL.0 /10/2021. This license authorized PT ASK to conduct timber logging and convert forests into timber plantations in the 33,605 Ha area for an initial period of 30 years, with the possibility of extension by a further 90 years. Following a change in ownership in 2022, the company made a strategic decision to abort the forest utilization plan and instead focus on forest and peatland conservation.

In addition to mitigating greenhouse gas emissions, the project contributes significantly to biodiversity conservation by protecting wildlife habitats. Key species targeted for conservation by the project include the Bornean Orangutan (*Pongo pygmaeus pygmaeus*), Proboscis Monkey (*Nasalis larvatus*), Tricolor Langur (*Presbytis chrysomelas ssp. cruciger*), Hairy-nosed Otter (*Lutra sumatrana*), Otter Civet (*Cynogale bennettii*), Bornean Clouded Leopard (*Neofelis diardi ssp. borneensis*), and Sun Bear (*Helarctos malayanus*). The Project will make significant efforts to ensure the preservation of diverse and endangered species within the project area, emphasizing its ecological importance.

SPCP is also committed to raising community awareness about sustainable natural resource management and fostering collaborative partnerships with 14 neighboring villages. The project provides direct employment opportunities through activities such as forest patrolling, monitoring, and restoration. Additionally, SPCP ensures communities have access to training and capacity-building programs aimed at improving entrepreneurship skills in key areas, including sustainable agriculture, fisheries, and zero-burning farming practices. These initiatives foster economic growth and sustainable livelihoods while promoting active community involvement in conservation efforts.

At the time of project registration, the area where SPCP is implementing a project is not included in a jurisdictional REDD+ program.

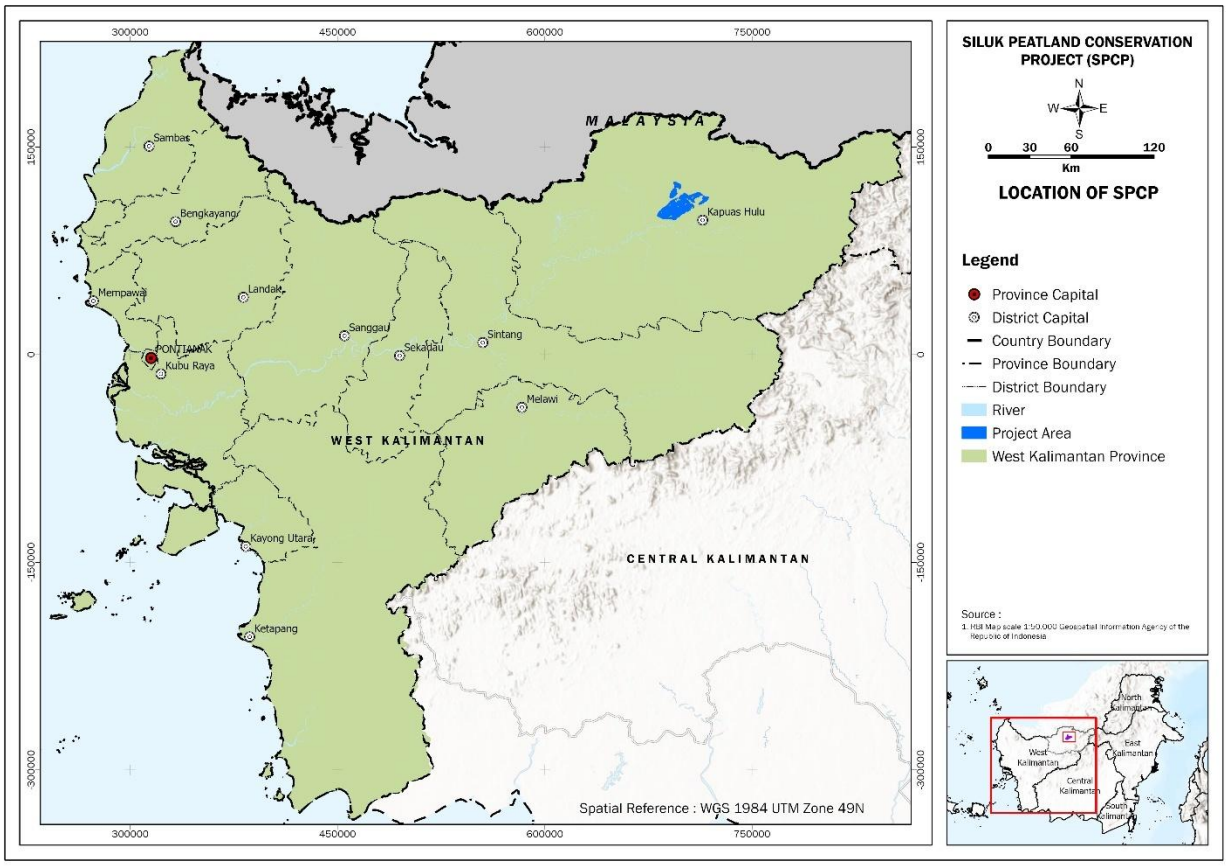


Figure 1. Location of The Siluk Peatlands Conservation Project (SPCP)

2.1.2 Audit History (VCS, 4.1)

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	(01 January 2023- 25 October 2051)	VCS CCB	Earthood Services Limited	28
Verification	(01 January 2023–31 December 2024)	VCS CCB	Earthood Services Limited	2

2.1.3 Sectoral Scope and Project Type (VCS, 3.2)

Sectoral scope	Agriculture, Forestry, and Other Land Use
AFOLU project category	Reduced Emissions from Deforestation and Degradation (REDD) Wetlands Restoration and Conservation (WRC)

Project activity type	Combination of following activity types: • Avoiding Planned Deforestation and Degradation • Conserving of Intact Wetlands • Restoring Wetlands Ecosystem Project activity types above were determined based on the decision tree guidance in VM0007

2.1.4 Project Eligibility (VCS, 3.1, 3.6, 3.8, 3.18, 4.1; CCB Program Rules, 4.2.4, 4.6.4)

The project meets all applicable rules and requirements set out under the VCS and CCB Programs, including:

- The project activity falls under VCS Scope 14 which concerns Agriculture, Forestry, and Other Land Use (AFOLU) and which is defined as "The sectoral scope that covers GHG emissions and emission reductions and/or removals from project or program activities in the agriculture, forestry, and other land use/land use change sectors and for which the VCS Program has established rules and requirements with respect to specific project categories" as described in detail in this Project Description.
- The project is assigned to the correct AFOLU project category (as given in Section 2.1.3 above, and as described in detail in Section 3.1.5) including their spatial separation within the project area.
- All related category requirements are met, as described in detail below in Section 3.1.2.

The project was opened for a 30-day public comment period between DD-MM-YYYY and DD-MM-YYYY: The opening meeting ('kick off call') with the validation/verification body (VVB; Earthood Services Limited) was held on DD-MM-YYYY. The project's validation statement was submitted on DD-MM-YYYY within the one-year time limit.

To date the project has met all requirements to relevant deadlines. The project was submitted for pipeline listing on DD-MM-YYYY. This complied fully with the requirement that AFOLU projects initiate the pipeline listing process within three years of the project start date. The project remains on course to achieve validation within five years of the project's start date of (01-Jan-2023, see Section 2.1.10 below).

At the time of submission to undergo validation, all applied methodologies and tools were eligible under the VCS Program (See Section 3.1.1).

During the public comment period (as above) XX comments were received: ADD WHEN KNOWN.

2.1.5 Transfer Project Eligibility (VCS, 3.23, Appendix 2)

Not applicable. The project eligibility remains solely under the current proponent's authority and will not be transferred to any other entity at any point. The proponent retains full control and responsibility for the project's compliance, implementation, and adherence to Verra's requirements.

2.1.6 Project Design (VCS, 3.6)

The project area is situated in a single location. It is not a Grouped Project

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

2.1.7 Project Proponent (VCS, 3.7; CCB, G1.1)

Organization name	PT. Annisa Surya Kencana	
Contact person	Iwan Tricahyo Wibisono	
Title	President Director	
Address	Jl Gunung Gede No. 6 Kota Bogor, Jawa Barat, 16153. Indonesia.	
Telephone	+62 81314666879	
Email	yoyok.itc@annisasuryakencana.com	

2.1.8 Other Entities Involved in the Project

Organization name	PT. Karbon Natura Indonesia	
Role in the project	Technical advisor PT. Karbon Natura Indonesia (KNI) is a private company that provides services on the development of carbon project and its implementation KNI provides technical supports to SPCP in key aspects including carbon MRV, peatland and forest management, community development, biodiversity conservation and project investment.	
Contact person	Irwansyah Reza Lubis	
Title	President Director	

Address	One Pacific Place Sudirman Central Business District 15th Floor, Jalan Jendral Sudirman Kav. 52-53 Jakarta 12190, Indonesia	
Telephone	+62 2125502654	
Email	info@karbonatura.com	

2.1.9 Project Ownership (VCS, 3.2, 3.7, 3.10; CCB, G5.8)

PT Annisa Surya Kencana (PT ASK) as project proponent is the rights-holder of forest management concessionaire under the Forest Utilization Business Licensing (*Perizinan Berusaha Pemanfaatan Hutan/*PBPH) scheme with the Decree of the Minister of Environment and Forestry SK.965/MENLHK / SETJEN/HPL.0/10/2021 on October 25, 2021.

In accordance with Government Regulation No. 23 of 2021 on Forestry Administration, PT ASK is fully authorized to implement a multi-forestry business system (*Multi Usaha Kehutanan/MUK*) within its licensed area. This regulation, particularly Article 181, explicitly recognizes the utilization of environmental services for carbon sequestration and/or storage as a legitimate component of forest utilization. As such, PT ASK's initiative to engage in carbon-related activities within the concession period is not only permissible under the law but also aligned with sustainable forest management and climate change mitigation

This license, combined with applicable laws, authorizes ASK to generate and sell carbon credits and implement planned project activities. This complies with the VCS Standard 4.7 definition of "Project ownership arising or granted under statute, regulation, or decree by a competent authority.

2.1.10 Project Start Date (VCS, 3.8)

Project start date	01-January -2023
Justification	Following the company's acquisition on 04-March-2022, the new management made a strategic decision to abandon the timber-based business model originally planned by the previous owner. Instead, the company shifted its focus toward the protection and conservation of peatlands and forests which lead to the generation of greenhouse gas emissions avoidance. Under the baseline scenario, ASK was required to submit and receive approval for its logging plan by 25-October-2022; within one year of the date of license issuance. This in turn would have resulted in the start of logging activities by late 2022. Accordingly, the project start date was conservatively set as 01-January-2023.

	As per VCS Standard v4.7, this date corresponds with the date on which activities that led to the generation of reductions or removals were implemented through 'changing agricultural or forestry practices, rewetting, restoring hydrological functions, or implementing management or protection plans'

2.1.11 Benefits Assessment and Project Crediting Period (VCS, 3.9; CCB, G1.9)

Crediting period	The project crediting period runs from the project start date on 01-January-2023 until 24-October-2051 (28.75 years). This crediting period corresponds to the remaining term of the initial licence held by ASK. This period also corresponds to the period over which changes in climate change adaptive capacity and resilience, biodiversity and community well-being resulting from project activities are monitored. Prior to the end of this licence term, ASK will seek a licence term extension to extend the project activities, as allowed in Ministry of Forestry regulation, for a further 90-year period. Once this extension is in place, the project will seek renewal of the project Crediting Period up to 25-October-2141, representing the maximum total Crediting Period allowable of 100 years, as per VCS V4.7 section 3.9.3.
Start date of first or fixed crediting period	01-January-2023 to 24-October-2051
CCB benefits assessment period	As above

2.1.12 Differences in Assessment/Project Crediting Periods (CCB, G1.9)

There is no difference between the assessment periods for GHG emissions accounting, climate adaptive capacity and resilience, community, and biodiversity. The project follows a consistent assessment throughout the project period for all impact areas to ensure comprehensive monitoring,

2.1.13 Project Scale and Estimated Reductions or Removals (VCS, 3.10)

☐ < 300,000 tCO_2e/year (project)

☒ ≥ 300,000 tCO_2e/year (large project)

SPCP estimates total GHG emission reductions (ERs) of 37,829,938.71 tCO2e over the entire project period, before buffer deductions. According to Verra's project scale classification, this qualifies the project as a 'Large Project'. The projected annual breakdown of GHG emission reductions is detailed below.

Calendar year of crediting period	Estimated reductions or removals (tCO_2e)
01-January-2023 to 31-December-2023	432,186.37
01-January-2024 to 31-December-2024	382,412.22
01-January-2025 to 31-December -2025	484,386.67
01-January-2026 to 31-December -2026	663,523.92
01-January-2027 to 31-December -2027	834,719.31
01-January-2028 to 31-December -2028	967,376.63
01-January-2029 to 31-December -2029	992,093.81
01-January-2030 to 31-December -2030	1,142,720.23
01-January-2031 to 31-December -2031	1,290,283.32
01-January-2032 to 31-December -2032	1,199,583.18
01-January-2033 to 31-December -2033	1,163,285.21
01-January-2034 to 31-December -2034	1,175,310.82
01-January-2035 to 31-December -2035	1,222,820.93
01-January-2036 to 31-December -2036	1,261,274.46
01-January-2037 to 31-December -2037	1,369,932.65
01-January-2038 to 31-December -2038	1,424,507.55
01-January-2039 to 31-December -2039	1,442,125.22
01-January-2040 to 31-December -2040	1,514,889.24
01-January-2041 to 31-December -2041	1,550,057.45
01-January-2042 to 31-December -2042	1,623,266.46
01-January-2043 to 31-December -2043	1,650,034.90
01-January-2044 to 31-December -2044	1,641,919.82
01-January-2045 to 31-December -2045	1,710,748.47

Calendar year of crediting period	Estimated reductions or removals (tCO_2e)
01-January-2046 to 31-December -2046	1,825,410.40
01-January-2047 to 31-December -2047	1,835,217.07
01-January-2048 to 31-December -2048	1,788,904.74
01-January-2049 to 31-December -2049	1,781,850.32
01-January-2050 to 31-December -2050	1,843,159.26
01-January-2051 to 24-October -2051	1,615,938.10
Total estimated ERRs during the first or fixed crediting period	37,829,938.71
Total number of years	28 years, 9 months
Average annual ERRs	**1,304,480.65**

2.1.14 Physical Parameters (CCB, G1.3)

2.1.14.1 Project location

SPCP is situated in Kapuas Hulu District of West Kalimantan Province (Figure 1), encompassing two sub-districts: Putussibau Utara and Embaloh Hilir Sub-district (Figure 2). SPCP is geographically located between 0^0 51' - 1^0 08' N and 112^0 37' - 112^0 59' E, covering two distinct and ecologically significant ecosystems; peat swamp forest and dryland forest (Figure 9).

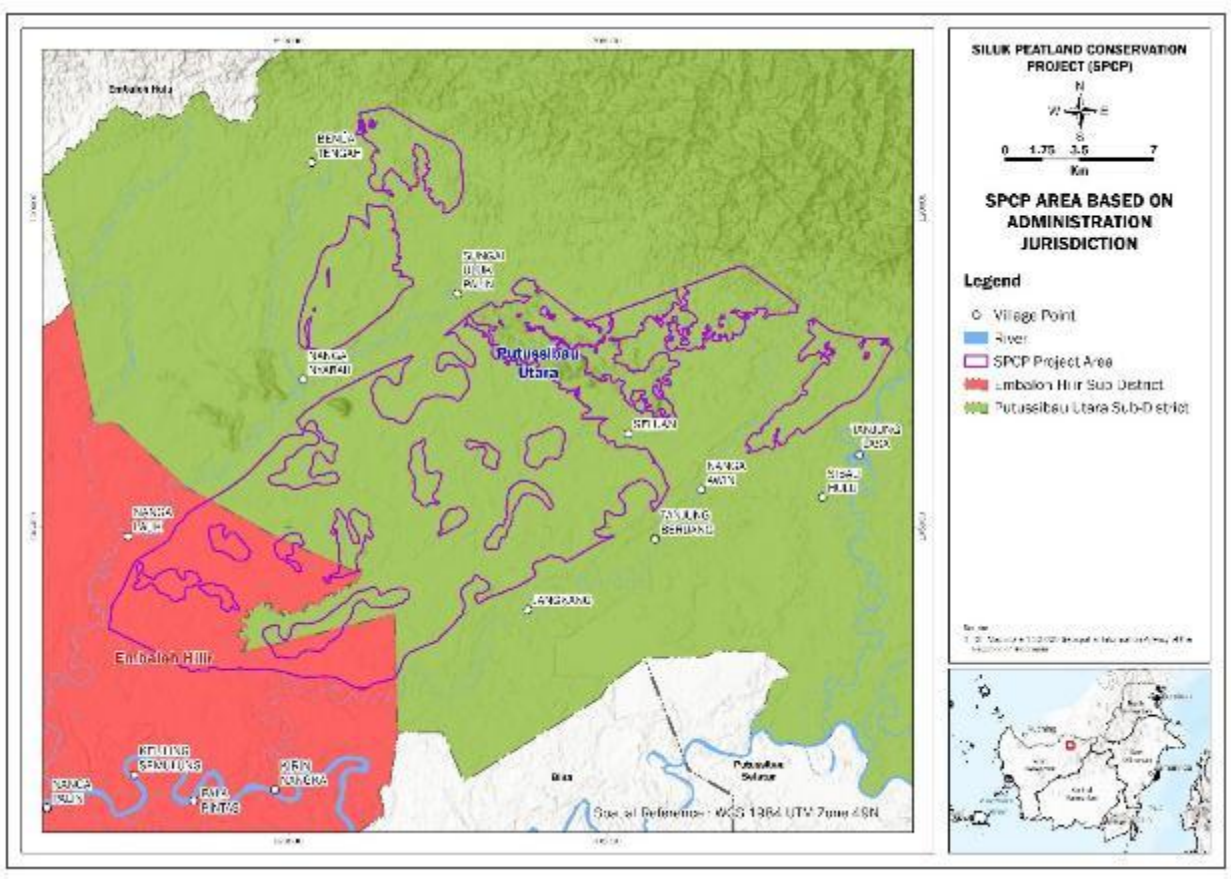


Figure 2. SPCP area based on administration jurisdiction

2.1.14.2 Topography

The landscape of SPC can be categorized as a peat-covered wetland that evolved on a tertiary geological basin (the East Ketungau a.k.a the Mandai basin), situated at about 37 meters above mean seal level (with minimum and maximum elevations of 25 and 237 m-msl respectively). The peat basin of the landscape is slightly sloping from the northeast to the southwest at 0.08% rate. Local terrain is dominated by flat slopes (0 — 0.25%) on peatlands (to the southwest) and undulating hilly terrain (>2%) on hilly areas to the northeast (see also Figure 3 and Figure 4).

Topography of the landscape strongly affects its hydrology and ecology. Sitting at more elevated position than those of coastal peatlands, the landscape had been given far earlier onset of peat accumulation (about 40,000 years BP, i.e. when today's SEA coastal peatlands were still free of mangrove and tidal flats). Having developed earlier allowed the peat substrates to evolve into higher maturity state (i.e. Sapric) and relatively lower hydraulic conductivity (ca. 1.6 $m.day^{-1}$). Closer vicinity to mountain ranges makes annual precipitation of the landscape much higher (>5,000 mm) than those in coastal peatlands (usually 1500 – 3000 mm).

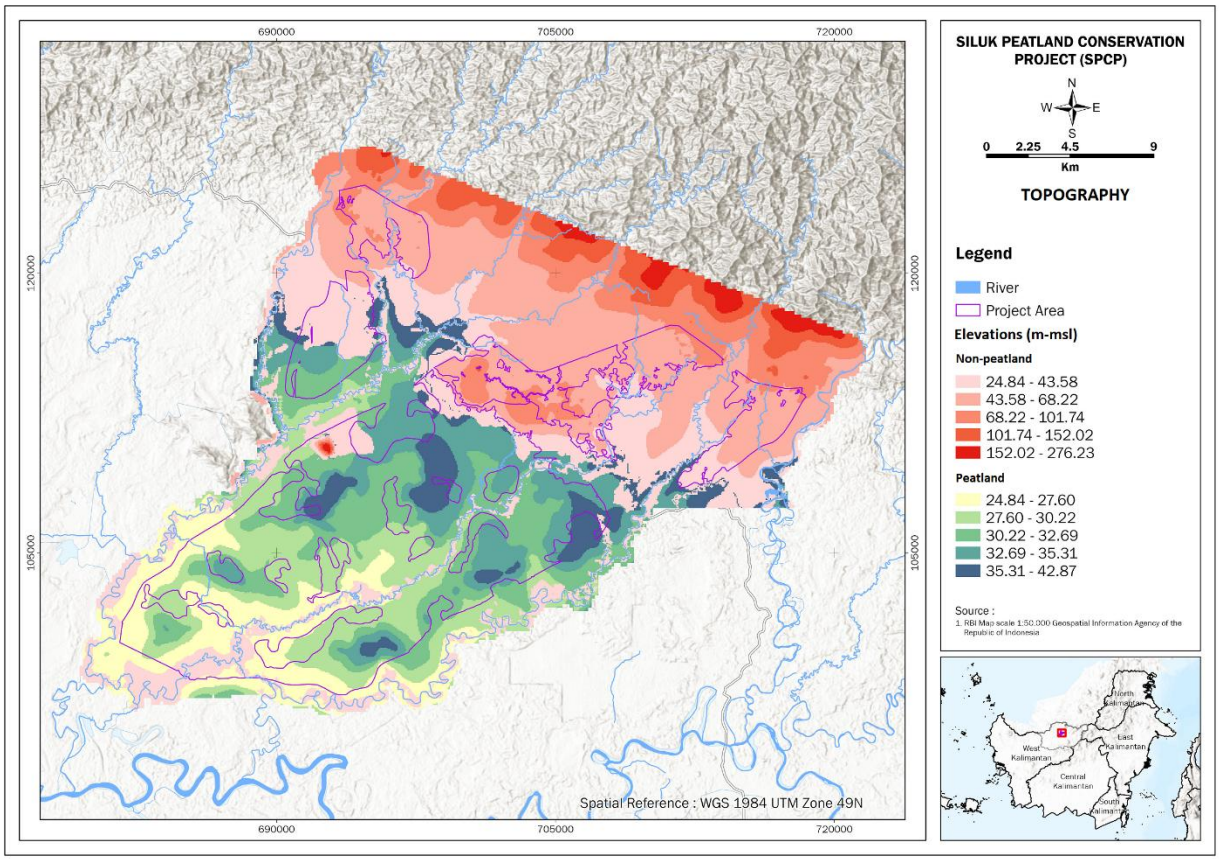


Figure 3. Topography of SPCP area based on LIDAR data

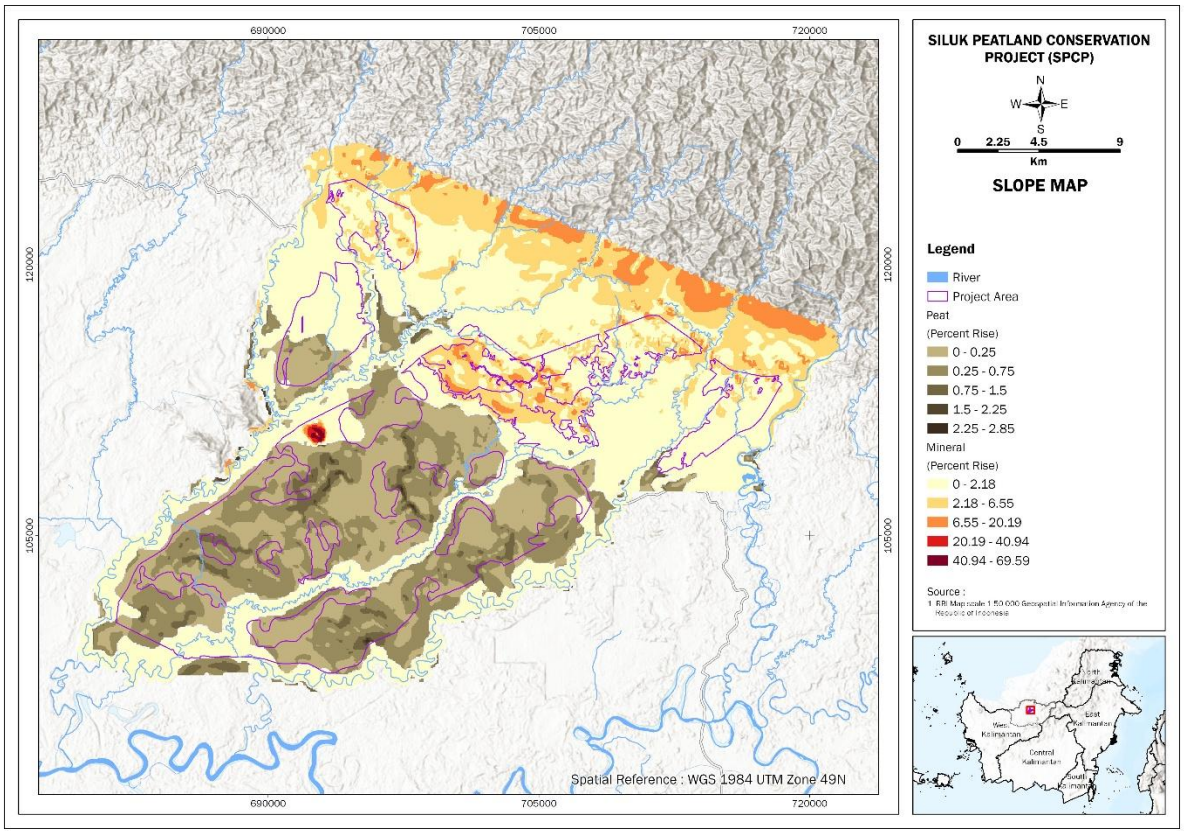


Figure 4. The slope characteristics of SPCP area

2.1.14.3 Soil characteristics

Based on field survey data, the project area is predominantly characterized by peat soils, covering approximately 17,003.09 hectares (60%). The classification of peat soils follows the FAO definition, which sets a minimum threshold of 0.4 meters of organic material. Peat soil is primarily concentrated in the central and southern parts of the project area. In contrast, mineral soil—covering approximately 11,503.09 hectares (40%)—are mainly located along the main riverbanks that traverses the project area and in the hilly regions in the north. Field measurements confirm peat depths ranging from 0.4 meters to 21.54 meters. Further details on peat soil distribution are provided in Section 3.2.1.2.

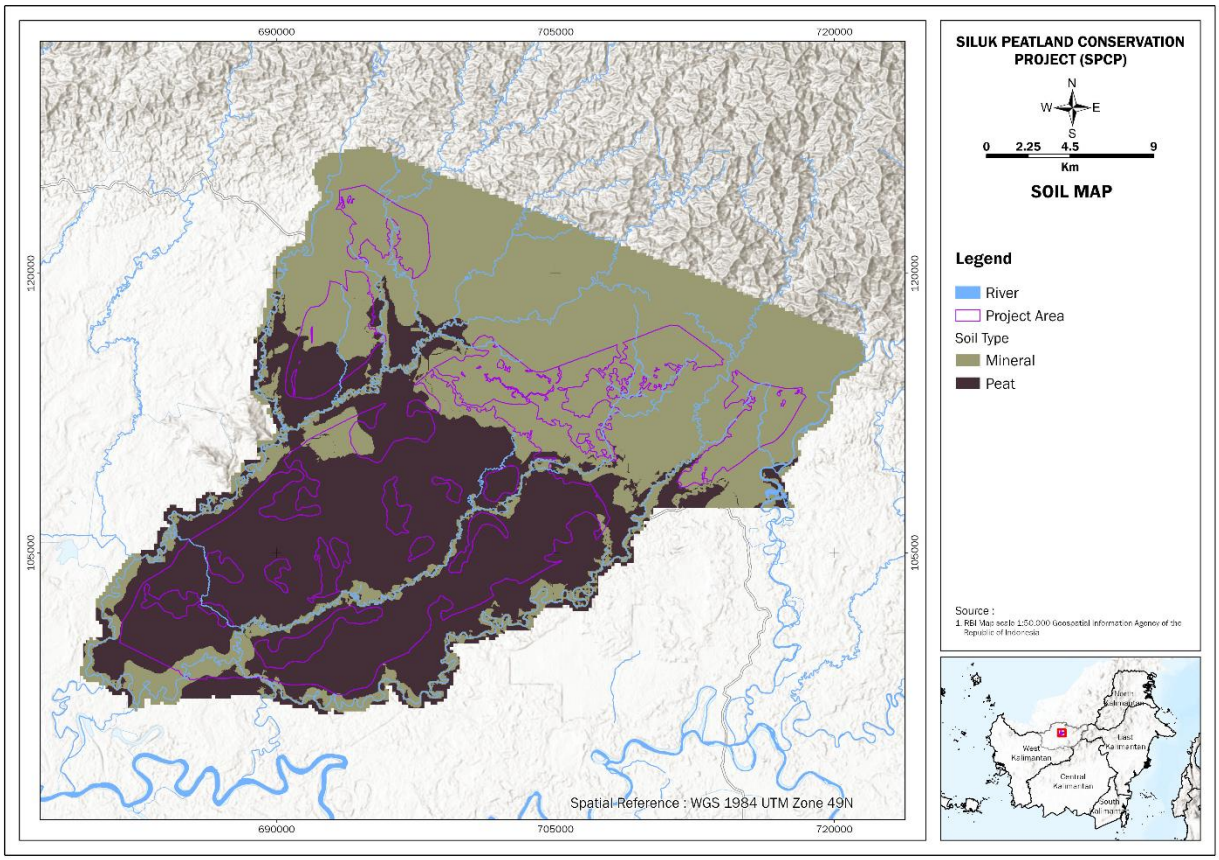


Figure 5. Soil characteristics in SPCP area

2.1.14.4 Climate

The Project Area lies within the equatorial weather region of West Kalimantan and falls into wet tropical climate (Af) class in the Koppen, and A under Oldeman classification systems. Based on the weather records from 2003-2022 in Pangsuma Meteorological Station in Putssibau, Kapuas Hulu District (16 km from the project boundary) by the Indonesian Agency for Meteorology, Climatology, and Geophysics (BMKG), the average temperature around the project area is relatively stable all-year at around 27°C (**Error! Reference source not found.**). The maximum and minimum temperature are also relatively stable at around 32°C and 23°C respectively, thus the diurnal temperature range is around 9°C.

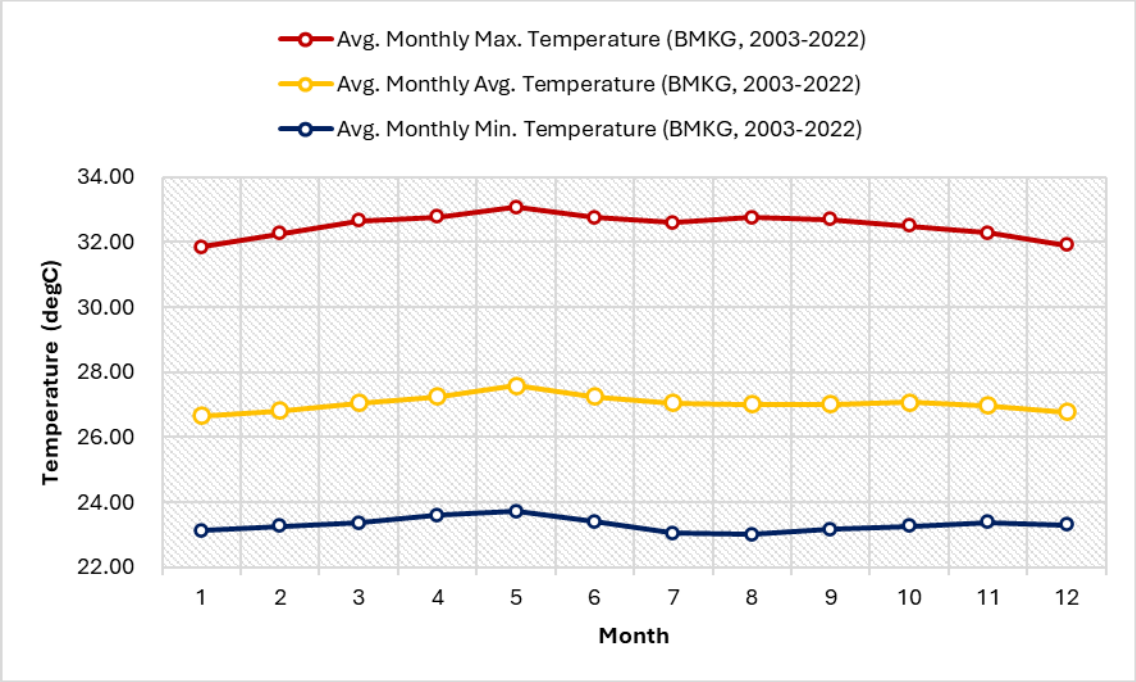


Figure 6. Average monthly temperature in Kapuas Hulu District (2003-2022)

As weather observation data is sparse and limited, rainfall data was obtained from satellite precipitation products, from The Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) dataset. The dataset combines satellite observations with station data and can be used for hydrological simulation (Funk et al., 2015).

According to Aldrian & Susanto (2003), the project area lies in a region with semi-monsoonal rainfall patterns, where there are two rainfall peaks within the year. The CHIRPS data (Figure 7) from 1983-2002 show the pattern, where there are two peaks (October and December-January). However, as climate changed, the pattern has lost in the last 20 years before project start (2003-2022). The peak of the rain season is now in November-December (ca. 420 mm/month). Nevertheless, the peak of the dry season is still the same in July (ca. 250 mm/month).

In addition to monsoon, the rainfall in the project area is affected by interannual weather events such as the El Niño Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD) (Kurniadi et al., 2021). For ENSO, El Niño events can cause decreased rainfall, while La Nina can cause the opposite effect. For IOD, positive phase leads to decreased rainfall, while negative phase leads to increased rainfall.

The project area has a humid climate with the average relative humidity is relatively stable at around 83-86% all year (data obtained from BMKG). The annual relative humidity pattern follows similar pattern to the rainfall; maximum in the end and start of the year, while minimum at the middle of the year.

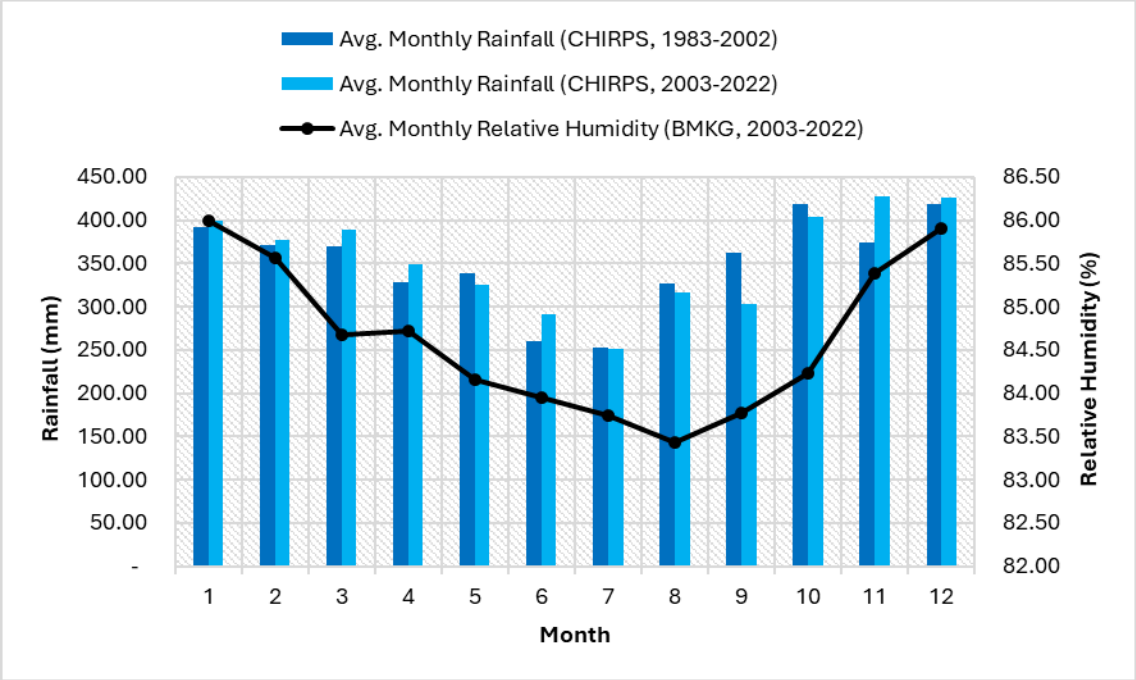


Figure 7. Average monthly rainfall and relative humidity around project area (Kapuas Hulu District)

2.1.14.5 Hydrology

Three main rivers traverse the landscape and serve as the natural drainage for the water balance of its hydrological system: the Palin, Seluan, and Sibau rivers. Below the foothills of the Betung Karihun range, peat soil has developed on top of a sandy loam deposit, and together they make a two-layered aquifer system and store fresh water in their soil pores.

Most of SPCP area is still covered by good forest stand, which strongly shapes the hydrology of the peatland. Trees on peatland elevate water loss through transpiration, but at the same time also provide shading and maintain a unique moist, cool and wind-free microclimate on forest floor, reducing soil evaporation. Trees also act as the source of organic matter for the sustainability of the peat soil, notably being the main aquifer in this hydrology.

Typical tropical peat swamp forest, like the SPCP, is characterized by a shallow water table depth, with a yearly average around 20 cm below soil surface. In dry seasons, when evapotranspiration exceeds rainfall, the water table depth usually drops deeper but rarely beyond 50 cm below the soil surface[8]. In wet seasons, soil pores are quickly filled to saturation and saturation-excess, owing to shallow water table, which causes flood and overland flow to take place.

[8] As shown in 21 dipwells covering 2023 – 2024 period

Water balance [9] of this tropical peat swamp forest is dominated by rainfall (5,878 mm yr^{-1}) as the main water input and evapotranspiration (4,072 mm yr^{-1}) as the main water loss components. Surface flow is estimated at 1,550 mm yr^{-1} and groundwater flow at 256 mm yr^{-1}. The dominance of evapotranspiration in the water balance is attributed to the high atmospheric evaporation demand and shallow water table nature of the peat swamp forest. The low contribution of groundwater flow is due to flat topography (on peatlands) whereby steeper hydraulic gradients are impossible to form naturally.

2.1.14.6 Types of Vegetation

The project area encompasses two distinct ecosystems: the peat ecosystem and the dryland ecosystem, both of which are predominantly characterized by forest land cover. These ecosystems play critical roles in maintaining biodiversity, supporting unique flora and fauna, and regulating environmental services such as carbon storage and water management. The peat ecosystem is notable for its high organic matter content and its function as a significant carbon sink, while the dryland ecosystem provides a habitat for various terrestrial species and supports different ecological dynamics.



Figure 8. Aerial view of vegetation conditions within the project area

The dryland ecosystem spans approximately 11,503 hectares, located in the northern part of the project area. Based on land cover classification, this ecosystem comprises three land cover types: secondary dryland forest (11,378 Ha), shrubland (40 Ha), and water body (86 Ha). The Secondary

[9] Calculated by using Penman-Monteith evapotranspiration model, calibrated storage coefficient parameter, and in situ rainfall, RH and temperature records (2024)

Dryland Forest represents a significant portion, characterized by dense tree coverage that supports a variety of flora and fauna adapted to relatively drier conditions. Shrubland represents non-forest areas, sparsely covered by herbs, woody shrubs or consists of barren land.

The peat ecosystem covers a significantly larger area within the project, estimated at approximately 17,003 hectares, and is in the middle and southern part of the project area. Recognized as a unique and ecologically vital system, tropical peatland ecosystems play a critical role in global carbon dynamics, serving as one of the planet's largest terrestrial carbon stores. By sequestering vast amounts of carbon in its dense organic layers over millennial timescales, it mitigates rises in greenhouse gas emissions and supports climate regulation. This ecosystem is comprised of three land cover types: Secondary Peat Swamp Forest (16,970 Ha), swampy shrubland (15 Ha), and water body (18 Ha). The Secondary Peat Swamp Forest represents a significant portion, characterized by dense tree coverage that grows on peat soil and swampy conditions. Tree species growing in peat swamp forests exhibit unique morphological and physiological characteristics that enable them to survive in extreme environmental conditions—conditions that are vastly different from those found in dryland ecosystems. These traits are essential for thriving in waterlogged, acidic, low-oxygen, and nutrient-deficient soils that define peat swamp environments. Field surveys identified common tree species in peat swamp forest including *Gonystylus bancanus, Koompasia malaccensis, Shorea belangeran, Dyera polyphylla, Alstonia pneumatophora, Campnosperma spp*, and *Mellahoornea walichii.*

Historically, the forest has experienced degradation in the past due to timber extraction by a logging company. Before PT ASK obtained the license, the previous logging company operating in the area primarily harvested high-value timber species, including *Shorea spp., Dipterocarpus spp*., and *Koompasia malaccensis* (see Section 2.1.15.3 for details).

Swampy Shrubland typically represents non forest area sparsely covered by herbs, ferns, or shrubs that grow on peat soil and swampy condition. Common plant species found in this area include *Melastoma malabathricum, Stenochlaena palustris, Pteridium aquilinum, Nephrolepis biserrata, Mikania micrantha, Scleria sumatrensis*, and *Phragmites karka*.

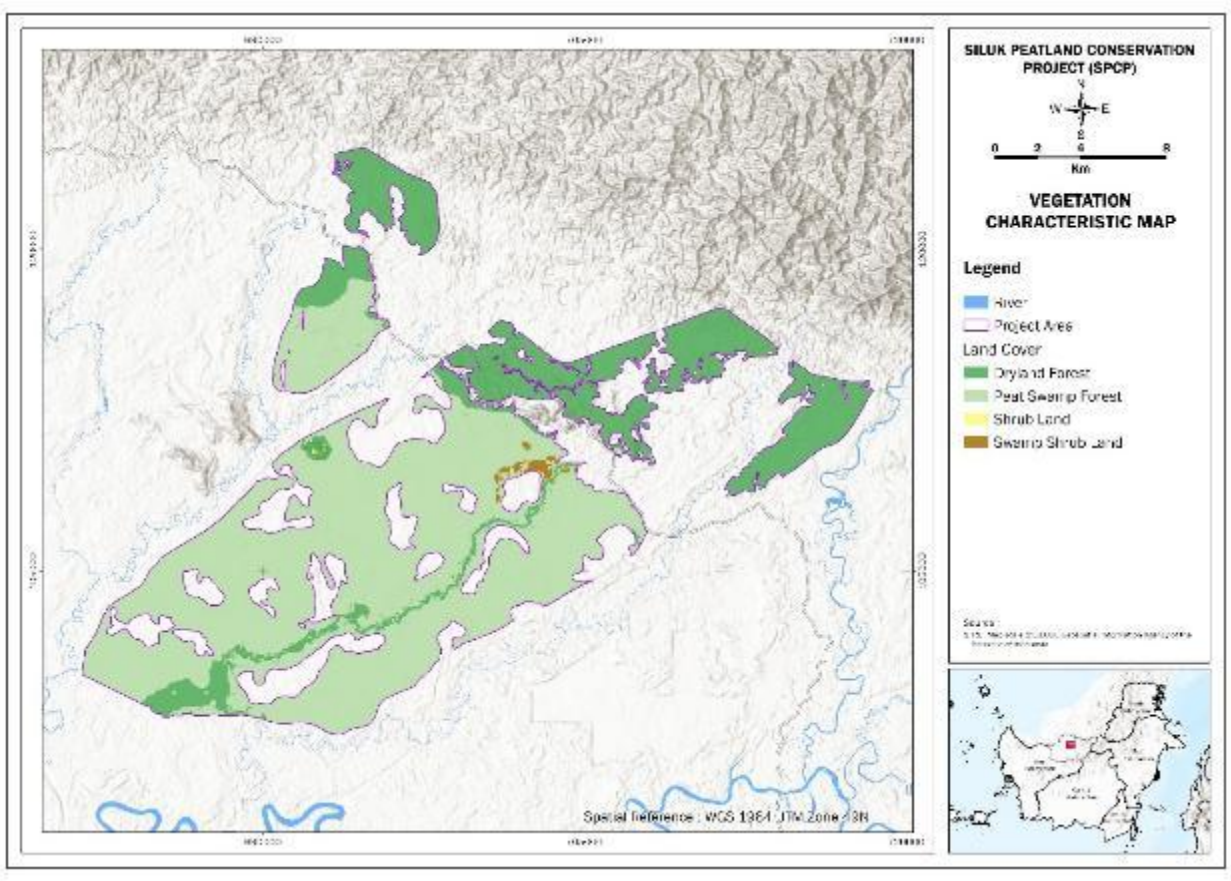


Figure 9. The Vegetation Characteristic of Project Area

A field survey conducted in 2023 identified at least 131 tree species from 35 families within the Permanent Sampling Plots (PSP). Further analysis shows that 86 tree species are found in dryland forests, while 90 species are present in peat swamp forests, with several species occurring in both ecosystems. Detailed information on these tree species can be found in Appendix 10: List Flora found within project area.

2.1.15 Social Parameters (VCS, 3.18; CCB, G1.3)

2.1.15.1 Communities and Project Area

There are no settlements within the concession area. The project area is neighbored by 14 villages, predominantly inhabited by the Dayak community, an indigenous group with a strong cultural and historical connection to the land. The local economy is largely reliant on natural resources, with agriculture and fishing serving as the primary means of livelihood.

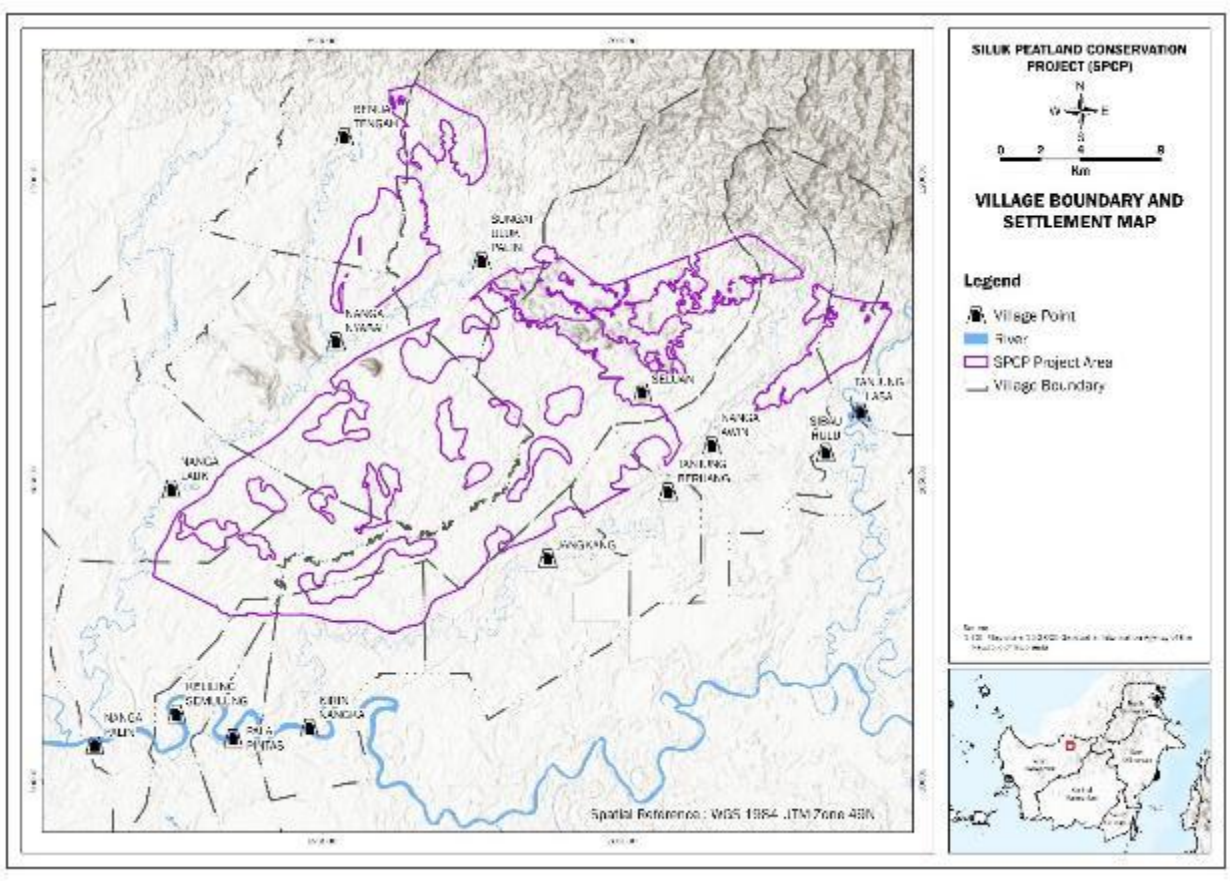


Figure 10. Settlement neighboring the project area

While most of the population consists of indigenous Dayak people, a small number of migrants from other regions have settled in the southern part of the area. Farming is generally small-scale and subsistence-based, with villagers primarily cultivating paddy rice using traditional shifting cultivation techniques. Fishing remains an essential economic activity, typically carried out in nearby rivers using handcrafted manual tools, reflecting the community's deep-rooted knowledge of the environment and sustainable resource use.

Communities surrounding the project area can be classified based on two primary patterns of land use and adaptation for economic activities.

- In the southern part, the majority of communities rely on fishing as they primary livelihood, engaging in both capture fisheries and aquaculture, including cage and pond-based fish farming. The Kapuas River with its tributaries are a valuable natural asset for the people in this area, providing an abundant and diverse supply of fish that supports household income.

  Fish availability and sustainability are relatively well maintained through the establishment of designated catch zone and a restricted (prohibited) zone fishing areas, which is currently still implemented. Agricultural practices, both plantations and rice cultivation, are scarcely found in this region. This is due to not only to the community's strong fishing-oriented culture, but also the area's unsuitability for agriculture as it is highly to prone to flooding caused by the overflow of the Kapuas

River. In the past 3-4 years, the region has seen a significant increase in the cultivation of kratom trees (*Mitragyna speciosa*), which is a typical plant in Kapuas Hulu that has emerged as an alternative source of income.

- In the northern part, people generally practice shifting cultivation to grow paddy and other commodities. However, the cultivation cycle has become relatively short, with farmers returning to previously used plots within 2-3 years. This practice is predicted to decline over time, as many people are starting to be reluctant to open new land for farming. Contributing factors include the increasing distance from their settlements to available land, rising costs of land preparation and harvesting, and limited labor availability. Additionally, more profitable and accessible livelihood alternative such as horticulture, poultry, livestock farming (e.g., cattle or pigs) are becoming more attractive. Despite this shift, some communities in both the northern and southern regions continue to rely on mixed sources of income from non-timber forest products (NTFPs). The most prominent among these is the collection of natural honey (Madu Lalau) and resin. On a smaller scale, products such as rattan and tengkawang fruit are also harvested.

2.1.15.2 Land Use and Economic Activities

Local communities have long benefited from the forest for both timber and non-timber forest products (NTFPs), which play a vital role in their daily lives. Timber is primarily used for constructing traditional houses "*Rumah Betang*", crafting household tools, and making canoes, while non-timber products such as rattan, honey, medicinal plants, and resin provide additional sources of income and materials for traditional practices.

The forest plays a vital role in sustaining the community's dietary needs and cultural traditions, serving as a key source of food and spiritual connection. Local hunters rely on traditional methods to catch deer, wild boar, and small mammals, providing a ready supply of protein for their households. Beyond sustenance, hunting is deeply intertwined with cultural practices, as certain animals are hunted for traditional ceremonies and rituals, reinforcing the community's ancestral customs.

The Kapuas River, along with several smaller rivers flowing through the project area—Seluan River, Uluk Palin River, and Sibau River—plays a crucial role in the community's fishing activities, providing both food security and economic sustenance. Fishing is traditionally carried out using handcrafted nets, traps, and bamboo fishing tools, techniques that have been passed down through generations. Due to the river-wetland landscape, fishing is particularly prevalent among communities in the southern villages, including Keliling Semulung, Pala Pintas, Nanga Palin, Nanga Lauk, and Nanga Nyabau, where water bodies serve as primary sources of livelihood.

In certain areas of the project site, slash-and-burn cultivation has been sporadically practiced by local communities. The governor has taken side of the practice as stipulated in the Governor regulation 103/2020 allowing the communities to apply burning methods within a safe threshold. This traditional agricultural method involves clearing small plots of land, burning vegetation to enrich the soil, and cultivating crops before allowing the land to regenerate. While this practice has historically been part of sustainable shifting cultivation, its impact varies based on land availability and fallow periods. Slash-and-burn farming is more commonly observed in the northern villages, including Benua Tengah, Sungai

Uluk Palin, Seluan, Tanjung Lasa, Nanga Awin, Tanjung Beruang, and Jangkang, where communities rely on this technique for subsistence farming.

The high market demand for cash crops has also influenced land use in the northern villages. Due to the lucrative nature of commodities such as oil palm, rubber, and kratom, some of community members have converted small areas into plantations.

Additionally, certain locations within the project area hold significant cultural value. One such site is Bukit Tendek, located in Nanga Nyabau village, which has been carefully protected and preserved by the local community for generations. This sacred site serves as a place for cultural purposes and spiritual rituals.

2.1.15.3 Relevant Historic Conditions

The project area is part of a larger forested regional area in Kapuas Hulu District, which has a long history of commercial timber utilization. Since the 1970s, the area was under the management of Bumi Raya Utama Wood Industries, a timber concession holder that operated under a license issued by the government. The company played a significant role in the region's forest industry, extracting timber for commercial purposes. In 2004, Bumi Raya Utama Wood Industries secured a license extension that would allow operations to continue until 2038. However, the company ceased operations in 2013 and formally returned the concession to the government. Following the withdrawal of Bumi Raya Wood Industries, the area remained vacant and open for new concession applications from the private sector.

During this period, the social conditions in the project area were closely tied to the commercial timber industry. Many local communities depended on logging and timber-related work for their livelihoods including becoming the company’s employees, while traditional activities like farming and NTPF gathering continued on a smaller scale. Land tenure became increasingly complex as commercial operations overlapped with traditional community areas.

The project area is traversed by a national road, which was re-constructed in the 1990s, providing access to the region. The company’s logging operations further enhanced accessibility by developing additional routes and infrastructure to support timber transport. In 2023, the national government undertook significant upgrades to the road, greatly improving its condition and making the area much more accessible.

Recognizing the potential of the site, the previous management of PT ASK initiated the application process for a new timber concession in 2019. After meeting the necessary regulatory requirements and approval processes, PT ASK was successfully granted the concession license in October 2021.

2.1.15.4 Socio-cultural Information

Fourteen (14) villages neighboring the concession area of PT ASK consists of two sub-districts, Putussibau Utara and Embaloh Hilir. In Putussibau Utara Sub-district there are nine (9) villages; Sibau Hulu, Tanjung Lasa, Nanga Awin, Jangkang, Tanjung Beruang, Seluan, Sungai Uluk Palin, Benua Tengah, and Nanga Nyabau. These villages are ethnically composed of the Dayak Kantuk, Dayak Taman, Dayak Tamam Balo, Dayak Iban, Malay and Javanese tribes. Meanwhile in Embaloh Hilir sub-district there are

five (5) villages; Nanga Palin, Keliling Semulung, Kirin Nangka, Pala Pintas, and Nanga Lauk. These villages are dominated by Malay and Dayak Kantuk tribes.

According to data from the Central Statistics Agency of Kapuas Hulu District in 2022, the population of 14 villages neighboring with the concession area was 9,688 people, consisting of 4,894 males and 4,794 females. The population composition of the population of Kapuas Hulu District by age based on age group shows that the largest percentage of the population is in the 15-39 and 40-64 year age groups.

The Community Welfare Indicator of Kapuas Hulu District, published by the Central Statistics Agency in 2022, highlighted that the condition of population's education can be assessed through education completed by the population aged 7-24 years and older. Among this population group, 41.57 percent had completed elementary school or an equivalent level, 11.65 percent had completed junior high school or an equivalent, and 16.15 percent had completed high school or a higher level of education.

At the sub-district level (Putussibau Utara and Embaloh Hilir), the majority of the population completed elementary school. Based on baseline assessment in 14 villages, the availability of educational facilities, accessibility, and awareness of the importance of education remain very limited. Educational infrastructure, teaching quality, and community participation levels still require further improvement. Field findings in Landau Ipoh Hamlet, Nanga Awin Village, an elementary school had to close due to the absence of teachers, primarily because of the village's remote location. To access higher educational facilities, the students within 14 villages need to travel to the district capital, Putussibau.

Surrounded by rivers, swamps, and forests, communities living in 14 villages are relatively vulnerable to various diseases. Baseline assessment identified the common diseases experienced by communities are diarrhea, itching/skin infection, respiratory difficulty, coughing, and tetanus. The conditions are exacerbated by the lack of available health facilities. Health services are only accessible at the sub-district level through community health centers, while auxiliary community health centers and Polindes (village maternity clinic) in the village are not operating due to the absence of health workers. The lack of healthcare facilities and personnel has a significant impact on community health, particularly for pregnant women and children. To access adequate maternal health services, residents have to travel long distances to Putussibau city, often burdened by high cost for transportation.

The community's livelihoods in 14 villages mostly consist of fishermen and kratom (*Mitragyna speciosa*) farmers, with other source of income including vegetable gardening, honey collection, rattan harvesting, resin collection and rubber plantations. In the past two years, the income of kratom farmers has steadily declined, with the price decreasing to IDR 10,000 from IDR 16,000 per kilogram at the highest price point within six months. This decline was driven by decreasing demand from foreign markets, especially from the United States, where several states issuing regulations prohibiting kratom consumption. Additionally, the decision by the National Narcotics Agency (BNN) to classify kratom as a Class I narcotic and prohibit its consumption starting in 2024 has further reduced domestic demand.

2.1.16 Project Zone Map and Project Location (VCS, 3.11, 3.18; CCB, G1.4-7, G1.13, CM1.2, B1.2)

The project is situated within the Kapuas Hulu District in West Kalimantan Province, Republic of Indonesia. More detailed information is provided in Section 2.1.14.

The project zone spans a total area of 151,355 hectares, encompassing the designated project area of 28,506 hectares, as illustrated in Figure 11. This defined area represents the geographic scope where project activities will be implemented, directly involving all identified village communities that are recognized as key stakeholders (see Section 2.3.1 for further details). Additionally, a detailed map highlighting the identified High Conservation Value (HCV) areas within the project landscape is provided in Figure 11 (see Section 4 and 5 for more details).

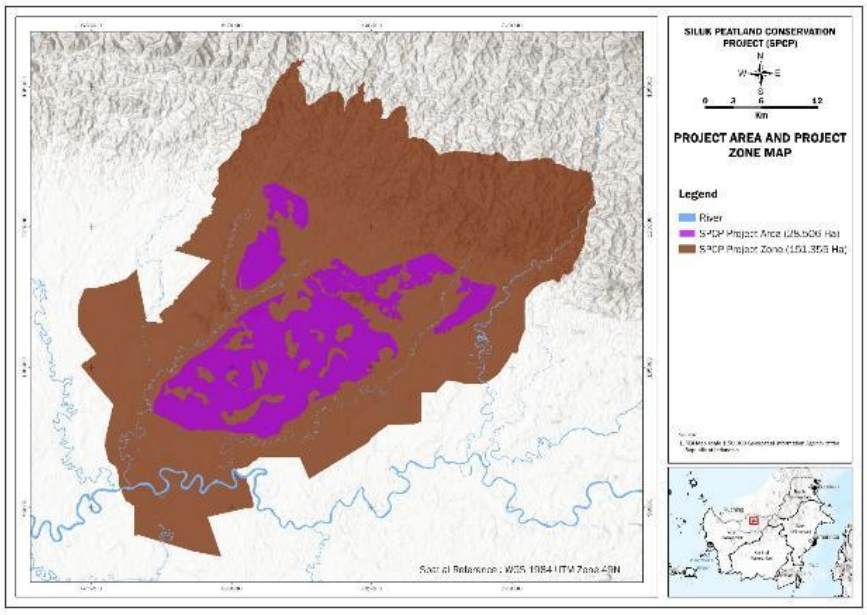


Figure 11. Project zone and project area of SPCP

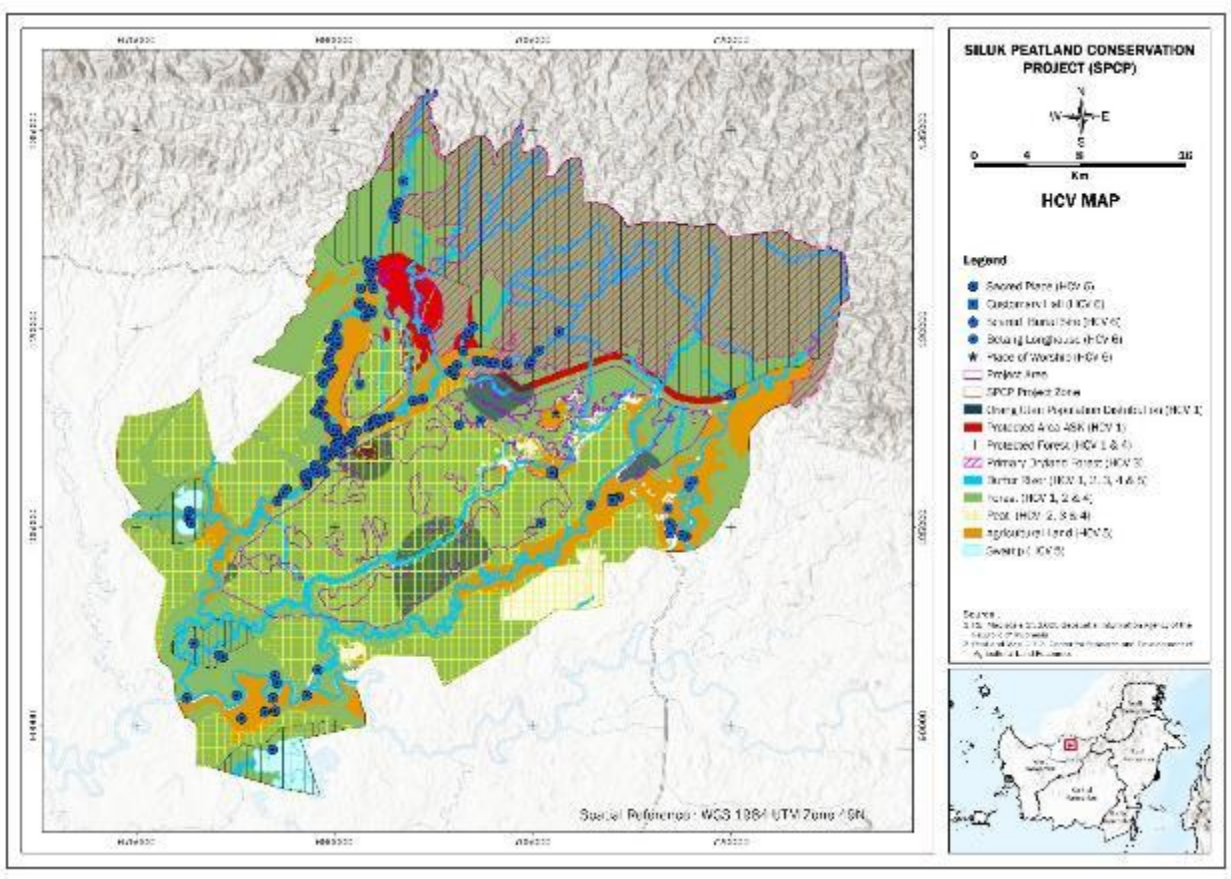


Figure 12. HCV area within the project zone of SPCP

2.1.17 Project Activities and Theory of Change (VCS, 3.6; CCB, G1.8)

SPCP's area faces increasing threats from deforestation, biodiversity loss, and carbon emissions due to unsustainable practices. The project addresses these challenges by integrating carbon finance, responsible resource use, and community development to establish a sustainable project zone. The SPCP is designed to address interconnected environmental, social, and economic challenges through a multi-dimensional approach centered on sustainable forest and peatland management, biodiversity conservation and community empowerment.

Goal 1: Mitigate Carbon Emissions by preventing deforestation, peatland degradation, and wildfires while enhancing carbon sequestration through forest and peatland restoration and a scientifically robust MRV system

The first goal of the project is to mitigate GHG emission through preventing forest and peatland disturbance, increase forest growth and avoid emissions from peatland restoration. This goal aligns with global climate action priorities, particularly the need to reduce greenhouse gas emissions from land-use changes. The project will not claim carbon credit from its effort in increasing forest growth.

Outputs and Activities

Key activities under this goal include:

1. Eliminate logging, diverting planned deforestation from timber plantation and selective logging into fully protected forest.
2. Implementation of Forest Protection Systems and Integrated Water Management: An early detection and response system will be established to safeguard forests and peatlands from deforestation, degradation, drainage and fires. This system will involve community and other supportive stakeholders' (NGOs and GOs), ensuring local ownership and sustainability.
3. Restoration of Peat and Forest Ecosystems: Degraded peatlands and forests will be rehabilitated through hydrological restoration and rewetting efforts. These activities will enhance carbon storage, reduce emissions, and restore ecological functions.
4. Awareness Raising and Capacity Building: By enhancing local capacity for forest and peatland conservation, the project aims to foster a culture of environmental stewardship amongst key relevant stakeholders, The project will conduct community meetings and training sessions to raise awareness about the impacts of illegal logging, hunting, and slash-and-burn practices. The meetings will be conducted through adaptive methods where applicable: e.g. Participatory Rural Appraisal, Focus Group Discussion and/or Training of Trainers.
5. Zero-Burning Agriculture and Fire Risk Reduction: Training programs will promote sustainable land-use practices, such as zero-burning agriculture to minimize fire-related incidents. Inception of Hügelkultur, the use of mini hand tractor and gradually internalizing organic farming will be distinctive to the program. This will be complemented by the implementation of fire response systems and community patrols to monitor and address forest disturbances.

Outcomes and Impacts

The project's outcomes include reduced deforestation and peatland degradation, enhanced carbon sequestration, and improved community and ecosystem resilience. These outcomes will contribute to measurable reductions in greenhouse gas emissions, aligning with international climate targets. Additionally, the project's focus on community involvement ensures that conservation efforts are locally driven and sustainable.

Goal 2: Improved Community Livelihoods through Sustainable Forest management, peatland restoration, and income-generating community-based enterprises linked to environmental conservation.

The overarching goal of the project is to enhance community livelihoods by promoting sustainable forest and peatland management, and fostering income-generating, community-based enterprises tied to environmental conservation. This goal is rooted in the recognition that environmental sustainability and economic development are mutually reinforcing. By integrating conservation efforts with livelihood programs, the project seeks to create a virtuous cycle where ecological restoration supports economic

stability, and vice versa. Additionally, the project supports improved health services, education initiatives, and access to clean water as part of its broader development approach. These social supports are essential to underpinning sustainable development.

Outputs and Activities

To achieve this goal, the project will implement a series of targeted activities, including:

1. Promotion of Sustainable Livelihood Programs: The project will provide support (financial, technical and capacity building) to establish community-based enterprises or groups, with a focus on sustainable livelihoods. Chicken coops and maize farms will be prioritized where they suit the communities' needs and capacity. The establishment of these enterprises is expected to generate consistent income, enabling beneficiaries to meet their basic needs and contribute to local economic stability.
2. Facilitation of Market Linkages and Enhancing Product Value: The project will empower local businesses by connecting them to markets. The project will explore market potential and analyse opportunities for improvement. With improved market access and/or product value enhancement, the community will be more motivated, as it enhances profitability and builds economic resilience, enabling a solid base for sustainable financial growth.
3. Capacity Building for Environmental Protection: Training programs will be conducted to enhance local communities' knowledge and skills in forest monitoring, peatland restoration, and sustainable resource management. This capacity-building effort will empower communities to take an active role in conservation, ensuring the long-term sustainability of restored ecosystems.
4. Employment in Forest Protection and Peatland Restoration: The project will create employment opportunities linked to environmental conservation, such as forest monitoring and peatland rehabilitation. These jobs will not only provide income but also foster a sense of ownership and responsibility toward natural resources.
5. Supporting health, education and access to clean water: The project supports improved health services, including community health campaigns, provision of nutritious food for children, and malaria prevention through fogging. It also strengthens education through the distribution of learning materials and awareness campaigns on healthy ecosystems. To promote safer and healthier household water use, the project facilitates access to clean water by developing deep wells.

Outcomes and Impacts

The expected outcomes include the establishment of financially stable community enterprises, improved local capacity for environmental protection, and the creation of sustainable livelihoods linked to conservation efforts. In the long term, these outcomes will contribute to improved community well-being, reduced poverty, reduced dependency on unsustainable practices for livelihoods and enhanced ecosystem health. The project's emphasis on inclusivity — particularly its focus on women and

marginalized groups — ensures that its benefits are equitably distributed, fostering social cohesion and resilience.

Goal 3: Protect and restore critical habitats to support thriving ecosystems, halting hunting and poaching to conserve wildlife.

The third goal focuses on biodiversity conservation, aiming to protect and restore critical Key Species and their habitats, halt hunting and poaching, and conserve wildlife. This goal underscores the intrinsic value of biodiversity and its role in maintaining ecosystem services.

Outputs and Activities

Key activities include:

1. Awareness Raising and Behavioural Change: Outreach campaigns will educate communities about the ecological and legal consequences of illegal hunting. These efforts will drive behavioural change, fostering support for wildlife conservation.
2. Biodiversity Monitoring and Law Enforcement: A systematic monitoring system will be established to track poaching activities populations through Hunting Respondent survey and wildlife populations using traditional surveys, as well as technologies such as Camera Trap and thermal imaging, Community-based patrols will enhance enforcement efforts, leading to a measurable reduction in illegal hunting.

Outcomes and Impacts

The expected outcomes include increased community support for wildlife conservation, stabilized or growing wildlife populations, and reduced poaching incidents. These outcomes will contribute to the long-term preservation of biodiversity and the ecological integrity of the project area.

2.1.18 Sustainable Development Contributions (VCS, 3.17)

The project is committed to actively contribute to multiple Sustainable Development Goals (SDGs) in alignment with Indonesia's Presidential Regulation No. 59/2017 on SDG implementation by integrating well-being programs, environmental conservation, economic empowerment, and governance initiatives as below:

- To reduce poverty (SDG 1), the project enables Community Enterprise Program Development by providing in-kind support and training, empowering communities to generate income through sustainable means. It prioritizes support for the poorest households, ensuring inclusive economic growth and reducing inequality. Furthermore, local wisdom is recognized and integrated into sustainable development initiatives.
- To enhance food security and promote sustainable farming (SDG 2), the project provides agricultural training to improve yields, establishes demonstration plots, and encourages crop diversity.

- Education and awareness-raising (SDG 4) are also prioritized, with initiatives to support students and increase environmental awareness within communities. Through these multifaceted efforts, the project strengthens local resilience, promotes sustainable development, and ensures long-term environmental and social benefits.
- In safeguarding water resources (SDG 6), the project protects watersheds through forest conservation, restores peatlands, thereby enhancing water quality for local communities.
- To foster economic resilience (SDG 8), the project supports small-scale enterprises engaged in eco-friendly products and sustainable agriculture, providing alternative income sources while promoting responsible resource use.
- The project also advances forest management innovation (SDG 9) by integrating technology for fire detection and carbon monitoring, enhancing conservation efforts.
- Additionally, the project promotes sustainable resource use (SDG 12) by utilizing agricultural waste to support regenerative agricultural practices, reducing environmental impact and improving soil health.
- Farmer groups are supported in adopting Zero Burning Agriculture, reducing environmental impact and promoting responsible land management (SDG 13, SDG 1). Additionally, training on agriculture and sustainable livelihoods equips communities with knowledge and skills to improve productivity and sustainability.
- To protect biodiversity and preserve ecosystems (SDG 15), the project contributes to the protection of endangered species and the conservation of their habitats within globally recognized High Conservation Value Areas. By implementing habitat restoration and species protection strategies, the project ensures the long-term sustainability of key species and the ecological health of the landscape

2.1.19 Implementation Schedule (CCB, G1.9)

The key milestones in the project's implementation are outlined in Table below, providing a comprehensive overview of significant events and progress.

Date	Milestone(s) in the project's development and implementation
2021	ASK obtained the license from The Ministry of Environment and Forestry (MoEF) on 25 - October 2021
2022	March 2022 • The acquisition of the company by new owners on 4 March 2022, marked a significant transition from a logging and forest conversion business model to one focused on protection and conservation • ASK, under new management, started recruiting staff for its Head Office and Branch Office ASK initiated forest protection initiatives and community development programs to promote conservation and sustainable livelihoods.

Date	Milestone(s) in the project's development and implementation
	July 2022 • ASK established a Branch Office to enhance on-the-ground operations and engagement with local communities. • ASK conducted socialization meetings at the sub-district level, ensuring transparency and fostering collaboration with stakeholders. • ASK initiated its hydrology monitoring program, aimed at assessing water conditions to develop baseline data and monitoring plan ASK initiated the Free, Prior, and Informed Consent (FPIC) process, ensuring that local communities were actively involved in the planning and the implementation of project activities.
	August 2022 ASK activated the fire response program to address fire risk in and surrounding project area. As part of this effort, ASK engaged local stakeholders and involved local communities in this program
	September-November 2022 • ASK conducted hydrology and peat survey commenced ASK installed manual and automatic hydrological devices in the project area
	November – December 2022 ASK performed social baseline assessment in the village level, covering demography profile, livelihood-economic activities, land tenure-resource access, stakeholder identification, cultural value, community perception to forest conservation, and other information, Nanga Palin was the first village visited and assessed as part of the social baseline assessment
	October – December 2022 • ASK initiated Biodiversity program ASK conducted Biodiversity survey from 27 October 2022 to 20 December 2022
2023	01 January 2023: Project start date and start of first crediting period In the absence of project, logging activities in the project area would have begun on this date (see 2.1.10).
.	10 to 12 January 2023

Date	Milestone(s) in the project's development and implementation
	• ASK received mandatory training from the government on the fire mitigation and adaptation The training was held in South Putussibau Sub-District, attended by 30 participants (ASK staffs and representative of villages surrounding the concession area)
	January-March 2023 Continuation and completion of social baseline assessment in all 14 villages, Benua Tengah was the last village visited and assessed as part of the social baseline assessment.
	January – March 2023 • ASK installed camera traps for biodiversity monitoring, distributed within the project area • ASK conducted out initial survey of population of Orangutan (Pongo pygmeus) from 30-January to 06-February 2023 ASK carried out Population and habitat assessment of Orangutan (Pongo pygmeus) from 7 to 21 March 2023
	March 2023 ASK, in collaboration with UNAS (*Universitas Nasional*-Jakarta) conducted orangutan survey to assess the population size and distribution within the concession area. The survey also assessed the habitat condition and provided recommendations to support orangutan conservation efforts within the project area.
	13 March 2023 • ASK established 2 fire brigades membered by the certified ASK staff and representatives from community ASK prepared the fire devices and equipment, successfully fulfilling the government standard
	May- December 2023 ASK conducted a social and economic baseline study in 14 villages to collect important information about the communities. The study gathered data on population size, ethnic composition, types of livelihood activities, income levels, and education levels, along with other relevant social and economic aspects. The study helped the project better understand the current situation in each village and

Date	Milestone(s) in the project's development and implementation
	identify potential programs that could be developed in collaboration with the communities.
	July – December 2023 • ASK conducted a small and medium sized mammal survey from July to December 2023 • ASK carried out a bird survey in September 2023 • ASK performed a herpetofauna survey from 8 to 20 November 2023 ASK conducted a freshwater fish survey from 15 to 25 November 2023
	August – December 2023 ASK, in collaboration with communities, implemented a fire response program to proactively prepare for and respond to potential fire incidents within and around the project area.
	23 September to 1 October 2023 ASK conducted field survey to verify and measure the canal within the project area. The data collected was used to develop a canal map to support peat conservation and restoration.
2024	October-November 2024 • ASK installed additional hydrological devices in the project area to improve the measurement coverage ASK installed Ombrometer and Automatic Weather Station (AWS)
	October 2024 ASK carried out the measurement of canal dimensions, starting on 08 October 2024, and continuing to 20 October 2024. This activity aimed to collect accurate canal dimension data to support hydrological data collection and rewetting program.
	January-December 2024
	Establishment of MoU with seven (7) villages; Tanjung Lasa, Sibau Hulu, Tanjung Beruang, Jangkang, Pala Pintas, Keliling Semulung, Nanga Palin
	December 2024 ASK conducted mandatory boundary demarcation

Date	Milestone(s) in the project's development and implementation
2025	January to March 2025 • ASK applied the Verra account on 22 January 2025 The account was approved by Verra on 11 March 2025
	December 2025 Completion of Formal Boundary demarcation and obtain official approval from the government
	January – December 2025 • Upscaling of community engagement, including in Community Enterprise Program Development. • Establishment of MoU with a village (Nanga Lauk). In total, eight (8) villages have agreed MoU with ASK Fully implementation of SPCP programs
	August 2025 Project Listing under VCS
	October 2025 VCS and CCB Validation & Verification (MR Period: 2023-2024). Dissemination of reports
2025-2051	• Full implementation of Forest-peatland protection and Restoration program (Blocking canal and revegetation) • Full implementation of community development program • Full implementation of biodiversity conservation program VCS-CCB Monitoring Event, Verification, dissemination of reports (minimum every five years); continuation of all project activities
2049	License extension sought
2051	• End of initial crediting period License renewal for 90 years
2051-2121	Project activities continued; project Monitoring and Verification continued (TBD)

2.1.20 Risks to the Project (CCB, G1.10)

The potential risks that could affect the project's climate, community, and biodiversity benefits are assessed and are presented in the table below. For each identified risk, corresponding mitigation measures, either already implemented or planned, are also described to demonstrate how the project would minimize negative impacts. In addition to this table, a more detailed analysis of relevant risks is provided in several supporting documents; the Non-Permanence Risk Report or NPRR (submitted through the Verra online tool); Section 2.3.6 of this document, which discusses key project-specific vulnerabilities and safeguards; and Appendix 1 Project Risks Table, which contains supplementary information and supporting data related to the risk assessment.

Identified Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Natural	**Climate**: As identified in the projects non-permanence risk report (NPRR), the main natural risk that is likely to affect the climate benefits of the project over its lifetime is fire. Although as per the NPRR, while the likelihood of natural fire is relatively low, however, the impact of anthropogenic induced fire in surrounding area could jeopardize the project area. Other natural risks, such as geological risk (earthquake, volcano), extreme weather (flooding, tropical cyclones) and disease are considered very low, or not applicable, for reasons described in detail in the NPRR.	The project will undertake a range of activities to mitigate fire risk, including education and awareness raising activities amongst local communities seeking to reduce the practice of burning to clear agricultural land (which could spread to the project area) and operating a comprehensive system of fire monitoring (early detection) and fire-fighting response (including full-time trained fire-fighting teams and part-time trained community fire-fighting teams). See Section 2.1.17)
	Community: As above, fire is the only significant natural risk identified. This can have a profound negative impact on community well being both in terms of heath impact (including through smoke inhalation) and loss of livelihood, through destruction of agricultural crops by uncontrolled burning	Project actions to mitigate fire risk and its impact on communities is as described above.
	Biodiversity: Natural risks to biodiversity are associated with those that lead to the loss of forest habitats, which as above is principally fire.	Project actions to mitigate fire risk and its impact on biodiversity is as described above.
Human-induced	**Climate:** The main identified human-induced impact on the climate benefits of	The project's activities to mitigate fire risk and its impact on the climate benefits of

Identified Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
	the project is fire (the vast majority, if not all, fires being started deliberately or accidentally by people). The impacts and mitigations however are identical to those described above for natural fires. In addition, the human threat of deforestation and forest degradation is also notable, however the direct climate impacts of such activities are much lower overall than those from fire.	the project are as described above. With respect to mitigating the loss of climate benefits from deforestation and forest degradation, the project seeks to target those involved in such activities as the focus for its livelihood program to stimulate alternative sources of income. In addition, the project undertakes forest patrolling activities and works in collaboration with the authorities to try and reduce illegal logging activities. See Section 2.1.17 for more details.
	Community: Human-induced risks to the project's community benefits are considered minimal/negligible, given that it is one of the project's core objectives to provide net positive community benefit, and the focus of much of its activities.	As the risk of human-induced impact on community benefits is considered very low, no specific activities are required to mitigate that risk. However, it the project remains very focused on delivering community benefits throughout its lifetime (as described in Sections 2.1.17 and Section 4.2.1), and also remained committed to monitoring for any change in the risks associated with the approach taken (see also Section 2.3.6, Appendix 1 Project Risks Table, and the NPRR).
	Biodiversity: Human-induced risks to biodiversity are similar to those that lead to the loss of forest habitats, which as above is principally fire, deforestation and forest degradation. In addition, there is also a threat of over-exploitation through hunting.	Project actions to reduce human-induced risks to biodiversity are similar to those described above under actions to address human-induced risks to climate benefits. In addition, the project will undertake periodic hunting offtake surveys to try and determine whether hunting levels are unsustainable (see Section 5.3 for more details).

2.1.21 Benefit Permanence (CCB, G1.11)

SPCP is designed to ensure the long-term permanence of its climate, community, and biodiversity benefits through a comprehensive strategy encompassing legal, institutional, ecological, and socio-economic intervention.

The project is implemented under an initial 28.75-year term. To ensure continuity and permanence of benefits, the project proactively plans to seek an extension of up to 90 years prior to the expiry of this initial term, in line with prevailing regulations. This extended timeline underscores the project's commitment to long-term sustainability.

SPCP actively engages in advocacy with government authorities to promote full legal protection of any remaining intact peatland ecosystems. As an alternative to project extension, the formal designation of the area as a legally protected zone is pursued to institutionalize conservation gains and ensure their permanence beyond the life of the project.

The community development program implemented by project aims to foster sustainable, forest-compatible economic alternatives that strengthen the local economy. With this condition, community dependence on destructive practices such as illegal logging, hunting, or land clearing is expected to significantly decline, reducing or eliminating the penetration into forests and peatlands within the project area. In contrast, empowered and economically supported communities will actively support project efforts to protect and restore the project area into the future.

Throughout the project period, SPCP will actively engage with key stakeholders including local communities, government agencies, and civil society, to ensure that project programs are aligned with other stakeholders. This collaborative approach is intended to embed the project's interventions into local systems, increasing their sustainability and relevance throughout the implementation period.

SPCP implements a robust, credible and transparent Measurement, Reporting, and Verification (MRV) system to ensure accurate tracking of its climate, community, and biodiversity outcomes. This MRV framework enhances the credibility and reputation of the project, thereby facilitating collaboration, partnerships, and transactions with wider international stakeholders, including markets and institutions. This strengthens the project’s long-term viability and aligns it with global standards of accountability and transparency.

SPCP continues to advocate for the recognition of the long-term societal, economic, and environmental benefits of protecting peatland ecosystems. By integrating these values into broader policy and planning frameworks, the project seeks to secure enduring support for conservation goals.

Through these integrated measures, SPCP aims to secure the permanence of its climate, community, and biodiversity benefits, ensuring they endure both during and beyond the project’s operational lifetime.

2.1.22 Financial Sustainability (CCB, G1.12)

The project has secured stable and sufficient financing to support the implementation of all planned activities throughout the entire crediting period. This ensures the successful execution of key initiatives, including forest conservation, biodiversity protection, community development, and climate adaptation efforts.

For validation/verification purposes, financial documentation and evidence of funding commitments can be provided to auditors upon request to demonstrate the project's financial security and long-term viability.

2.2 Without-project Land Use Scenario and Additionality

2.2.1 Conditions Prior to Project Initiation and Land Use Scenarios without the Project (VCS, 3.13; CCB, G2.1)

The project area consists of two distinct ecosystems: peat swamp and dryland forest, both of which are predominantly covered by natural forest. Further details on the area's climate, hydrology, topography, historical conditions, soils, vegetation, and ecosystems are provided in Section 2.1.14. Historically, the area was managed for timber extraction by a private company from the 1970s until the concession was returned to the government in 2013. Following the return of the concession, the area remained unlicensed. In 2019, PT Annisa Surya Kencana (PT ASK) initiated the process of applying for the area and formally obtained a concession license in 2021.

Following the issuance of the license, the area was initially planned for logging and the conversion of natural forest into industrial timber plantations. However, the acquisition of the company by new ownership in 2022, shifting the business model from forest exploitation to protection and conservation, established the foundation for the project's implementation. This demonstrated that the project was developed after planned logging and forest conversion were in place and was specifically designed to prevent the anticipated deforestation and forest degradation.

In the absence of the project, eight alternative land use scenarios were identified: selective logging, industrial timber plantation, commercial oil palm plantation, smallholder agriculture, mining, protected forest, social forestry, and unprotected forest. Based on the application of methodology VT0001, as detailed in Section 3.1.5.2, the baseline scenario was selected as selective logging and the establishment of industrial timber plantations.

2.2.2 Most-Likely Scenario Justification (CCB, G2.1)

See Section 2.2.1 above and Sections 3.1.4 and 3.1.5 below for more details of the justification of the most likely without project scenarios. The most-likely without-project scenario (Logging and conversion to industrial tree plantation) was identified using VT0001: Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (Version 3.0) which constitutes a credible, well-documented and published methodology, as per the requirements of the CCB standard v3.0.

2.2.3 Community and Biodiversity Additionality (CCB, G2.2)

Without SPCP, forest conversion into timber plantation and planned selective logging on peatlands would have proceeded as planned under the technical proposal and the concession license. This would have led to the destruction of peat swamp forests, significant greenhouse gas emissions, and the irreversible degradation of critical ecosystems. Local communities would have faced major disruptions

to their traditional livelihoods, including the loss of access to non-timber forest products (NTFP), fisheries, medicinal plants, and clean water sources provided by the intact peatlands forest. Economic opportunities linked to the forest would have slumped, replaced by insecure, low-wage labor in logging or plantation operations. The clearing and draining of peatlands would also have increased community exposure to peat fires, flooding, and land subsidence. Furthermore, the timber extraction would likely have exacerbated land tenure disputes and social conflicts in the villages surrounding the area. Through SPCP, communities would benefit from sustainable livelihood programs such as agriculture farming, agroforestry program, employee opportunity, and community-based forest management (engaged patrol or survey, restoration and conservation). The project is committed to developing the local community's awareness on natural resource management, reducing conflict risks, and delivering socio-economic benefits that would not have occurred without project intervention.

In the absence of the project, biodiversity would have been severely affected. The planned logging and forest conversion activities would have destroyed large areas of peat and forest, leading to habitat loss, fragmentation, and degradation for numerous species. Among the most severely impacted would be the critically endangered orangutan (*Pongo pygmaeus pygmaeus*), which relies on contiguous, undisturbed peatland forests for feeding, nesting, and movement. Habitat loss would have resulted in sharp declines in orangutan populations, increased human-wildlife conflict, and a heightened risk of local extinctions. SPCP is committed to safeguarding biodiversity by preserving critical habitats, maintaining landscape connectivity, and preventing ecological processes from being disrupted by drainage, fire, logging or conversion. By protecting peatland ecosystems, the project enhances ecosystem resilience and ensures the continued existence of the threatened species that would not have been possible under the business-as-usual scenario.

Although national laws and regulations call for the protection of peatlands, enforcement within the project area has historically been weak. In practice, existing legal frameworks did not effectively prevent degradation and deforestation of peatland (Gunawan et al.,2024; Mizuno et al., 2023). Without SPCP, business-as-usual activities would result in irreversible environmental destruction, social damage, and biodiversity loss. Under its program, the project will strengthen local enforcement, promote sustainable peat-forest management, and align community development with conservation efforts.

2.2.4 Benefits to be used as Offsets (CCB, G2.2)

The SPCP ensures that all community and biodiversity benefits generated by the project are solely dedicated to its intended objectives. These benefits will not be used as offsets in any other program, project, or crediting mechanism. The SPCP does not seek to transfer, trade, or allocate these benefits beyond its defined scope

2.3 Safeguards and Stakeholder Engagement

2.3.1 Stakeholder Identification (VCS, 3.18, 3.19; CCB G1.5)

This project seeks to identify all stakeholders who have a relationship with the project and conduct an assessment of their rights, interests, and relevance to the project. This assessment has included both

institutional/non-community stakeholders and community stakeholders. The identification of stakeholders was carried out in stages in West Kalimantan Province and then through stakeholders in the districts. Institutional/non-community stakeholders (such as government and non-government related organizations) were initially identified through Focus Group Discussions (FGDs) attended by the North Kapuas Hulu Forest Stakeholder Unit (KPH) as stakeholders in the forestry sector.

Local community stakeholders were carried out through consultation stages with institutional/non-community stakeholders in the province and in the Regency and Sub-district, to explore deeper information regarding the relationship and connection of the community with the project area. The results of this consultation were that the project area was in 2 (two) sub-districts consisting of 14 (fourteen) villages. Coordination began through discussions with the sub-districts, North Putussibau Sub-district and Embaloh Hilir Sub-district. Through these discussions and coordination, stakeholder involvement at the village level was identified. In meetings with stakeholders such as socialization and coordination, the level of interaction and dependence of local communities on the project area was known, including threats and challenges faced by the community, and through community approval, a socio-economic baseline assessment was conducted in 14 villages surrounding the project area.

Through the socio-economic baseline assessment, stakeholders were identified and categorized into two main groups: community and non-community stakeholders, as detailed in Appendix 4: Stakeholder Description Table. The assessment revealed that all communities surrounding the project area have direct interests in the forest areas, due to the division of village territories that incorporate parts of the forest within their administrative boundaries. Community stakeholders include various groups with distinct interests such as farmers, fishermen, loggers, NTFP collectors, hunters, and marginalized groups including women, persons with disabilities, the elderly, and the poor. These also include indigenous communities residing within the 14 villages in the project area. Non-community stakeholders consist of government institutions at the village, district, and provincial levels, as well as NGOs and private sector entities. The identification of stakeholders, including those recognized by customary structures, was conducted through coordination and consultations with both community representatives and government bodies.

2.3.2 Stakeholder Descriptions (VCS, 3.18, 3.19; CCB, G1.6, G1.13)

Based on the stakeholder identification process described in Section 2.3.1, the following is a summary of the stakeholders identified.

a. Communities are the residents of the 14 (fourteen) villages adjacent to the project zone.
b. Community groups – There are 6 community groups comprising of members of the villages with distinct interests and relevance to the project.
c. Other stakeholders are the entities beyond the “communities” whose are affected by and/or may affect the project. The entities identified are from government sector, civil society groups, customary group/institution and the private sector.

A detailed description of stakeholders is presented in Appendix 4: Stakeholder Description Table.

2.3.3 Stakeholder Access to Project Documents (VCS, 3.18, 3.19; CCB, G3.1)

A hard copy of the Project Description (PD) and Monitoring Report (MR) is kept in SPCP office and can be accessed by communities and other stakeholders identified. In addition, executive summaries in both English and Indonesian will be uploaded on the company's website for broader accessibility. As part of its commitment to transparency, SPCP encourages and welcomes stakeholders to freely access project documents. The project also actively provides project documentation through its community engagement activities, including project socialization and consultation elaborated in Section 2.3.4.

2.3.4 Dissemination of Summary Project Documents (VCS, 3.18, 3.19; CCB, G3.1)

SPCP is fully committed to ensuring that the project document is accessible and disseminated to the stakeholders. The dissemination to the community will be done through locally relevant channels, such as village meetings and community gatherings. The project will also share the documents with other relevant stakeholders through meetings and other appropriate occasions.

To ensure stakeholder access to project documents, the SPCP Office will keep a complete printed version of the Project Description (PD) and Monitoring Report (MR) in English for public viewing. The summary of these documents will be translated into Indonesian and made available in both printed document and presentation material. This will be disseminated to community leaders, communities, and other stakeholders through meetings or other appropriate occasions. Additionally, the executive summaries in both English and Indonesian will be uploaded on the company's website for broader accessibility.

2.3.5 Informational Meetings with Stakeholders (VCS, 3.18, 3.19; CCB, G3.1)

ASK initiated a series of introductory and socialization meetings in July 2022, starting at the sub-district level. These were subsequently followed by more detailed meetings at the village level and broader community engagements. Throughout this process, ASK coordinated closely with relevant stakeholders and conducted informational sessions, including meetings related to company introduction, Free, Prior, and Informed Consent (FPIC), development of livelihood program, and the socialization of SPCP. Full details of these meetings are provided in Appendix 5: List of .

2.3.6 Risks from the Project and No Net Harm (VCS, 3.18, 3.19)

Both natural and human-induced risks associated with the SPCP have been systematically identified, assessed, and quantified using the online NPRA (Non-Permanence Risk Analysis) tool. A detailed breakdown of these risk assessments can be found in Appendix 1 Project Risks Table. Additionally, potential risks that may impact stakeholder participation are specifically addressed in Section 4.5.3. To safeguard the well-being of employees and vulnerable groups, SPCP has implemented comprehensive safety measures, which are outlined in Section 2.3.19.

2.3.7 Community Costs, Risks, and Benefits (CCB, G3.2)

The project has taken comprehensive steps to ensure that communities are fully informed about the potential costs, risks, and benefits associated with their participation in efforts to reduce forest degradation, biodiversity loss, and unsustainable land use. Information was disseminated through inclusive, participatory processes, using culturally appropriate communication methods in local languages to reach all segments of the community, including marginalized groups.

A key area of focus is the development of alternative livelihoods, such as livestock farming (poultry and ruminants), fish farming, and sustainable agriculture. In the case of livestock-based enterprises, one of the primary risks identified is the availability and affordability of animal feed. Communities were informed that over-reliance on commercial feed – often expensive and inconsistently supplied due to the long distances from provincial distributors or ports – could undermine the sustainability and profitability of livestock ventures. These challenges were openly discussed, and potential mitigation measures, including local feed production and feed substitution strategies, were explored with community input.

Additionally, the project's efforts to reduce illegal logging and hunting, a common source of income for some individuals, may initially lead to short-term income losses. In response, the project developed a targeted livelihood-enterprise development program that prioritizes individuals previously involved in logging and hunting, offering alternative income opportunities through employment in forest protection, biodiversity conservation, and company field operations. These interventions are designed to transition communities toward long-term, stable and sustainable livelihoods that align with conservation goals.

In regions where slash-and-burn agriculture is practiced, the project has acknowledged the risk of reduced income during the transition to more sustainable practices. This issue was transparently communicated, and communities were presented with support options, including a zero-burning agriculture program, capacity-building for improved farming techniques, and facilitation of market access for new products. These strategies aim to stabilize household incomes while promoting sustainable land management.

Across all proposed livelihood interventions including agriculture-based, poultry-based, and aquaculture programs, the project is conducting participatory risk-benefit assessments. These assessments help ensure that appropriate mitigation and adaptation strategies are in place and reflect community input and priorities.

2.3.8 Information to Stakeholders on Validation and Verification Process (VCS, 3.18.6, 3.19; CCB, G3.3)

To ensure transparency and stakeholder participation, the project proponent will conduct targeted socialization and consultation activities with local communities and relevant stakeholders regarding the validation and verification processes. These activities will be publicly announced at least 30 days in advance. These activities are designed to ensure that stakeholders clearly understand the purpose and procedures of third-party validation and verification under the VCS and CCB Standards.

The role of the independent validation/verification body (VVB) will be communicated, including the requirement for site visits as part of the validation and verification process. Upon request by the VVB, the project will facilitate opportunities for communication between stakeholders and the VVB.

To further support stakeholder understanding and engagement, the project will provide an executive summary of the Project Description Document (PDD) translated into Bahasa Indonesia, along with a simplified poster version. These materials are intended to ensure that local communities and other stakeholders can more easily understand the project.

2.3.9 Site Visit Information and Opportunities to Communicate with Auditor (VCS, 3.18.6; CCB, G3.3)

The project staff will schedule meetings with the identified project communities, villagers, and nearby settlements. To prepare for the audit, project staff will inform relevant stakeholders in advance about the details of the audit process and prepare the local group with sufficient time to accommodate the auditors' field visit so that there is plenty of time to communicate with the auditor. The project will arrange meetings with all relevant stakeholders during the validation and verification field visits where the auditor can ask questions to all stakeholders regarding the project.

2.3.10 Stakeholder Consultations (VCS, 3.18; CCB, G3.4)

As described in Section 2.3.5, SPCP has conducted consultation through socialization, discussion and meetings with the village community stakeholders, involving more than 600 participants in 14 villages. The full list of such meetings is provided in Appendix 5: List of . During these engagements' events, discussions are held where community members are giving input concerning the activities and program. In the discussion, the community members also give their feedback on what they need and their concerns about the project. As a result of these consultations and the community engagement, the project design for the community enterprise development is based on the stakeholder's input.

Moreover, the project seeks to ensure that all potential activities are designed specifically for each individual community, recognizing inter-community diversity in terms of aspirations and the suitability of different interventions.

Below is an example of consultation meetings at village level based on the agenda grouping: socialization, FPIC, and Community meetings. See Appendix 5: List of for more details on the stakeholder consultation.

Introductory and Socialization Meetings

Date of stakeholder consultation	April-July 2022
Stakeholder engagement process	A series of socialization meetings were held with local communities and stakeholders of the project zone. The meetings constituted as part of the FPIC process.

	Attendees comprised of Village government representatives, district level stakeholders, Indigenous Representatives and local community representatives of the 14 villages within the proximity of the project zone. These meetings were conducted in the local language (both Indonesian and the Dayak Taman Kapuas language) and facilitated by the project team. In total, there were 18 meetings held, participated by approximately 680 individuals (191 men and 489 women). The meetings in Sungai Uluk Palin and Kirin Nangka were held twice as key figures of the village administration could not attend the meeting on the day due to higher priority agenda. These meetings were held at public spaces of the respective villages. Main objective of the socialization meeting was to introduce PT ASK and to share information on the goals, objectives and approach of SPCP, followed by discussion to clarify questions and solicit feedback, The first kick-off workshops were held on 10 July 2022 in Putussibau Utara regency and 12 July 2022 in Embaloh Hilir regency. The meetings were attended by the regional regency coordination leaders (Regency head, chief of local police office and chief military base) and representatives of the 14 villages. The representative of villages are the village head, village parliament head, and chief of indigenous people institutions. The discussion allowed thought exchange on socio-economic conditions, past involvement with other projects/initiatives/companies, and opportunities for future partnership between the stakeholders and the project. Prior to the workshops, the project assigned a team to convene preparatory meetings with key figures to secure endorsement and support for the workshop. The process took about 2 months to complete, as the team needed to ensure proper representations, and the attendees receive prior information regarding the project and its workplan in the region.
Consultation outcome	Stakeholder and communities had a better understanding of PT ASK, the project and its activities. The project gained valuable inputs and insights from community members to be considered and integrated into project design. The regional regency coordination leaders showed support the project to initiate the program and provided guidance to respect the community's interest.

	The key representatives of the indigenous people welcome the project's intention to conserve the environment and support the betterment of community livelihood. Representatives of the villages in general relayed expectations that the project would bring benefits to the communities through its programs and maintain communications and amicable relationship. The project communicated its immediate workplan to carry out baseline assessment at village level. The baseline assessment is aimed at collecting important data and information as the basis to develop appropriate and beneficial programs for the communities prior to signing MoU with the project.
Stakeholder input	The regency head emphasized the importance of giving employment priority to the local people and to maintain amicable approaches should any dispute arise. The project is expected to deliver benefits to the communities while preserving the biodiversity and forest and peatlands conservation.

FPIC Meetings

Date of stakeholder consultation	Oct 2023 – Feb 2024
Stakeholder engagement process	A series of FPIC meetings were held with local communities at 6 villages within the project zone. Attendees comprised of village government representatives and local community members of the respective villages. In total, there were 6 meetings held, participated by approximately 234 individuals (173 men and 61 women). These meetings were conducted in the local language (both Indonesian and the Dayak Taman Kapuas language) and facilitated by the project team. They were held at public spaces of the respective villages. Focus of these meetings was on the socio-economic conditions of the respective village, past collaborations and to explore opportunities for collaboration through the project's community enterprise programme. In ensuring the communities have ample time to understand the intent of the meeting, invitations were distributed one week in advance at the

	latest. The meeting, commonly, was held at the Village Hall or community centre.
Consultation outcome	• Validation of social baseline information. • Insights from community members on current involvement in enterprises as well as past experiences. • Identification of potential enterprise of interest and the market potential as well as better understanding on the capacity of the communities in the respective village. MOUs stating that the FPIC between the communities and the project were signed by the village head, village parliament head and the indigenous people chief. The project agreed to formulate appropriate Community Enterprise (CEPD) program in the village, it is designed to support communities in maximizing the use of local resources to develop sustainable livelihoods. The community responded positively to both the CEPD initiative and the assessment findings, showing strong enthusiasm for participating in the program.
Stakeholder input	• Communities proposed enterprises such as laying hen farming citing limited local capacity in egg production in the village and the sub-district. • They also expressed a keen interest in corn cultivation however requested for support from the project in improving market access.

Community Workshops

Date of stakeholder consultation	August 2022 to December 2024
Stakeholder engagement process	A series of thematic community workshops were held with specific community groups. Attendees comprised of community group members and representatives from local supporting agencies (e.g. Credit Union Keling Kumang). In total, there were 3 workshops held, participated by approximately 275 individuals (169 men and 106 women). These meetings were conducted in the local language (both Indonesian and the Dayak Taman Kapuas language) and facilitated by the project

	team in collaboration with external resource person. They were held at public spaces of the respective villages. These workshops were a combination of upskilling as well as discussions on specific topics such as 1) financial reporting and proposal preparation, 2) agricultural aspects and feed corn cultivation, and 3) laying hens and pig farming.
Consultation outcome	• Increased knowledge and awareness on the relevant topics. • Understanding various aspects to develop and sustain such enterprise. • Alignment with community groups on enterprise that would be viable based on market potential, capacity of community members and resources available.
Stakeholder input	The community responded positively to both the CEPD initiative and the assessment findings, showing strong enthusiasm for participating in the program. In some villages, like Nanga Nyabau, Nanga Awin and Seluan, there is a fraction of community representatives are yet to sign an MOU as they have not yet reached a consensus on their involvement in the project.

Summary of comment received	When comment was received	Actions taken
Communities proposed laying hen farming	30-August to 22-December-2023	Based on community input and feasibility assessment result, the project agreed to support community with laying hen farming program. To support this program, project provided training and practical guidance from external expert consultants to build capacity in both activities.
Communities proposed corn cultivation		Considering its economic prospect, the project agreed to support communities with feed corn cultivation program In response to the market challenges for feed corn cultivation, the project

		secured a purchase commitment from the Keling Kumang Cooperative in Sintang, providing a practical solution to support local production.

2.3.11 Continued Consultation and Adaptive Management (VCS, 3.18; CCB, G3.4)

SPCP is committed to upholding the principle of Free, Prior, and Informed Consent (FPIC), recognizing that it is an ongoing and evolving process that must adapt to the changing dynamics of local communities. To ensure continuous communication and meaningful consultation, the project has and will employ multiple engagement approaches:

1. Project Socialization: SPCP ensures that all stakeholders, including communities, government agencies, and local organizations, are fully informed about the project's objectives, activities, and expected outcomes. Project socialization is an essential ongoing process aimed at fostering transparency, building trust, and encouraging active participation.
2. Community-Based Reporting: A dedicated village facilitator (*Fasdes - Fasilitator Desa*) and local village companion (*PLD - Pendamping Lokal Desa*) will report monthly on project progress, challenges, community needs, and concerns, particularly those of vulnerable groups. These reports will be systematically recorded in the project filing system and used to inform both formal and informal discussions, including focus group meetings and broader community consultations. Once key points are validated by the wider community, they will be integrated into the ASK socio-economic work plan.
3. Regular Community Engagement: ASK staff will conduct regular visits to each target community to discuss various aspects of the project, including the design, implementation, and progress of livelihood strategies. Constructive and actionable feedback gathered during these visits will be incorporated into the ASK work plan.
4. Grievance Mechanism: A grievance mechanism will be maintained to ensure that community members have a formal avenue to voice concerns, raise grievances, and receive responses properly.

SPCP follows a fully adaptable and responsive approach that involves regularly monitoring progress, gathering feedback from stakeholders, and assessing the impact of activities. It ensures that any dynamic changes or challenges, such as shifts in local conditions, unforeseen environmental impacts, or new regulations, are quickly identified. By doing so, the project can adjust its strategies to remain aligned with its objectives. If issues arise, such as changes in community needs or external factors affecting project implementation, the project will adapt its approach to effectively address these challenges.

2.3.12 Stakeholder Consultation Channels (CCB, G3.5)

Since mid-2022, discussions and coordination with the village government, traditional leaders, and community leaders have been established by PT ASK both formally and informally, including coordination related to field work that will be carried out by involving the surrounding village community. Formal discussions are carried out in public spaces in the village or sub-district, and informal discussions are carried out according to the activities carried out that are related to the community in the village.

Every socialization activity not only involves the village government, but also the community, by always ensuring the involvement of traditional leaders, women's leaders, youth leaders, people with disabilities; to be involved in socialization and discussion activities so that information is conveyed equitably to all groups. In formal activities, attendance lists are always available, and documentation is kept by the relevant department.

2.3.13 Stakeholder Participation in Decision-Making and Implementation (VCS, 3.18, 3.19; CCB, G3.6)

Scope of community participation in decision-making and implementation covers different levels of engagement:

1. At the project zone level, SPCP engages representatives of all villages. The exhibits of the kick-off meeting in July 2022 are available.
2. At the village level, SPCP convened a series of meetings to discuss and signed FPIC by the legal representatives of the village. SPCP allows the villages not to agree in the first meetings and seek amicable solutions to maintain the engagement. Example: FPIC meeting in Nanga Nyabau, Nanga Awin, Sungai Uluk Palin and Benua Tengah. These meetings occurred between July 2023 – May 2024.
3. Prior to initiating an operational activity, SPCP consistently engage the villages reps to obtain inputs and decision for the implementation. These participations are recorded in the SPCP community dashboard.
4. The project respects decisions from the village's representatives, that are usually represented by the village head and/or village parliament, and/or village customary head. The representatives reserve the right to ample time for understanding the nature of project's activities, considering the impacts consolidating villagers' inputs and are under no pressure to give their approval.
5. The project strictly prohibits any violation against Ethics and Compliance policy in any engagement with the community and their representatives to obtain approval. This includes gratification, bribery or gift/hospitalities.

2.3.14 Anti-Discrimination Assurance (VCS 3.19; CCB, G3.7)

The Project ensures that no entity at the community level is discriminated against based on ethnicity, religion, social class, sexual orientation, and gender, for this purpose steps have been taken both internally and externally:

1. Internally, all staff involved in implementing activities in the field have been given training and a pocketbook of company regulations related to ethics and compliance, and opened a Whistler Blowing System channel
2. Externally, every activity at the village level must involve at least 30% of women, marginalized communities, indigenous and religious communities, and young people.
3. A Grievance mechanism is established and maintain as an avenue for community members to flag any anti-discriminatory practices encountered in project engagements or activities.

2.3.15 Feedback and Grievance Redress Procedure (VCS, 3.18.4; CCB, G3.8)

SPCP has established grievance redress procedures as briefly summarized below:

Development process	SPCP engages with stakeholders, particularly local communities, in ways that respect their culture and traditional way of life. Such condition is addressed by project in the development of the project's grievance redress procedure, which is designed to be accessible, culturally appropriate, and trusted. Complaints can be submitted verbally or in writing via project staff, village facilitators, or a dedicated phone line. The procedure provides a clear opportunity to raise concerns or complaints. The complaints are then systematically followed by the project to ensure timely and effective responses. In certain cases, traditional conflict resolution methods (such as mediation by customary authorities) are applied to resolve issues. This ensures that grievances are addressed fairly, promptly, and in alignment with local values and customs. The project enables anonymous reports embedded in the web portal that is secured from unauthorized access. Project's commitment to protect complainants' identities will be made public. A grievance committee will also be established through a credible and transparent process.
Grievance redress procedure	**Complaint Recording and Classification**. Reported public complaints are recorded, reviewed and classified according to the problem, then grouped according to the categories of supervision and non-supervision. **Initial Assessment and Evidence Gathering**. Gathering evidence to substantiate public complaints. The process of proving public complaints is carried out through confirmation and clarification.

Acknowledgement and Initial Response. An official acknowledgment is issued to the complainant within 3 working days. An initial response outlining next steps is provided within 7 working days from acknowledgment.

Complaint resolution. The project team attempts to resolve the issue directly within 14 working days from the start of investigation. If direct resolution fails, the team will proceed with mediation. In certain conditions, mediation is needed with the involvement of a neutral third party, ideally within 30 working days from complaint registration. The third party will have to obtain approval from the complainant to ensure they are neutral; this will be case-sensitive.

If mediation is unsuccessful, the project may escalate to arbitration or, as a last resort, to the courts, in accordance with applicable legal and contractual frameworks.

Resolution and Closure. Once resolved, the case is closed in agreement with the complainant. A formal closure notice is issued, and feedback is collected to improve future complaint handling. All documentations related the case are stored for audit, learning, and transparency

2.3.16 Accessibility of the Feedback and Grievance Redress Procedure (VCS, 3.19; CCB, G3.8)

The project published and socialized the grievance system to all staff, communities in the concession area and Stakeholders through various media such as staff Meetings, social media such as WhatsApp, websites, and meetings with the community. Communities will have contact of both the village facilitator (*Fasilitator Desa or Fasdes*) and village local staff (*Pendamping Lokal Desa or PLD*) and the ASK Focal Point in the form of mobile phone numbers and email addresses.

The project developed a clear and structured mechanism for handling complaints and resolving conflicts that may arise during its implementation. This mechanism outlines the step-by-step process for affected individuals or groups to submit their concerns, ensuring transparency, accessibility, and fairness. This includes designated contact points (contact number of Village Facilitator and ASK Focal point) and timelines for the response. To ensure community awareness and participation, the project conducted socialization sessions in villages, where local residents were informed about their rights, the available channels for lodging complaints, and how their concerns will be addressed.

2.3.17 Worker Training (VCS, 3.19; CCB, G3.9)

The project is committed to providing training programs that enhance community participation and skills development. These programs will be designed to meet the specific needs of local communities, ensuring practical and effective learning opportunities.

As of the preparation of this document, the project has conducted training sessions, including the following training:

Training on Laying Duck Farming

The training was conducted in Keliling Semulung Village on August 22–23, 2024, with the participation of 22 community members. The main objective was to enhance participants' knowledge and technical skills in laying duck farming, covering key topics such as breed selection, feed and nutrition management, disease prevention, and egg production techniques. This capacity-building initiative has strengthened the community's ability to implement and sustain laying duck farming practices in the village.

Training on Laying Chicken Farming

The training was held in Pala Pintas Village on August 20–21, 2024 and was attended by 33 community members from two villages—Jangkang and Pala Pintas. The program aimed to strengthen participants' capacity in managing egg-laying chickens by covering essential topics such as breed selection, feed and nutrition management, housing systems, disease prevention, and egg handling techniques. This training helped the community in implementing laying chicken farming in these villages.

Training on Zero Burn Agriculture (ZBA)

As part of the ZBA initiative, training was conducted in January 2024, targeting five villages—Tanjung Lasa, Sibau Hulu, Tanjung Beruang, Jangkang, and Benua Tengah. This training marked a critical stage in the implementation process, equipping participants with the necessary knowledge and technical skills to adopt sustainable, fire-free land preparation methods. The training was attended by 15 community members. Delivered by experienced ZBA consultants, the training covered key aspects of ZBA practices, including soil management, organic inputs, planting techniques, and environmental safeguards. Supported by this training, ZBA participants have capacity to implement these sustainable practices in their respective villages.

Training on Fire Prevention and Suppression.

In January 2023, a total of 30 participants (comprising 16 staff members from ASK and 14 community representatives from 14 villages) took part in a fire prevention and mitigation training held in Kedamin Hilir, Putussibau Selatan Sub-District. The training was facilitated by Manggala Agni, the official government agency responsible for forest fire management in Indonesia.

The training aimed to strengthen participants' understanding of forest fire risks and to equip them with practical skills in fire prevention and suppression techniques. To ensure ongoing preparedness, ASK has continued to conduct annual internal refresher sessions. These efforts

are intended to maintain the operational readiness of the fire response team and enhance the overall resilience of the project area against potential fire incidents.

Additionally, the project prioritizes Health, Safety, Security, and Environment (HSSE) training, with a strong focus on fire prevention-response and other field activities. The safety of staff and communities is a top priority, with training efforts first directed toward high-risk activities to minimize hazards and ensure a secure working environment.

2.3.18 Community Employment Opportunities (VCS, 3.19.13; CCB, G3.10)

SPCP is dedicated to supporting the people living within the project zone and surrounding regions by creating fair and inclusive employment opportunities. Job openings are available to all, regardless of gender, age, social class, or ethnicity, ensuring equal access to work. The project prioritizes hiring from within the project-zone communities, recognizing that their involvement is crucial for the long-term success and sustainability of SPCP initiatives.

All employees and contractors, whether in long-term or short-term roles, receive fair employment terms that align with prevailing regulations and local working conditions. Job vacancies are widely advertised through multiple channels, including online job provider/services, social media, the company website, and direct community outreach. To ensure maximum participation, SPCP field staff and facilitators visit all villages to announce certain job opportunities, allowing village governments to discuss role requirements and qualifications with community members.

SPCP expects that around 60% of project field staff will be recruited from the project-zone communities and other regions within West Kalimantan Province. The remaining project staff will come from other parts of Indonesia, ensuring a diverse and skilled workforce to support project implementation.

2.3.19 Occupational Safety Assessment (VCS, 3.19; CCB, G3.12)

The Occupational Health and Safety Management System is part of the general risk management system of the project, which includes policies and commitments, planning, implementation, measurement, and evaluation. To determine the performance of the occupational health and safety management system applied at SPCP by Government Regulation of the Republic of Indonesia Number 50 of 2012.

For the project, a suitable and sufficient risk assessment must be carried out prior to a particular activity or task being carried out to eliminate, reduce or suitably control any associated risk to the health, safety and wellbeing of people involved with (or affected by) the task/activity in question.

Once completed, a risk assessment should be reviewed periodically (proportionate to the level of risk involved) and in any case when either the current assessment is no longer valid and/or at any stage there have been significant changes to the specific activity or task. Relevant risk assessments should be reviewed following an accident, incident or ill-health event in order to verify if the control measures and level of evaluated risk were appropriate or require amendment.

SPCP has completed a five-step process for risk assessment. This provides a useful checklist to follow to ensure that the assessment is suitably comprehensive. It involves:

1. Identifying potential hazards
2. Identifying who might be harmed by those hazards
3. Evaluating risk (severity and likelihood) and establishing suitable precautions
4. Implementing controls and recording your findings
5. Reviewing your assessment and re-assessing if necessary.

During day-to-day field activities, project staff are regularly exposed to a wide range of challenging natural conditions. These include physically demanding tasks carried out in wet, humid, and high-temperature environments, often within remote peatland and forest areas. In addition to the physical strain, there are several significant safety and health risks associated with work. These risks include forest-land fires, potential accidents during water-based transportation, and interactions with illegal loggers, which may pose safety threats. Staff may also face encounters with wild animals, as well as exposure to insect bites and allergens, which can result in adverse health effects.

To minimize and manage these risks, the project has implemented a set of comprehensive safety and risk mitigation measures, including but not limited to the following:

1. Accredited firefighting training for SPCP's personnel responsible for forest protection by relevant authority (Manggala Agni) on specific methods in suppressing fires in the peatlands and human-induced burning. SPCP also applies mandatory fire drill on monthly basis.
2. Developing procedure and conducting in-house training/briefing on tackling illegal activities by adopting VPSHR approaches.
3. In house training to mitigate risk from the snakebite and other potential risks from wild animals.
4. Providing first aid kit for staff to carry into the forest which also includes a snake-bite kit.
5. Ensuring members of survey team entering forest or remote location have been trained in medical emergency response and they have been assigned a first aid kit.
6. Providing emergency communication tools and navigation tools such as GPS and satellite telephone. This is a part of the project's emergency protocol. These are essential for ensuring effective coordination, rapid response, and personnel safety during field emergencies.
7. Providing personal protective equipment such as safety helmets, rubber shoes, safety vests, uniform, heavy duty gloves, portable water bottles/bags, and life jackets.
8. Providing additional logistics such as fuel, propeller for a boat, and water and meals enough for three extra days.
9. Providing proper training on safety procedures, evacuation, communication, equipment uses, and shelter making to ensure worker safety and mitigate potential risks inherent to certain field activities such as fire suppression and surveys. Provide an assessment of substantial risks to worker safety that could arise due to project implementation.

10. Establish a 'stop work' policy that allows project staff to suspend activities when encountering conditions that may pose danger or significant risk to their safety. This policy is a critical component of the project's health and safety framework, empowering staff to prioritize their well-being and prevent accidents during field operations.
11. Providing safety training and preparedness in firefighting and fire management prior to the fire or dry season is a key component of the SPCP strategy. This proactive approach is intended to maintain and enhance the readiness of fire response teams, ensuring they are well-equipped and well-coordinated ahead of high-risk periods. Early preparation also allows the project to identify and mitigate potential risks that may arise during fire suppression efforts or other related emergency activities

The project has established a credible HSSE policy and ensured its full implementation to strengthen the company's HSSE system. As part of this commitment, PT ASK successfully obtained SMK3 (*Sistem Manajemen Keamanan dan Keselamatan Kerja*) certification (mandatory) and ISO 45001:2018 certification, demonstrating its dedication to maintaining high standards of health, safety, security, and environment (HSSE).

SPCP is committed to continuous improvement of its HSSE policy, procedures, and implementation. Internal audit is periodically conducted on an annual basis to improve the corrective action from the surveillance audit by the third-party auditor. Improvements are also made to respond to emerging requiring attention or follow-up from an HSSE standpoint.

2.4 Management Capacity

2.4.1 Project Governance Structures (CCB, G4.1)

The project is implemented and managed by the Indonesian company PT Annisa Surya Kencana (ASK), which is responsible for overseeing all operational, administrative, and strategic aspects of the project. PT ASK ensures that the project is executed in accordance with its objectives, regulatory requirements, and financial management standards. This includes supervising day-to-day activities, ensuring compliance with prevailing regulations, and maintaining accountability for project outcomes.

To support technical aspects of the project, PT ASK collaborates with PT Karbon Natura Indonesia (KNI), which provides specialized expertise in areas such as carbon accounting, environmental monitoring, and sustainable land management. PT KNI offers scientific and technical guidance to enhance project effectiveness and ensure adherence to best practices in conservation and carbon offset initiatives.

A simplified organizational structure outlining the roles and responsibilities of PT ASK is presented in Figure 13 below.

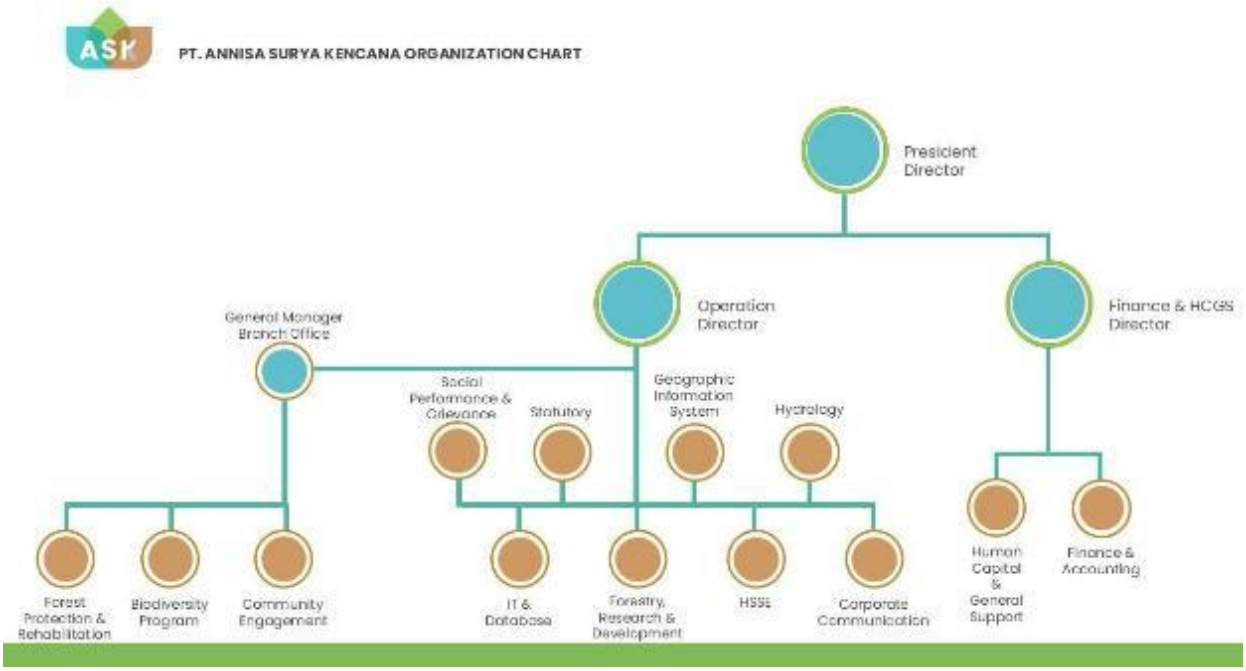


Figure 13. Organization Structure of PT ASK

At the implementation level, each proponent focuses on different areas of implementation. PT ASK, a subsidiary of PBPH Indonesia, specializes in sustainable forest management. Its staff have significant experience in overseeing the implementation of forest and environmental management projects. As the PBPH permit holder, its role in the project is to carry out all field activities in accordance with the project design, manage and oversee community and stakeholder relations, and ensure compliance with all government regulations.

KNI is a leading forestry, conservation and restoration consultant that has been working in Indonesia since 2019. Karbon Natura Indonesia has experienced staff in project management, VCS/CCBA project design, Geographic Information System (GIS) and remote sensing, forest and biomass inventory, biodiversity mapping and monitoring, and community engagement. KNI also leads project management, project design, field data collection and analysis, VCS/CCBA certification monitoring and compliance, and technical consulting services.

2.4.2 Required Technical Skills (VCS, 3.19; CCB, G4.2)

The project requires a range of technical and managerial skills in order to implement the project's activities.

Table 1. Thematic skills required by the project

Project Activity	Sub-project activity	Key Skill Required
MRV – Carbon accounting system	Above-ground ground biomass measurement, REDD accouting, peat-hydrology	Peat swamp science, forestry, GIS/ remote sensing, forest and peat swamp inventories, statistics, and

	measurenment-monitoiring, GHG calculation	carbon monitoring, reporting, and verification (MRV).
FPIC and community engagement and development	Stakeholder consultation, livelihood development, and education program.	Community organizing, conflict resolution, business management, adult education, and livelihoods.
Biodiversity assessment and monitoring	Habitat conservation and management and biodiversity monitoring.	HCV mapping, forest conservation, conservation biology, and biodiversity monitoring
Monitoring skills	Land cover mapping, water level monitoring, subsidence monitoring, climate monitoring, biodiversity monitoring, community monitoring, and fire monitoring.	GIS/remote sensing, hydrology, peat swamp science, conservation biology and monitoring, social science surveys, and peat swamp forest fire management
Forest protection and enforcement	Enforcement and patrolling and forest fire prevention and control.	Forestry, peat swamp forest fire management, and community engagement.
Forest and peat swamp conservation and restoration	Hydrological management, reforestation, enrichment planting, and habitat conservation.	Hydrology, peat swamp science, silviculture, forestry, and biodiversity conservation, engineering.
Project management and administration	Logistics, finance and accounting, human resources (HR), administration, and government reporting.	Finance and accounting, HR, business management, legal compliance, and administration.

2.4.3 Management Team Experience (VCS, 3.19; CCB, G4.2)

SPCP managed by highly qualified professionals with extensive experiences in forest management, conservation, biodiversity, community, carbon MRV in Indonesia and other countries. Below are the key personnel and experts within SPCP.

1. Iwan Tricahyo Wibisono (Yoyok) is the President Director of PT Annisa Surya Kencana (PT ASK) and the lead of SPCP. He is responsible for managing the conservation and restoration of 33,000 hectares of peatland landscape within 30 years counted from October 2021 onwards. Prior to PT ASK, he has 20 years of experience in wetlands restoration and management in Indonesia, engaged with various restorations in Malaysia, Brunei Darussalam, Philippine, Thailand and Maldives. Over that time, he also gained experience in the development of carbon projects, carbon accounting systems and community development programs. With the various precious experiences and

knowledge, he has successfully driven PT ASK within these past 4 years to manage its concession area. PT ASK has good engagement with local communities and stakeholders, recruited almost 60 employees placed in Head Office and Branch Office, as well as successfully received the ISO 45001 Certificate.

2. Irwan Gunawan (Irwan) is the Operation Director of PT ASK and oversees the implementation of the project commensurate with the agreed business plan and corporate KPIs. Prior to joining ASK, Irwan recorded over 20 years as a professional in mainstreaming sustainability and environmental conservation through different management roles in conservation NGOs: WWF, Rainforest Alliance and Indonesian Ecolabel Institute.
3. Herry Akbar (Herry) is the Finance and General Service Director of PT ASK and oversees financial management and provision of supporting services to the project. Prior to joining PT ASK, Herry recorded over 25 years career track as a professional in financial management and accounting for non-profit organizations. He is familiarized with the financial audit requirements under international donor agencies.
4. Irwansyah Reza Lubis (Reza) holds Master on Biodiversity Management, with Over 25 years working on conservation of wetlands and its biodiversity with an International NGO. Since 2020 he was appointed as the Director of Karbon Natura Indonesia, a company that provide services to develop and manage carbon project within the scope of LULUCF. Reza has experience on managing several peatland restoration and conservation project in Indonesia with develop skill in project planning, project implementing and project monitoring. He is also involved in development of MRV in REDD Project including PDD and MR development on peatland carbon project, Peatland Policy Development, Private Sector Advocacy, Land use management, Wetlands restoration and biodiversity conservation.
5. Dipa Satriadi Rais (Dipa) is a seasoned Senior Hydrologist at PT. Karbon Natura Indonesia with over 23 years of experience in hydrological conservation and wetland restoration across Southeast Asia. A Soil Science graduate from the University of Jambi and certified in Hydrological Modelling from Wageningen University, he excels in wetland-related carbon accounting, hydrological modelling, and the application of numerical and stochastic methods. Proficient in GIS and programming languages including C++, C#, Visual Basic, and Matlab, Dipa has successfully led capacity building initiatives and collaborated with diverse stakeholders in river basin management, making him a pivotal figure in advancing sustainable environmental practices.
6. Telly Kurniasari (Telly) is a technical advisor on social and community wellbeing at PT. Karbon Natura Indonesia with over 15 years of experience. She had numerous contributions in designing social development strategies for UNEP and IUCN Projects and specialized in peatlands related social development during her tenure with Wetlands International.

CVs are available upon request.

2.4.4 Project Management Partnerships and Team Development (VCS, 3.19; CCB, G4.2)

The project has established a partnership with KNI to strengthen technical capacity in peat restoration, revegetation, Monitoring, Reporting, and Verification (MRV). This collaboration ensures access to specialized expertise, supporting the project in effectively implementing its activities, and addressing any knowledge or experience gaps.

The project is committed to retaining its employees by implementing a capacity-building program, offering clear career pathways, and providing competitive benefits, recognizing that the carbon project industry is highly competitive. The company will make every effort to support and invest in its staff, ensuring they feel valued, motivated, and see a long-term future within the project.

The project opens up partnership and collaboration with potential partners in the future in order to improve project implementation.

2.4.5 Financial Health of Implementing Organization(s) (CCB, G4.3)

The project proponent PT ASK is a financially stable company, capable of implementing and maintaining a project as large as SPCP. PT ASK has secured a long-term financial commitment covering the project implementation within the whole project period. See Section 2.1.22 for information on the financial sustainability of project funding. Project validators may request more specific financial reports and verify financial activities.

2.4.6 Avoidance of Corruption and Other Unethical Behavior (VCS, 3.19; CCB, G4.3)

As a collaborative effort, the SPCP team is committed to upholding integrity and professionalism in all aspects of project design and implementation. We do not tolerate corruption and unethical behavior and are not involved in any form of corruption such as bribery, embezzlement, fraud, extortion, and collusion. This project also complies with the Anti-Corruption Practices Act: Law No. 20 of 2001 concerning Amendments to Law No. 31 of 1999 concerning the Eradication of Criminal Acts of Corruption, which we apply in the Ethics and Compliance Agreement Form, Company Regulations, and Employment Agreement.

2.4.7 Commercially Sensitive Information (VCS, 3.5.2 – 3.5.4; CCB Rules, 3.5.13 – 3.5.14)

No commercially sensitive information has been excluded from this Project Description.

2.5 Legal Status and Property Rights

2.5.1 National and Local Laws (VCS, 3.1, 3.6. 3.7, 3.14, 3.18, 3.19; CCB, G5.6)

In addition to being oriented towards the preservation and protection of natural resources, PT ASK also carries out a mission to comply with applicable regulations and policies in Indonesia. In its implementation, the company refers to regulations at the national and local levels, including:

1. Law No. 6 of 1994 concerning Ratification of the United Nations Framework Convention on Climate Change
2. Law No. 41 of 1999 concerning Forestry
3. Law No. 6 of 2014 concerning Villages
4. Presidential Regulation No. 98 of 2021 concerning the Implementation of Carbon Economic Values for the Achievement of Nationally Determined Contribution Targets and Control of Greenhouse Gas Emissions in National Development
5. Government Regulation of the Republic of Indonesia No. 47 of 2012 concerning Social and Environmental Responsibility of Limited Liability Companies
6. Government Regulation No. 23 of 2021 concerning Forestry Implementation
7. Regulation of the Minister of Forestry No. P.35/MENHUT-II/2007 concerning Non-Timber Forest Products
8. Regulation of the Minister of Forestry No. P.19/MENHUT-II/2009 concerning National Non-Timber Forest Products Development Strategy
9. Regulation of the Minister of Environment and Forestry No. 8 of 2021 concerning Forest Management and Preparation of Forest Management Plans in Protected Forests and Production Forests
10. Regulation of the Minister of Environment and Forestry No. 9 of 2021 concerning Social Forestry Management
11. Regulation of the Minister of Environment and Forestry No. 7 of 2023 concerning Procedures for Carbon Trading in the Forestry Sector
12. Regulation of the Financial Services Authority of the Republic of Indonesia No. 14 of 2023 concerning Carbon Trading Through the Carbon Exchange
13. Regulation of the Governor of West Kalimantan No. 33 of 2022 Concerning the Development of Non-Timber Forest Products
14. West Kalimantan Regional Regulation No. 8 of 2019 Concerning Forestry Management
15. Kapuas Hulu Regency Regional Regulation No. 20 of 2015 Concerning the Determination of Kapuas Hulu Regency as a Conservation Regency
16. Kapuas Hulu Regency Regional Regulation No. 13 of 2018 Concerning the Recognition and Protection of Indigenous People.

The relevance and compliance of the project with these regulations are provided in Appendix 3: List of Laws and Regulation relevant to the Project.

2.5.2 Relevant Laws and Regulations Related to Worker's Rights (VCS, 3.18.2; CCB, G3.11)

1. Law Number 13 of 2003 concerning Manpower
2. Law Number 11 of 2020 concerning Job Creation

3. Law Number 6 of 2023 concerning Job Creation (Determination of PERPU No.2 of 2022)
4. PP Number 34 of 2021 concerning the Use of Foreign Workers
5. PP Number 35 of 2021 concerning Fixed-Term Employment Agreements, Outsourcing, Working Hours and Rest Hours, and Termination of Employment
6. PP Number 36 of 2021 concerning Wages
7. PP Number 37 of 2021 concerning the Implementation of the Job Loss Guarantee Program
8. PP Number 58 of 2023 concerning Article 21 Income Tax Withholding Rates
9. KEPMENAKER 261 of 2004 concerning Companies Required to Implement Job Training
10. PT ASK Company Regulations which have been ratified by the Director General of Industrial Relations Development and Social Security for Manpower Work Decree No. 4/Hi.00.00/00.0000.230307005/B/VII/2023 Concerning Ratification of Company Regulations of PT Annisa Surya Kencana

The relevance and compliance of the project with these regulations are provided in Appendix 3: List of Laws and Regulation relevant to the Project.

2.5.3 Human Rights (VCS, 3.19)

The project is committed to recognizing, respecting, and protecting the rights of Indigenous Peoples, Local Communities, and customary rights holders by ensuring their full participation in decision-making. The project acknowledges and supports the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and ILO Convention 169 by implementing Free, Prior, and Informed Consent (FPIC) processes. The project also uses community meetings, allowing communities to actively share their voice in the development of programs and initiatives that directly address their needs.

The project promotes inclusive, community-led decision-making, ensuring that all voices—especially those of women and marginalized groups—are heard and valued. It provides opportunities for skill development, leadership, and capacity building, empowering women to participate, contribute, and advocate for their needs and aspirations. Additionally, the project is committed to preserving local values and traditions, respecting human dignity, and improving the living standards of the most vulnerable households in its target communities.

2.5.4 Indigenous Peoples and Cultural Heritage (VCS, 3.18, 3.19)

The project is committed to safeguarding and promoting the cultural heritage of Indigenous Peoples and local communities *living in surrounding project area*, where the Dayak people form the dominant ethnic group. Recognizing the importance of traditional knowledge, governance systems, and cultural practices, the project integrates local customs into conservation and livelihood initiatives, ensuring that community-led approaches align with long-standing traditions.

1. Supporting Traditional Livelihoods and Indigenous Knowledge

The project promotes sustainable agroforestry by incorporating Dayak traditional ecological knowledge, which has been passed down for generations to maintain forest health.

Traditional rotational farming (ladang shifting agriculture) is acknowledged and adapted to align with sustainable land management, ensuring food security while preventing deforestation.

2. Strengthening Traditional Governance and Decision-Making

The project is in coordination with customary Dayak leadership, traditional leaders (Temenggung), and village elders to support the development of community-based programs in the villages.

3. Preserving Sacred Sites and Indigenous Spiritual Practices

Sacred forests and culturally significant landscapes or buildings are mapped and protected from land conversion and encroachment, maintaining areas vital for rituals, ancestral worship, and traditional medicine.

2.5.5 Statutory and Customary Property Rights (VCS, 3.18, 3.19; CCB, G5.1)

2.5.5.1 Statutory Rights

ASK obtained a license based on the Decree of the Minister of Environmental and Forestry SK.965/MENLHK/SETJEN/HPL.0 /10/2021, granting a Business Permit for the Utilization of Timber Forest Products in Natural Forest over a production forest area of 33,605 hectares in Kapuas Hulu District, West Kalimantan Province.

For the AFOLU project, a portion of the concession area, totaling 28,605 hectares, constitutes the Project Area. The project area has been determined due to its significant environmental value, predominantly composed of natural forests and peatlands. Originally, ASK's license permitted selective logging in the remaining forested area and the establishment of timber plantations. Under its new management, ASK transitioned its forest utilization through selective logging and timber plantation to conservation of forest and peat.

The company has obtained approval from The Ministry of Environment and Forestry to apply Multiple Forestry Business, which includes permissions to utilize the license area for environmental services (including carbon credits).

In the project area, it has been confirmed that there are no third-party rights legally recognized by applicable laws. There are no legal demands that can burden and hinder the project activities to be carried out because legally the Siluk project has obtained forest management rights through a forest utilization business permit (PBPH) based on SK.965/ MENLHK/ SETJEN/ HPL.0/10/2021 dated October 25, 2021.

2.5.5.2 Customary Rights

Based on the social baseline assessment, it was identified that some communities reside within the company's concession permit area but outside the designated project area. These communities are generally located in non-forested or non-agricultural areas. Through participatory mapping processes,

the project has recognized the close ties and dependencies of local communities and Indigenous People (IPs) on both the project area and project zone.

While the project is not in the position to formally recognize customary rights, it is committed to upholding the sustainability of Indigenous Peoples's rights, as long as they do not conflict with applicable laws. To this end, the project will maintain continuous consultation and collaboration with local communities to ensure they have meaningful opportunities to participate and benefit from the project activities.

The project will be implemented with full commitment to recognizing and respecting the rights of communities and stakeholders directly connected to the project area, including customary rights where they exist. It will promote inclusive participation and create opportunities for collaboration with communities and stakeholders in promoting conservation and environment-based initiatives.

The project respects customary rights and commits to pursue mutually beneficial collaboration and consult with local communities to ensure that opportunities for communities to benefit from project activities are secured.

2.5.6 Recognition of Property Rights (VCS, 3.7, 3.18, 3.19; CCB, G5.1)

Please refer to Sections 2.5.5.2 above.

2.5.7 Free, Prior and Informed Consent (VCS, 3.18; CCB, G5.2)

Free, Prior and Informed Consent (FPIC) is a reference for development activities and utilization of natural resources that will impact the community and certain communities. In the SPCP, there is no land, building, or site owned by individuals, government and indigenous communities that are directly or indirectly affected. The project has implemented the FPIC principle in all its activities in 14 villages in the concession area, where the Village Government, community and indigenous communities are given the right to accept or reject the project to be implemented.

Currently, there are eight Villages that have given their approval by signing the FPIC MOU, Sibau Hulu Village, Tanjung Lasa, Nanga Palin, Keliling Semulung, Pala Pintas, Tanjung Beruang, Jangkang and Nanga Lauk. Six other villages: Nanga Awin Village, Kirin Nangka, Seluan, Sungai Uluk Palin, Nanga Nyabau and Benua Tengah are still in the process of implementing FPIC which is targeted in 2025.

Eight villages that have given their consent and signed the FPIC MOU have been in collaboration with the project to implement community empowerment programs such as business development in the fields of corn farming, laying hens and broilers. In addition, in the eight villages, beneficiary community groups have been formed, capacity building in the form of group institutional strengthening training, corn cultivation training, laying hen and broiler training, and training in non-burning agricultural cultivation. Routine assistance for groups is also provided by the project through accompanying facilitators in each village. The 6 (six) remaining villages that have not yet signed an MOU have understood the nature of the project, however there is a fraction in the village that applies conditions in which the project has not yet been able to meet or deliver.

Description of process for obtaining consent	During the first operational quarter, PT Annisa Surya Kencana deployed a small team to identify and engage prominent district and regency (*kecamatan*) figures. This foundational effort aimed to introduce the company's presence and mission while gathering authentic feedback. A newly formed Community Development Team (initially termed "community organizers") followed up by distributing engagement documents to local stakeholders. These materials outlined the project's short- and long-term plans, emphasizing that—unlike typical PBPH (*Perizinan Berusaha Pemanfaatan Hutan*) operations—SPCP would not involve logging. Two regency-level kick-off meetings were held in July 2022, attended by village representatives and FORKOPIMDA (local authorities). Subsequent village meetings preceded the social baseline assessment, which ran from May to December 2023. The assessment aimed to collect direct feedback from communities on their expectations for a mutually beneficial partnership with the project. Findings were shared with respective villages to inform the drafting of FPIC (Free, Prior, and Informed Consent) terms and agreements. These agreements now serve as the foundation for designing community-enterprise programs, ensuring tangible benefits in exchange for local support. SPCP prioritizes clarity, ensuring the village members fully grasps the program's scope—including its potential social, economic, cultural, and environmental impacts. Detailed explanations are provided to empower the village members to make informed decisions about their involvement. Crucially, the program will only move forward after the village formally grants its approval. This consent-based approach underscores the project's commitment to ethical, community-driven development.
Outcome of FPIC process	Following the Free, Prior, and Informed Consent (FPIC) process, both parties formalize a Community Enterprise Development Agreement. This contract outlines: ▪ Specific program activities, ▪ Responsibilities of each party, ▪ Benefits for the village, and ▪ Monitoring mechanisms to ensure accountability.

- Both parties commit to fostering a respectful, sustainable, and equitable partnership. This includes safeguarding shared infrastructure and resources while upholding mutual interests throughout the program's implementation.

The SPCP, within its capacity and aligned with project needs, will provide financial and capital support to facilitate the program's success—without replacing the village's own contributions and active participation.

2.5.8 Benefit Sharing Mechanisms (VCS, 3.18, 3.19;)

This project does not impact property rights (see Section 2.5.9 below) however, it does adopt a policy of benefit sharing for affected stakeholders and local communities living in proximity to the project. The project's approach to benefit sharing is described in more detail in Section 4.5.6.

2.5.9 Property Rights Protection (VCS, 3.18, 3.19; CCB, G5.3)

SPCP will not involve any voluntary or involuntary removal or relocation of individuals, households, or communities. The project activities also do not interfere with or prohibit community livelihood activities such as fishing, honey and resin collectors in the concession area, as long as these activities do not violate the law. Sacred sites and traditional rituals located and carried out in the concession area are recognized and respected as part of local cultural wisdom. The project is committed to providing support for the preservation of culture carried out by the community in 14 villages in the concession area.

2.5.10 Illegal Activity Identification (VCS, 3.19; CCB, G5.4)

Based on the results of the identification that has been carried out, there are several small-scale illegal activities taking place in the project area. Illegal activities such as illegal logging and hunting still often occur which can have a negative impact on forest sustainability and biodiversity. Efforts to overcome this are carried out by conducting routine patrols and building guard posts that will be placed at the main access locations in the project area. Routine patrols are not only carried out by the company individually but also involve communities in the villages as part of the collaboration of forest security activities. Later, a forest security unit will be formed in each village that will collaborate with the company for various forest security activities. In addition, the development of community economic activities to find alternative income that is no longer oriented towards logging and hunting.

2.5.11 Ongoing Disputes (VCS, 3.18, 3.19; CCB, G5.5)

SPCP has recorded a potential dispute from an article published on equatoronline.id on 25 March 2024 along with related posts on social media (Instagram and Facebook) regarding the removal of boundary markers in Tanjung Lasa by a village member. March 26, 2024, to address the situation, the project's

management assigned an internal team to carry out verification and fact findings. This process occurred until 4 April 2024 with the following findings from various parties:

Boundary Demarcation Consultant:

The boundary demarcation is conducted by a consultant who is contracted by the project. The consultant stated that the boundary survey has official permits from the Ministry of Environment and Forestry (KLHK) and the Pemdes (Village head). The survey team included village representatives, community leaders, and local residents. Miscommunication about the boundary survey triggered protests and the removal of markers. Of the installed markers in Tanjung Lasa, three were removed by a village member. The consultant had informed the villagers that the survey's purpose is not to seize land but to map PT ASK's concession boundaries and identify community-managed areas.

Information from the Village Government (*Pemdes*):

- The Pemdes will facilitate a socialization activity on boundary demarcation once the survey is completed and will invite community members, especially those managing land within the concession area, as a priority.
- Some residents with land near the work area began visiting their fields to check if markers had been installed.
- The village head (Kades) will contact the consultant for follow-up on the boundary survey.

Information from Putussibau Police Resort (*Polres*):

- Recommended involving "bhabinkamtibmas" (community policing officer) in village activities.
- The police support company or institutional activities as long as they comply with the law.

Statement from Temenggung Banua Sio (Dayak's leader):

- Received reports from Tanjung Lasa and Sibau Hulu residents about marker installation without prior notice.
- Advised dialogue to resolve the issue and offered to facilitate a meeting.
- Emphasized the need for pre-survey socialization to the broader community, not just village officials.
- Recommended a closed meeting between PT ASK, community representatives, Pemdes, and traditional leaders to address Tanjung Lasa's concerns.

Additional Community Perspectives:

- A customary leader shared that before the news viral, the village member who remove the poles, had informed him about marker installations near the *Pangkaran* reservoir. He noted that there is an opposition group in the village which is led by the BPD chairman and a small group whose land was marked. He also added that the BPD chairman had tried to collect signatures for a petition.

- Another prominent village member added that most supporters of the BPD chairman's protest were his extended family in RT III (53 people), while only three in RT II joined. RT is a sub administration under the village. This prominent village member suggested the project to exclude the community group who protested and remove the pole markers.
- Community leaders, traditional figures, and the *Pemdes* pledged continued support for PT ASK's programs if they benefit Tanjung Lasa.

Conclusion for this dispute:

Marker installation has been temporarily halted to mitigate any adverse social risk.

To address any potential disputes, ASK has developed a grievance mechanism that allows community from the 14 villages or other stakeholders to submit concerns or claims, which are then assessed and responded properly. This includes open dialogue with concerned parties, documentation of grievances, investigation, and negotiated resolution.

The project is committed to ensuring that no activities are undertaken that could prejudice the outcome of any unresolved disputes related to the project.

2.5.12 Approvals (CCB, G5.7)

For its operation, ASK has the following approvals (2). Copies of all documents are available upon request.

Table 2. List of Formal Approval to the Project

Document Name	Issued by	Approval Purpose
Decision Letter General Secretary Ministry of Forestry and Plantation No S.361/PHPL/KPHP/HPL.0/2019 Dated 14-May-2020 on approval of Environment Impact Assessment Document (ANDAL)	Ministry of Forestry and Plantation	This letter provide approval that the operation of the license has passed all regulatory requirements for environmental impact
Decree of the Minister of Forestry Number: SK.965/MENLHK/SETJEN/HPL.0 /10/2021 concerning the Granting of Business Permits for Utilization of Timber Forest Products in Natural Forest to PT Annisa Surya Kencana	Ministry of Forestry	Official license for the rights to utilize timber products in the licensed area
Ministry of Forestry and Environment Decree Letter 6381 year 2024 on the approval of the	Ministry of Forestry and Environment	Approval of the 10-year workplan of ASK. Under this decree, ASK is eligible to

Work Plan for Utilization of Timber Forest Products in Natural Forest in Production Forests		implement environmental services business (carbon project)

2.5.13 Double Counting and Participation under Other GHG Programs (VCS, 3.23; CCB G5.9)

2.5.13.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program, or any other form of community, social, or biodiversity unit or credit?

☐ Yes ☒ No

No, the project is not receiving or applying for credits related to greenhouse gas (GHG) reductions or removals under any other GHG program. The project is also not pursuing any form of recognition or credits, including those related to community, social, or biodiversity units.

2.5.13.2 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

SPCP is not currently registered with, nor is it seeking registration under, other GHG programs. However, as stipulated in Presidential Decree 98/2021 and the Ministry of Forestry Decrees No. 71/2017 and No. 7/2023, all carbon projects within the country are required to register in the Indonesian Registry System (SRN) and comply with applicable regulations regarding the Economic Valuation of Carbon (NEK-Nilai Ekonomi Karbon).

Registration in the SRN involves opening a registry account, being officially listed, submitting a DRAM (Project Design Document or equivalent), undergoing validation, and having the emission reductions independently verified. In compliance with these regulations, SPCP intends to open a registry account and be listed in the SRN system. However, it does not plan to proceed further with the validation and verification steps.

The regulation also mentions the possibility of a Mutual Recognition Agreement (MRA) between SRN and other carbon standards, including Verra's VCS. As of the development of this document, discussions are still ongoing, with the government showing positive support for the MRA to accelerate carbon project development in Indonesia.

The project maintains that participation in the voluntary carbon market can support the achievement of Indonesia's Nationally Determined Contributions (NDCs) without resulting in double counting or double claiming of Voluntary Carbon Units (VCUs) or carbon credits.

2.5.13.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

2.5.14 Double Claiming, Other Forms of Credit, and Scope 3 Emissions (VCS, 3.24)

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

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

☐ Yes ☒ No

The GHG emission reductions from SPCP will not be included in any other emissions trading program or subject to binding emission limits. SPCP is committed to avoiding double counting emissions.

The project aims to generate Voluntary Carbon Units (VCUs) for retirement by international parties that are not obliged to contribute to other countries' Nationally Determined Contributions (NDCs). This approach ensures that the Indonesian government is not required to make Corresponding Adjustments in its GHG reduction reports against the country's NDC targets. Consequently, the carbon finance and implementation support provided by the project will contribute to Indonesia's NDC goals and align with the objectives of the Paris Agreement.

All credits generated by the project will be reported to Indonesian authorities in accordance with the Minister of Environment and Forestry Regulation P71/MENLHK/SETJEN/KUM1/12/2017, Presidential Decree No. 98/2021 on Economic Valuation of Carbon, Ministry of Environment and Forestry Decree No. 21/2022 on the governance of Economic Valuation of Carbon, and any relevant future regulations.

2.5.14.2 No Double Claiming with Other Forms of Environmental Credit

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

☐ Yes ☒ No

2.5.14.3 Supply Chain (Scope 3) Emissions

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

☐ Yes ☒ No

2.6 Additional Information Relevant to the Project

2.6.1 Leakage Management (VCS, 3.11, 3.15)

Activity-shifting leakage is deemed negligible (zero) as the agents of deforestation and degradation do not have access and control to operate in other areas beyond the SPCP project area. Ecological leakage is also considered negligible, as the project activities are not expected to cause significant ecological displacement. Nonetheless, the project will continue to monitor for any potential ecological impacts beyond the project area. Market leakage (LK-ME) is monitored and reported in accordance with the applicable methodology. Any potential impacts on supply and demand resulting from the project interventions will be assessed and transparently documented through periodic monitoring reports.

See further in section 3.2.3.

2.6.2 Further Information

No additional information is required. All relevant details that may impact the project's eligibility, the greenhouse gas (GHG) emission reductions or carbon dioxide removals, as well as the quantification of those reductions or removals, have been comprehensively addressed in the relevant sections of this document.

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology (VCS, 3.1)

SPCP applies the latest and most applicable methodology, modules and tools as listed by the table below.

Type (methodology, tool, module)	Reference ID	Title	Version
Methodology	VM0007-REDD+MF	VM0007 REDD+ Methodology Framework (REDD+MF)	6.0 Version 1.8, 04 June 2024
Modules	VMD0016 - X-STR	Methods for stratification of the project area (X-STR)	Version 1.3, 27 November 2023
Modules	VMD0001 - CP-AB	Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools (CP-AB)	Version 1.2, 27 November 2023

Type (methodology, tool, module)	Reference ID	Title	Version
Modules	VMD0005 - CP-W	Estimation of carbon stocks in the long-term wood products pool (CP-W)	Version 1.2 27 November 2023
Modules	VMD0006 - BL-PL	Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation(BL-PL)	Version 1.4, 27 November 2023
Modules	VMD0013 - E–BPB	Estimation of greenhouse gas emissions from biomass and peat burning (E–BPB)	Version 1.3, 27 November 2023
Modules	VMD0042 – BL-PEAT	Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities (BL-PEAT)	Version 1.1. 08 September 2020
Modules	VMD0046 – M-PEAT	Methods for monitoring of soil carbon stock changes and greenhouse gas emissions and removals in peatland rewetting and conservation project activities (M-PEAT)	Version 1.1. 08 September 2020
Modules	VMD0017 – X-UNC	Estimation of uncertainty for REDD project activities (X-UNC)	Version 2.2, 08 September 2020
Modules	VMD0015 - M-REDD	Methods for monitoring of greenhouse gas emissions and removals (M-REDD)	Version 2.3, 27 November 2023
Modules	VMD0009 - LK-ASP	Estimation of emissions from activity shifting for avoiding planned deforestation/forest degradation and avoiding planned wetland degradation (LK-ASP)	Version 1.3, 08 September 2020

Type (methodology, tool, module)	Reference ID	Title	Version
Modules	VMD0044 – LK-ECO	Estimation of emissions from ecological leakage (LK-ECO)	Version 1.1. 08 September 2020
Modules	VMD0011 – LK-ME	Estimation of emissions from market-effects (LK-ME)	Version 1.2. 27 Nivember 2023
Tools	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
Tools	VT0005	VT0005 Tool for measuring aboveground live forest biomass using remote sensing	Version 1.0, 06 March 2015
Tools	NPRA	AFOLU Non-Permanence Risk Tool	Version 4.2, 03 May 2024

3.1.2 Applicability of Methodology (VCS, 3.1)

Reference ID/Title	Applicability condition	Justification of conformance
VM0007 REDD+MF	The methodology is applicable for the land in the project area has qualified as forest following the definition used by VCS, The methodology is applicable baseline deforestation in the project area that falls within either of the category unplanned deforestation (AUDef) and planned deforestation (APDef)	Condition met The land within the project area has been classified as forest for at least 10 years prior to the project start date, satisfying the eligibility criteria related to historical land cover. Additionally, based on the technical proposal and the concession license, the area is legally permitted for the intended activities (falls to planned deforestation/APDef),

Reference ID/Title	Applicability condition	Justification of conformance
		ensuring regulatory compliance as required under VM0007.
VMD0006 BL-PL	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. PT ASK obtained a forest utilization license through Decree No. SK.965/MENLHK/SETJEN/HPL.0/10/2021, authorizing the company to conduct timber harvesting (selective logging) and establish timber plantations for an initial period of 30 years. This confirms the planned degradation and deforestatio
VMD0042 BL-PEAT	This module is applicable to Rewetting of Drained Peatland (RDP) and Conservation of Undrained or Partially Drained Peatlands (CUPP) activities on project areas that meet the VCS definition for peat swamp. The scope of this module is limited to domed peat swamps in the tropical climate zone	Condition met. The project area includes tropical peat domes
VMD0042 BL-PEAT	It must be demonstrated by using the latest version of the CDM A/R methodological tool: "Tool for testing significance of GHG emissions in A/R CDM project activities" (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	Condition met.
VMD0042 BL-PEAT	In the baseline scenario the peat swamp must be (partially) drained. At project start the peat swamp may still be undrained.	Condition met. Baseline activities include conversion to industrial plantations and selective logging, both of which require

Reference ID/Title	Applicability condition	Justification of conformance
		infrastructure for operations and transportation that would involve peatland drainage
VMD0016 X-STR	For peat swamp rewetting and conservation project activities this module must be 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.	Condition met.
VMD0015 M-REDD	This module is mandatory for REDD and WRC	Condition met.
VMD0046 M-PEAT	This module is applicable to RDP and CUPP activities as defined in VCS AFOLU Requirements. The project area must meet the VCS definition for peat swamp. This module is limited to domed peat swamps in the tropical climate zone. It must be demonstrated using Module LK-ECO that ecological leakage must not occur	Condition met.
VMD0013 E-BPB	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.	Condition met. As evidenced in the proxy area and within Project Area, peat combustion from uncontrolled burning is expected to occur in the baseline scenario
VMD005 CP-W	This module is applicable to all cases where wood is harvested for conversion to wood products for commercial markets, for all forest types and age class	Condition met. Under the baseline scenario, the forest within the project area would be subject to logging, with the harvested

Reference ID/Title	Applicability condition	Justification of conformance
		timber converted into wood products.
VMD0001 CP-AB	This module is applicable to all forest types and age class	Condition met.
VMD0009 LK-ASP	The module is applicable for estimating the leakage emissions due to activity shifting from forest lands that are legally authorized and documented to be converted. This tool must be used for projects in areas where planned deforestation is applied.	Condition met. Under the baseline scenario, the forest within the project area would be converted.
VMD0044 LK-ECO	This module is applicable under the following condition: Leakage caused by hydrological connectivity is avoided by project design and site selection	Condition met. Intervention under hydrological restoration design in this project is planned to avoid any hydrological disturbance outside Project Area.
VMD0011 LK-ME	This module is applicable for calculating market-effects leakage from projects that are anticipated to reduce levels of wood harvest substantially and permanently.	Condition met Under the baseline scenario, the forest within the project area would be harvested. As a result of project implementation, a reduction in wood harvest within the project area is expected. This may potentially lead to a shift in timber production to other areas of the country to compensate for the reduced supply.
VT0005	This tool is applicable to all forest types and age classes.	Condition met

Reference ID/Title	Applicability condition	Justification of conformance
	The tool is applicable in conjunction with AFOLU methodologies in which estimation of ALFB is required.	Condition met. Tool is used with VM0007
	The remotely sensed data necessary to estimate ALFB is accessible for the time period desired.	Condition met. Remote sensing data are available from the project start date.
	Predictive model (PM) relating RS metrics to ALFB is parametric (eg, ALFB = f(x, α, ε))	Condition met. The project uses a parametric model to upscale ALFB using RS metrics.

3.1.3 Project Boundary (VCS, 3.12)

3.1.3.1 Spatial Boundary

Section 2.1.16 provides the detailed geographic location of the project, including administrative boundaries, spatial extent, and precise geographic coordinates.

In accordance with VCS guidance, the spatial boundary is defined as the geographic area encompassing all land where project activities are implemented and where GHG emission reductions or removals occur. For the SPCP, applied this spatial boundary includes all areas where emissions would have occurred in the absence of the project, including areas of planned deforestation (APD), planned degradation (APDeg), planned degradation with strip planting (APDeg_SP), and wetlands restoration and conservation (WRC), as illustrated in Figure 14 and Table 3 below.

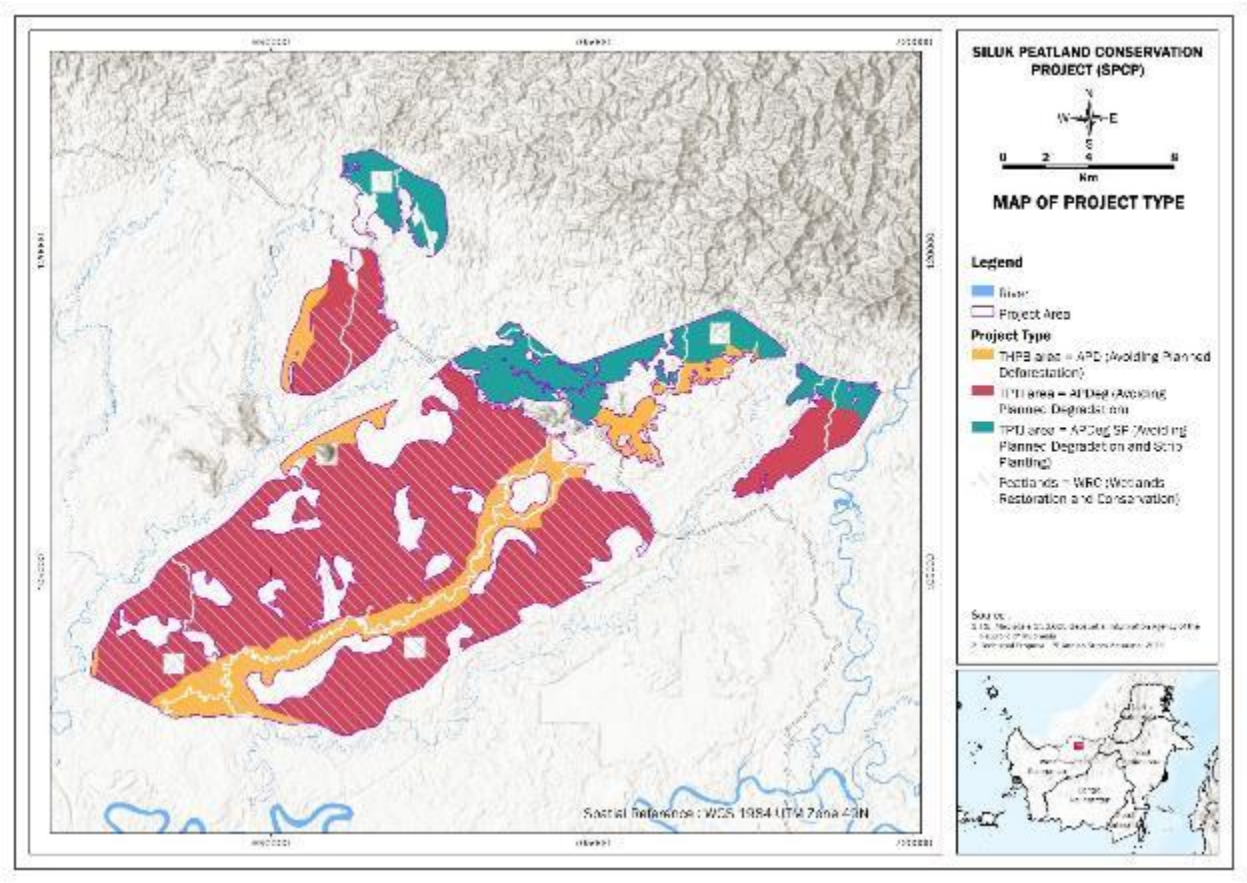


Figure 14. SPCP spatial boundary; APDeg Project Boundary, APDeg_SP Project Boundary, APD Project Boundary, WRC project boundary

Table 3. Project areas by methodology/baseline activities

Methodology/Baseline activity	Area (ha)
VM0007-APDeg	18,367.60
VM0007-APDeg_SP	3,938.68
VM0007-APD	4,236.47
VM0007-WRC	17,003.09
Total of Project Area	28,506.11

Given that the project area is located approximately 191 kilometers inland from the sea (and is minimum 28 m above mean sea level), the potential impact of sea-level rise on the project boundary is considered negligible. Therefore, no adjustments to the project boundary are deemed necessary.

3.1.3.2 Temporal Boundary

The temporal boundary is defined by the project start date and the duration of the crediting period. For SPCP, the temporal boundary spans from 01-January-2023 to 24-October-2051, covering a period of 28 years. For further details, see Section 2.1.10.

3.1.3.3 Carbon pool

Carbon pools included in the SPCP are shown by table below (Table 4). All obligatory carbon pools required by the methodologies are included.

Table 4. Carbon pools included in the SPCP

Carbon pool	Methodology	Carbon Sub-pool	Inclusion?	Justification
Above-ground biomass	VM0007-APD	Tree biomass	Included	Carbon stock change in this pool is always significant
		Non-tree biomass	Excluded	Per VM0007, herbaceous vegetation/non-tree biomass is conservatively excluded
	VM0007-APDeg, APDeg_SP	Tree biomass	Included	Carbon stock change in this pool is always significant
		Non-tree biomass	Excluded	Excluded as this is conservative when forests remain as forest
Below-ground biomass	VM0007-APD		Excluded/included	There is risk of double calculation with peat, therefore conservatively excluded . This pool included for dryland forest
	VM0007-APDeg, APDeg_SP		Excluded/included	
Dead wood	VM0007-APD		Excluded	Deadwood is excluded as it will not be greater in the baseline (i.e. cleared land for roads) compared with the project scenario (i.e. primary tropical forest)
	VM0007-APDeg, APDeg_SP	Logging slash	Included	This will be greater in baseline than the project scenario and is therefore included
		Naturally accumulated	Excluded	This is assumed that carbon stocks in the naturally occurring dead wood pool are

Carbon pool	Methodology	Carbon Sub-pool	Inclusion?	Justification
				equivalent in both the project and baseline scenario. Based on this, this pool is conservatively excluded
Harvested wood products	VM0007-APD		Excluded	This pool is excluded since the process of deforestation in APD area doesn't specifically involve timber harvesting for commercial market
	VM0007-APDeg, APDeg_SP		Included	All timber above the DBH of 30 cm (for peat swamp forest) and/or 40 cm (for dry land forest) are assumed to be harvested for commercial timber production, and are therefore allocated to the harvested wood products pool
Litter	VM0007-APD		Excluded	There is risk of double calculation with peat, therefore conservatively excluded
	VM0007-APDeg, APDeg_SP		Excluded	
Mineral soil organic carbon pool	VMD0043 – BL-PEAT		Excluded	This pool is not relevant
Peat soil organic carbon	VM0007-APD		Excluded	Covered by VMD0043 (BL-PEAT)
	VM0007-APDeg, APDeg_SP		Excluded	
	VMD0043 – BL-PEAT		Included	60% of Project Area located in Peat deposit land

3.1.3.4 Source of Emissions

The primary sources of emissions within the SPCP area are detailed in Table 5 for REDD and Table 6 for WRC. These tables categorize emissions according to the applicable methodology modules, scenarios, and specific emission sources, providing a comprehensive overview of where and how emissions are generated.

Table 5. GHG source of emission from REDD; APDeg, APDeg_SP and APD

Source		Gas	Included?	Justification/explanation
Baseline	Burning of woody biomass	CO2	Included	Carbon stock decrease resulting from burned woody biomass are considered a significant emission source, as this leads to a direct loss of carbon stored in vegetation
		CH4	Excluded	Non-CO2 gases emitted from woody biomass burning is excluded
		N2O	Excluded	Non-CO2 gases emitted from woody biomass burning is conservatively excluded
	Combustion of fossil fuels	CO2	Excluded	Conservatively excluded
		CH4	Excluded	Potential emissions are negligible
		N2O	Excluded	Potential emissions are negligible
	Use of fertilizer	CO2	Excluded	Potential emissions are negligible
		CH4	Excluded	Potential emissions are negligible
		N2O	Excluded	Conservatively excluded
Project	Burning of woody biomass	CO2	Included	Carbon stock decrease resulting from burned woody biomass are considered a significant emission source, as this leads to a direct loss of carbon stored in vegetation
		CH4	Included	Non-CO2 gases emitted from woody biomass burning must be included if fire occurs
		N2O	Included	Non-CO2 gases emitted from woody biomass burning must be included if fire occurs
	Combustion of fossil fuels	CO2	Excluded	Can be neglected as this is exclude from baseline accounting
		CH4	Excluded	Potential emissions are negligible
		N2O	Excluded	Potential emissions are negligible
	Use of fertilizer	CO2	Excluded	Potential emissions are negligible

Source		Gas	Included?	Justification/explanation
		CH4	Excluded	Potential emissions are negligible
		N_2O	Excluded	Excluded from the baseline and therefore project accounting.

Table 6. GHG source of emission from WRC

Source		Gas	Included?	Justification/explanation
Baseline	Oxidation of drained peat	CO_2	Included	Considered under carbon pools
		CH_4	Excluded	Conservatively excluded
		N_2O	Excluded	Excluded as per applicability condition in Module BL-PEAT
	Combustion of peat soils	CO_2	Included	Procedures are provided for REDD project activities with emissions from REDD-WRC with the emissions from biomass and peat burning.
		CH_4	Included	
		N_2O	Included	
Project	Oxidation of drained peat	CO2	Included	Considered under carbon pools
		CH4	Included	Conservatively included
		N2O	Included	
	Combustion of peat soils	CO2	Included	Procedures are provided for REDD project activities with emissions from REDD-WRC with the emissions from biomass and peat burning.
		CH4	Included	
		N2O	Included	

3.1.4 Baseline Scenario (VCS, 3.13)

In the absence of project intervention, the project area is expected to be logged and converted into industrial plantations, in line with the plans outlined in the technical proposal and concession letter. As

a result, the peatland ecosystem would be significantly disturbed due to infrastructure development required to support logging and land conversion operations.

Following a systematic and step-by-step approach using VT0001 (Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities), the baseline scenario has been determined as avoiding planned deforestation and degradation, and conserving and restoring the peatland ecosystem.

A detailed explanation of the baseline scenario selection is provided in Section 3.1.5.

3.1.5 Additionality (VCS, 3.14)

The comprehensive and step-by-step process for demonstrating the additionality of SPCP is outlined in section 3.1.5.1 and 3.1.5.2 below.

3.1.5.1 Regulatory Surplus (VCS, 3.14)

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 a law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

☐ Yes ☒ No

SPCP is implemented in a country classified as a non-annex I Party under the United Nations Framework Convention on Climate Change (UNFCCC). The project activities undertaken by SPCP are entirely voluntary and are not subject to any legal mandates, statutes, or regulatory frameworks.

3.1.5.2 Additionality Methods (VCS, 3.14)

The baseline scenario for the SPCP project was established using VT0001: Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities. The determination of the baseline scenario followed a systematic and step-by-step approach as outlined in detail below.

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

In this step, alternative land use scenarios that represent plausible baseline scenarios have been determined following the sub-steps:

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

The identification of land use scenarios based on existing land uses in the Project Area and its surroundings, as well as an analysis of past and current trends in peatland management across West Kalimantan, Kalimantan, and Indonesia, regardless of land tenure status. List of credible land use scenario (Sub-step 1a) is shown by Table 7. This includes a continuation of the pre-project land use (marked as 'status quo' in the first column), and the proposed project activity on the land within the project boundary performed without being registered as the VCS AFOLU project (marked as 'project' in the first column).

Under the pre-project land use, some small areas would have included activities similar to the proposed project activity resulting from legal requirements for forestry concession management. This includes the legal requirement to maintain permanent forest sampling plots, buffer areas, and certain conservation areas, etc. These areas are fully accounted for in the baseline scenario as described in detail in Section 3.1.4 and as shown in Table 7.

Table 7. List of credible land use scenario as prescribed by Sub-step 1a

Scenarios	Land use options
Selective logging (status quo)	Continuation of the pre-project land use (partial). A substantial portion of Kalimantan's peat and dryland forests, including the project area, has been managed by private companies for timber extraction since the 1970s. In accordance with prevailing regulations, these operations follow a selective logging approach, harvesting only trees that exceed a specified diameter threshold. This system is intended to minimize environmental impact and promote sustainable forest management. The practices continue at present with legacy concession granted extension for its operation for another 90 years. See timber concession distribution in West Kalimantan in Figure 15.
Industrial timber plantation (status quo)	Continuation of the pre-project land use (partial). This type of land use is widespread across Kalimantan, including the Kapuas Hulu district. Since the early 2000s, plantations have expanded significantly, thriving on both mineral soils and peatlands. However, plantations established in peatland areas often involve significant environmental modifications, primarily through the construction of canals to lower the water level. Secondary forest and non-forest area will be subjected to Industrial Timber Plantation. See industrial timber plantation distribution in West Kalimantan in Figure 15.
Commercial oil palm plantation	Oil palm plantations are widely commercially established across both dryland and peatland areas in Kalimantan. However, under government regulations, their development is legally restricted to the areas for other purposes (*Areal Peruntukan Lain*), not permitted within forest area (*Kawasan Hutan*). If oil palm plantation were to exist in a Forest Area it would be under illegal/conflicting presence or in the process of conversion to Other Purposes Area. See oil palm distribution in West Kalimantan in Figure 15.

Scenarios	Land use options
Small-holder agriculture/ plantation	This land use is widespread throughout West Kalimantan. Most plantations operated by smallholders in West Kalimantan primarily cultivate oil palm (*Elaeis oleifera*), rubber trees (*Hevea brasiliensis*), and kratom (*Mitragyna speciosa*). Such agricultural practices are more commonly found in non-peat areas as agriculture on peat demands higher cost and resources. It tends to be concentrated near key access points, such as roads, rivers, and settlement, where transportation and the logistic deployment are more feasible.
Mining	Mineral deposits can occasionally be found along rivers, as well as in certain sandy ridges, heath forests, and mineral-rich soil areas on the edges of peatlands. In Kalimantan, these resources have long attracted both legal and illegal miners. Mining activities in these areas are typically short-term and nomadic, with miners relocating once deposits are depleted. Some gold mining activities are currently in operation in Kapuas Hulu district.
Protected forest (project)	Proposed project activity on the land within the project boundary performed without being registered as the VCS AFOLU project. Designating protected forests is one option for areas with unique characteristics, critical ecosystem functions, high ecological value, and key biodiversity habitats. Such areas can be designated as national parks or other protected zones, but this requires a formal process involving regulatory approvals. Once designated, protected status effectively prevents commercial land use, such as timber harvesting or conversion into plantations. However, legal protection does not guarantee the prevention of illegal activities, such as illegal logging and land encroachment, which remain ongoing challenges
Unprotected forest	Unprotected areas do exist, often remaining in a state of status quo condition, making them vulnerable to various disturbances. These areas are frequently targeted for illegal activities such as logging, land encroachment, and unsanctioned agricultural activities. Since 2011, some of these areas meeting certain criteria (deep peat and primary forest) have been included under a moratorium on new licensing, effectively restricting legal commercial exploitation. However, in practice, enforcement remains weak, providing minimal protection against illegal activities. As a result, these landscapes continue to face significant threats from deforestation, habitat destruction, and unsustainable land use practices.

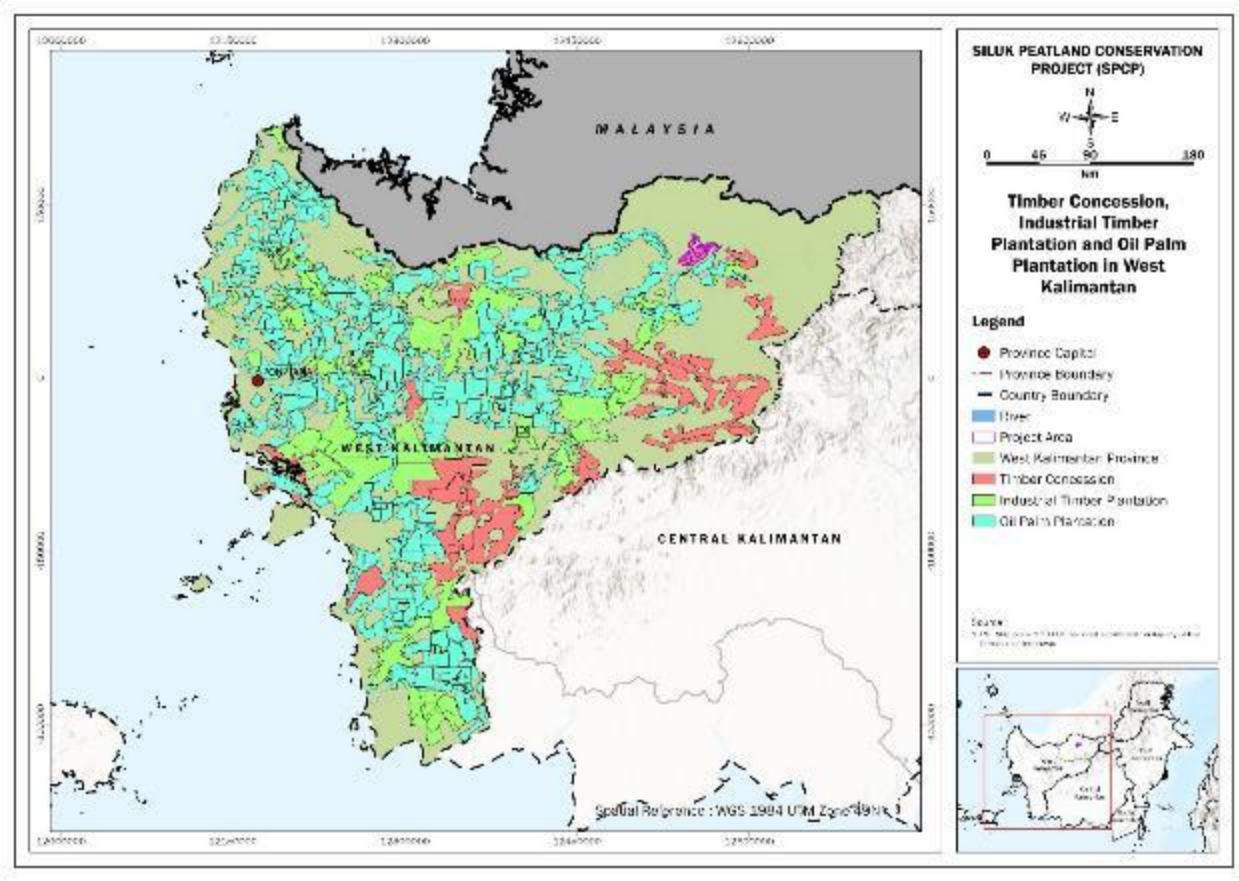


Figure 15. Distribution of timber concession, industrial timber plantation, and oil palm plantation in West Kalimantan

Out of the seven (7) alternative scenarios considered, the mining scenario was eliminated because there is no existing mining activity in the project area and neighboring area.

Sub-step 1b. Consistency of credible alternative land use scenarios with enforced mandatory applicable laws and regulations

This step is purposely designed to assess the remaining six (6) scenarios to determine their compliance with the relevant mandatory legal and regulatory requirements as outlined by Table 8.

Table 8. List of credible alternative land use scenario with enforced mandatory applicable laws and regulations

Scenarios	Land use options
Selective logging	This land use is legally permitted. Approximately 78% of the concession area was designated for selective logging based on the technical proposal submitted in 2018 and the concession license issued in 2021. This land use is considered in next step (barrier analysis).

Scenarios	Land use options
Industrial timber plantation	This land use is legally permitted, with approximately 15% of the concession designated for industrial timber plantations under the 2018 technical proposal and 2021 concession license. This land use is considered in next step (barrier analysis).
Commercial oil palm plantation	This land use is not legally permitted, as the project area falls entirely within the Production Forest (*Hutan Produksi*), where oil palm plantations are not allowed. According to prevailing regulations, including Government Regulation No. 104/2015 and related Ministry of Environment and Forestry decrees, Production Forest areas are designated for sustainable timber harvesting and forest ecosystem services, not for oil palm plantation. This land use in not assessed further in the next step (barrier analysis).
Small-holder agriculture/plantation	This land use is not legally permitted but remains widespread due to weak enforcement, unclear jurisdiction, and socio-economic pressures. Small-holder agriculture predominantly occurs in areas with high accessibility. This land use is considered in next step (barrier analysis).
Protected forest (project)	This land use is legally permitted but can only be implemented if there are no existing concession license. In the case of unlicensed Production Forest (Hutan Produksi), implementing forest protection as part of the project would require a formal agreement and explicit approval from the government to authorize this type of land use. It is important to note that such projects are often characterized by short implementation periods and lack long-term sustainability. This land use is considered in next step (barrier analysis).
Unprotected forest	This land use is legally permitted but can only be implemented if the existing concession license is either formally revoked or expires and needs further process to change the forest status. This land use in not assessed further in the next step (barrier analysis).

Following this assessment, it was found that four scenarios — industrial tree plantations, selective logging, protected forest and unprotected forest — adhere to all applicable legal and regulatory frameworks. These activities operate within the established legal boundaries and align with government policies on land use and resource management.

In contrast, commercial oil palm cultivation does not meet legal requirements, as this activity is not officially permitted within the project area. Despite their illegality, smallholder agriculture are assumed to continue to exist due to weak regulatory enforcement and governance challenges. Because they remain prevalent in the region, they have been temporarily retained for further consideration to ensure a realistic and contextually relevant analysis.

Sub-step 1c. Selection of the baseline scenario

Based on step 1b, the baseline scenario is defined as the continuation of pre-project land use, with selective logging in the net area of 22,306.45 Ha or 78% of the project area and industrial timber plantations in the net area of 4,236.47 Ha or 15% of project area. This scenario aligns with the technical proposal and the concession license granted by the Ministry of Environment and Forestry in 2021.

Additionally, two (2) land use scenarios — smallholder agriculture/plantation and protected forest— are retained for further evaluation in the barrier analysis as outlined in Step 3 (Barrier analysis). While these activities are not legally permitted, they remain prevalent in the region due to weak law enforcement and regulatory gaps.

Step 2. Investment analysis

This step assesses whether the proposed project activity, without revenue from GHG credit sales, is economically or financially less attractive than at least one alternative land use scenario. As prescribed by the tool, investment analysis was conducted alongside the Barrier Analysis (Step 3) to ensure a comprehensive assessment, even though the tool suggests them as alternative approaches.

Sub-step 2a. Determine appropriate analysis method

Per VT0001, as the VCS AFOLU project generates no financial or economic benefits other than VCS related income, the simple cost analysis approach was selected (Option I).

Sub-step 2b: Apply simple cost analysis (Option 1)

As demonstrated by project budget and financial forecasts made available to the auditors (see Sections 2.1.22 and 2.4.5 and NPRR supporting evidence), SPCP has no source of revenue other than VCS related income. In comparison, the baseline activity is predicted to be a profitable venture, as demonstrated by documentation made available as part of the NPV comparison presented in support of the Non-Permanence Risk Report (Internal Risk/Opportunity Cost). As per the evidence provided, it is concluded that the proposed VCS AFOLU project produces no financial benefits other than VCS related income. Per VT0001 this permits the assessment to proceed to Step 4 (Common practice analysis), however Step 3 Barrier analysis is also included for completeness.

Step 3. Barrier analysis

As previously elaborated in Step 1b, four scenarios were included in the barrier analysis: the pre-project land use of industrial tree plantations and selective logging (established as the baseline scenario), along with smallholder agriculture and smallholder plantation.

Sub-step 3a. Determine appropriate analysis method Identification of barriers that would prevent the implementation of at least one alternative land use scenarios.

In accordance with the tool (VT0001), the key barriers that prevent the implementation of various land use scenarios in the project area are identified and outlined in Table 9.

Table 9. Identification of barrier in alternative land use scenario

Scenarios	Sub Step 3a
Selective logging (status quo)	• There are no investment barrier to this scenario, as ASK has secured the necessary potential investor and business model to implement selective logging. • There are no institutional barriers, as government policies fully support the implementation of land use plans in accordance with the concession license. • There are no technological barriers to conducting selective logging and forest conversion into selective logging in the project area. Similar operations have been successfully implemented across West Kalimantan and Indonesia, both on peatland and mineral soils. • There are no barriers related to local traditional use, as the majority of the area is not subject to traditional land use practices. In cases this occurs, it does not conflict with the establishment of a legally sanctioned logging operation. • There are no barriers related to prevailing practices, as the baseline scenario aligns with common forestry practices in Indonesia. • There are no ecological barriers, as selective logging are widely practiced on peatlands throughout Kalimantan and Sumatra. • There are no social barriers, as the project area contains no permanent settlements and the majority of the area is not used for agriculture or subsistence farming. • There are no land tenure barriers, as the project area is designated as state land, classified as production forest, and has been licensed to ASK since 2021.
Industrial timber plantation (status quo)	• There are no investment barrier to this scenario, as ASK has secured the necessary funding to implement this land use (see above). • There are no institutional barriers, as government policies fully support the implementation of land use plans in accordance with the concession license. • There are no technological barriers to conducting selective logging and forest conversion intoi timber plantation in the project area. Similar operations have been successfully implemented across West Kalimantan and Indonesia, both on peatland and mineral soils. • There are no barriers related to local traditional use, as the majority of the area is not subject to traditional land use practices. In cases this occurs, it does not conflict with the establishment of a legally sanctioned plantation.

Scenarios	Sub Step 3a
	• There are no barriers related to prevailing practices, as the baseline scenario aligns with common forestry practices in Indonesia. • There are no ecological barriers, as industrial tree plantations are widely practiced on peatlands throughout Kalimantan and Sumatra. • There are no social barriers, as the project area contains no permanent settlements and the majority of the area is not used for agriculture or subsistence farming. • There are no land tenure barriers, as the project area is designated as state land, classified as production forest, and has been licensed to ASK since 2021.
Smallholder agriculture/plantation	The primary barriers to this scenario are legal and land tenure constraints. It could only occur if the existing concession license were disregarded. Smallholder agriculture in the Project Area faces significant investment and technical challenges. Productive cultivation is not viable in peatland, as it requires heavy fertilization and extensive drainage, both of which demand substantial capital and pose serious environmental risks. In nearby dryland areas, smallholder farming is typically carried out using conventional methods on small, scattered plots, leading to low productivity. Given these constraints (legal, tenure, high cost and low productivity), smallholder agriculture/ plantation in the project area considered to be not feasible.
Protected Forest (project)	There are major financial barriers to implementing forest protection and restoration activities without carbon finance. Managing a site of this scale over the long term requires stable, high-level funding that far exceeds what philanthropic donations can typically provide, especially since such funding is rarely sustained over time. Institutional barriers also exist. The project area falls within the production forest estate and is legally designated to generate revenue for the state. As such, securing long-term management rights depends on presenting a credible business plan—this is a core requirement under the licensing conditions and essential to gaining government support.

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

The analysis in Sub-step 3b confirms that smallholder agriculture/plantation and protected forest (the project activity in the absence of carbon finance) are unfeasible due to multiple barriers. As a result, the baseline scenario remains the continuation of industrial tree plantations and selective logging.

Step 4. Common practice analysis

The project area consists of peat swamp forest ecosystems located within the area legally designated for production use. Under prevailing regulatory and land-use frameworks in Indonesia, such areas are expected to be developed for commercial purposes, particularly for logging activity and the establishment of industrial timber plantations using fast-growing species. This pattern of peatland utilization is consistent with regional land-use trends and is widely practiced across Sumatra and Kalimantan, where large areas of peat swamp forest have already been cleared and drained to support pulpwood or oil palm operations.

Outside of areas formally designated as protected (e.g., conservation forests or national parks), there are very few examples of conservation being implemented within production zones—especially on peatlands—without the support of carbon finance or philanthropic intervention. The opportunity cost of conserving high-value peatland areas is high, and without alternative revenue streams, license holders have no economic incentive to forego conversion. In rare cases where conservation has occurred, it has typically involved small-scale donor-funded projects or one-off corporate offsets that are not replicable under current policy and market conditions.

Moreover, local governments often expect production areas to contribute to regional revenue targets, and therefore tend to discourage conservation that does not align with licensed productive use. As such, the long-term protection of peat swamp forests within the project area is not consistent with business-as-usual practices and would not be implemented in the absence of targeted support through carbon finance.

Given this context, the proposed REDD+ activity, avoiding planned deforestation-degradation and conserving-restoring peatlands ecosystem represents a clear deviation from common practice in the region. The project therefore meets the criteria for additionality under the Verra REDD+ Methodology Framework (VM0007), supported by the application of the BL-PL module and a with-project scenario (WRC) that would not occur without intervention.

3.1.5.2.1 Detail description of the baseline management

The baseline management plan is established based on two official documents: the Technical Proposal submitted by PT ASK in 2019 and the concession license issued by the Ministry of Environment and Forestry (MoEF) in 2021 (Figure 16). These documents serve as the foundation for defining land use without project intervention within the project area. Copies are available to auditors upon request.



Figure 16. Technical proposal of PT ASK

The Technical Proposal presents a detailed zonation that designates the area into 1) protected areas, 2) non-productive areas, and 3) productive areas. Concession holders are required to set aside protected areas based on ecological, hydrological, and biodiversity criteria. These include riparian zones, steep slope areas, and High Conservation Value (HCV) areas. Based on spatial analysis, protected area is estimated to be 1,285.68 Ha (5% of project area). Non-productive areas include degraded land, areas unsuitable for forest utilization, Permanent Sampling Plot (PSP), and germplasm area. Based on spatial analysis, non-productive areas are estimated to be 677.07 Ha (2% of project area).

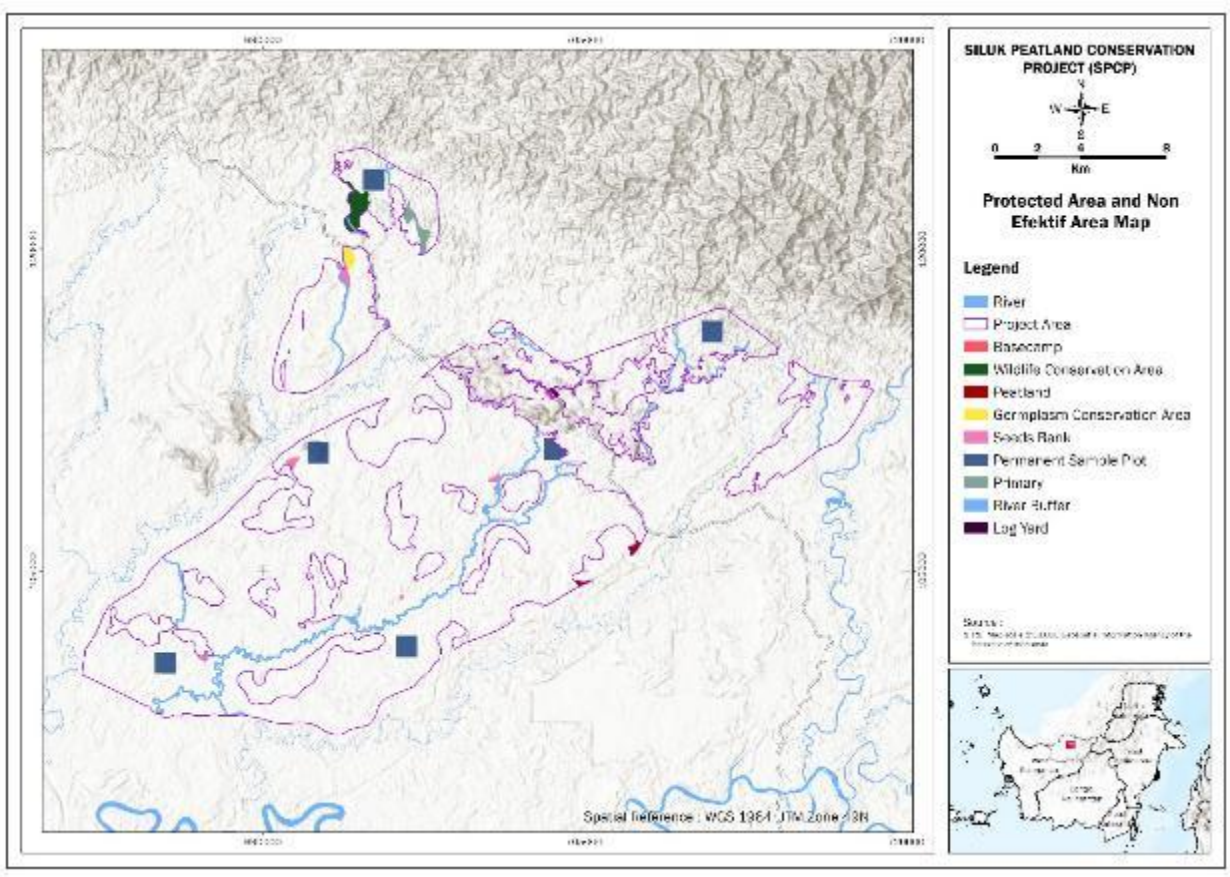


Figure 17. Non-productive and protected areas designated by technical proposal

As for the productive area, this refers to the area where regulated harvesting or forest utilization will take place. As outlined in the Technical Proposal, the productive area is the area designated for three primary silviculture system: selective logging (*TPTI-Tebang Pilih Tanam Indonesia*), selective logging and Strip line planting (*TPTJ-Tebang Pilih Tanam Jalur*), and industrial timber plantations (*THPB-Tebang Habis Permudaan Buatan*), each with specific spatial and temporal allocations. Selective logging is planned within designated zones, following a rotational harvesting schedule, while industrial timber plantations are established in other areas for commercial timber production. The Selective Logging and Strip Planting System (TPTJ) is applied within designated zones which involve selectively harvesting mature trees while replanting in designated strips to promote the growth. Based on spatial analysis, productive areas are estimated to be 26,542.93 Ha (93% of project area). In addition to this designation, the project area includes 17,003.09 hectares of peatland located within the TPTI and THPB areas, subjected to infrastructure development to support logging activities and forest conversion.

This designation as explained earlier serves as the basis for determining project activity category and proceeding further with GHG emission calculation to be applied in SPCP as outlined below:

- REDD-APDeg (Reducing Emissions from Forest Degradation in areas designated for selective logging or TPTI)

- REDD-APDeg_SP (Reducing Emissions from Forest Degradation in Areas Designated Selective Logging and Strip planting or TPTJ),
- REDD-APD (Reducing Emissions from Deforestation in the areas designated for Industrial Timber Plantation establishment or THPB).
- WRC (Reducing Emissions from Wetlands Rewetting and Conservation in peatlands areas impacted by baseline logging operation and forest conversion)

This distinction is crucial for accurately estimating greenhouse gas emissions within each land use category under the baseline scenario.

These classifications of the area based on project category are visually represented in Table 14.

3.1.5.2.2 Baseline Management of REDD-Avoiding Planned Degradation (REDD-APDeg) area

Within the designated timber logging area, the proposal provides a structured harvest schedule, specifying the sequence and timing of harvesting activities across different blocks. This planned timeline, illustrated in Figure 18 and detailed in Table 10, ensures that logging is conducted in a phased manner to optimize resource use while minimizing environmental impact. Additionally, the proposal sets out key operational guidelines, including cutting limits, logging methods, and rotation cycles, ensuring that harvesting activities follow a systematic and regulated approach.

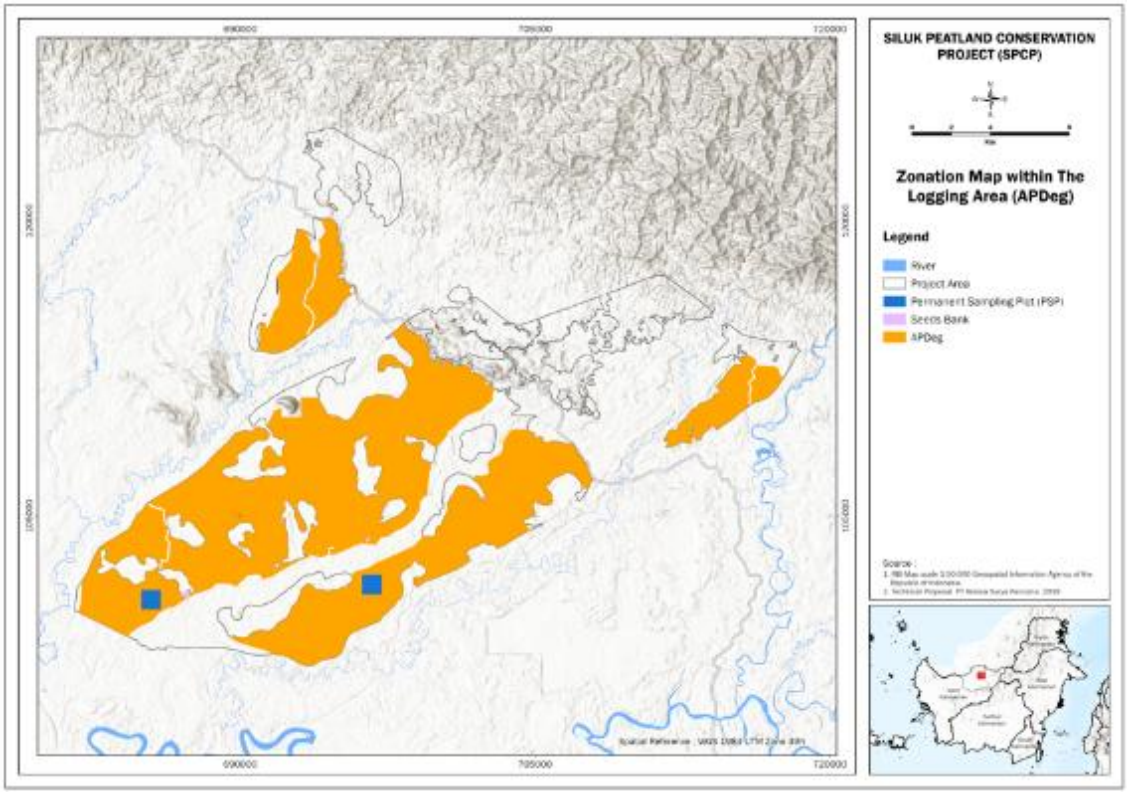


Figure 18. The Area Zonation of Logging Area

Table 10. The zonation areas of logging area

No	Zonation	Area (Ha)	%
1	Permanent Sampling Plot (PSP)	199.84	1.07%
2	Seed bank	44.84	0.24%
3	Logging area - APDeg	18,367.60	98.69%
	Total	18,612,29	100.00%

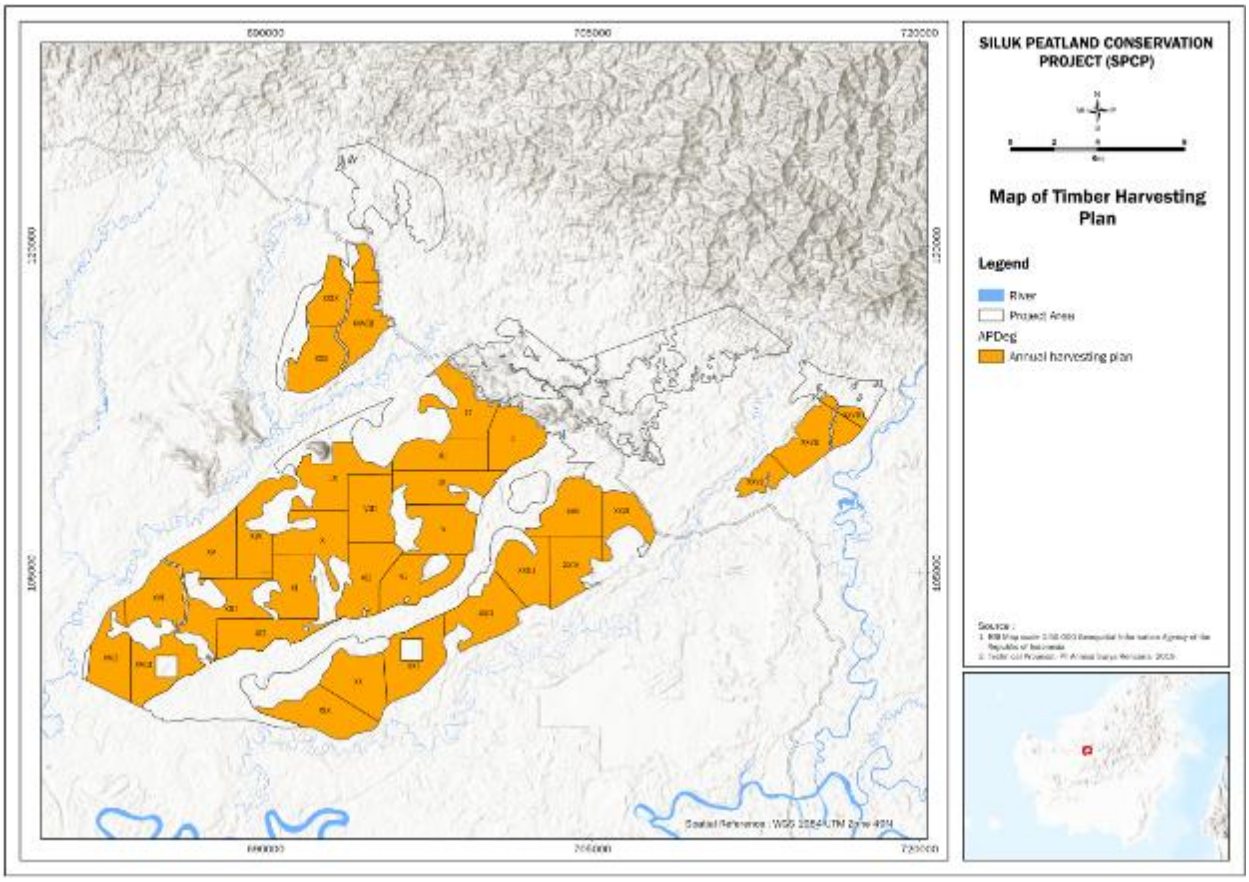


Figure 19. Timber Harvest Plan in the Baseline Scenario

Table 11. Annual timber harvest plan in the baseline scenario

No	Annual Plan	Area (Ha)	No	Annual Plan	Area (Ha)	No	Annual Plan	Area (Ha)
1	I	762.65	11	XI	566.58	21	XXI	663.17
2	II	588.00	12	XII	563.80	22	XXII	661.39

No	Annual Plan	Area (Ha)	No	Annual Plan	Area (Ha)	No	Annual Plan	Area (Ha)
3	III	588.82	13	XIII	608.28	23	XXIII	593.68
4	IV	601.68	14	XIV	624.69	24	XXIV	583.75
5	V	632.78	15	XV	578.08	25	XXV	632.05
6	VI	590.25	16	XVI	563.20	26	XXVI	631.58
7	VII	639.74	17	XVII	574.35	27	XXVII	641.18
8	VIII	646.85	18	XVIII	578.45	28	XXVIII	639.85
9	IX	668.68	19	XIX	658.96	29	XXIX	547.49
10	X	632.52	20	XX	640.79	30	XXX	554.31
		Total						**18,367.60**

3.1.5.2.3 Baseline Management of REDD-Avoiding Planned Degradation applying Strip planting (REDD-APDeg_SP) area

Within the designated selective logging and strip planting, the proposal provides a structured harvest schedule, specifying the sequence and timing of harvesting activities across different blocks, and a strip planting plan. This planned timeline, illustrated in Figure 20 and detailed in Table 12, ensures that logging and planting are conducted in a phased manner to optimize resource use while minimizing environmental impact. The proposal further sets out key operational guidelines, including cutting limits, logging methods, planting methods and rotation cycles.

,,

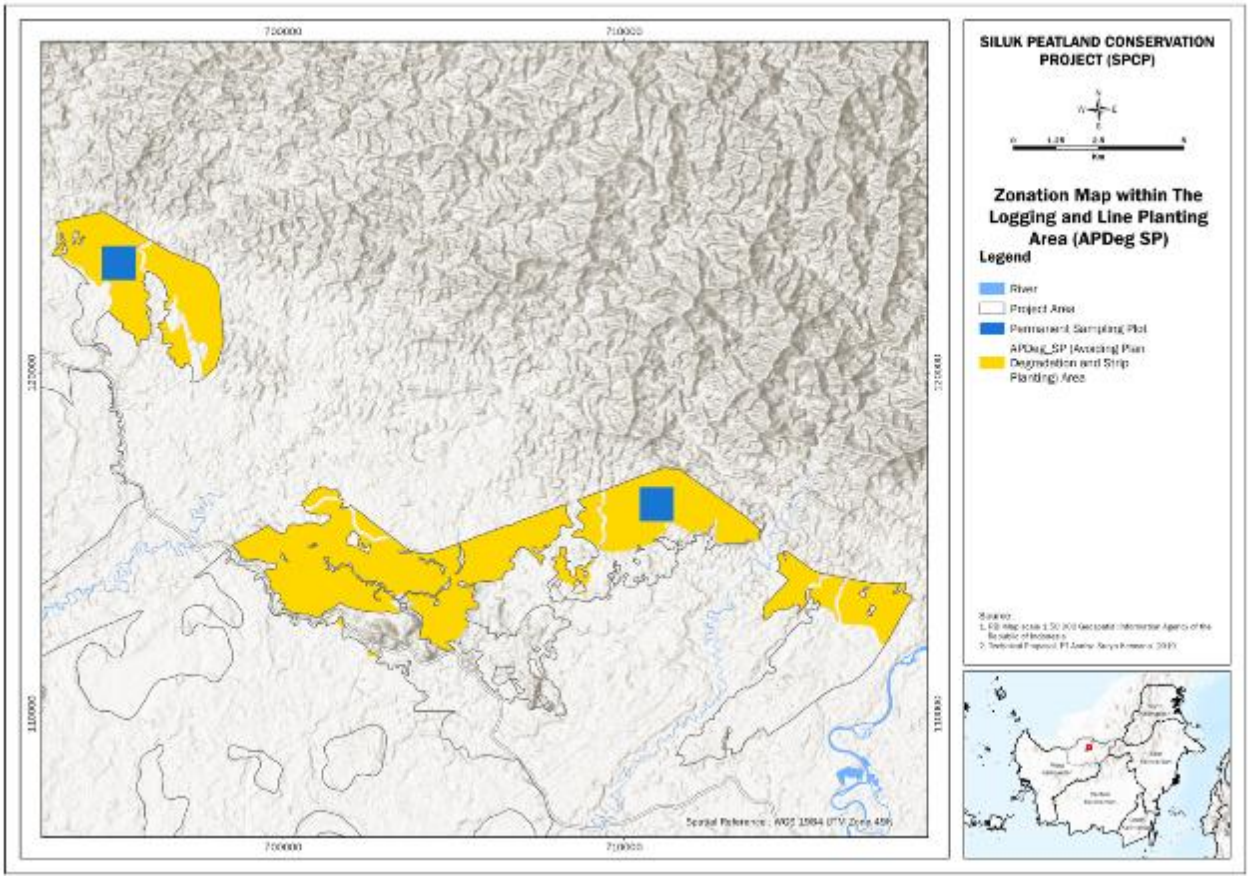


Figure 20. The areas zonation of logging area and strip planting area

Table 12. The areas zonation of logging area and strip planting area

No	Zonation	Area (Ha)	%
1	Permanent Sampling Plot	199.84	4.83%
2	Area of logging and Strip Planting	3,938.86	95.17%
	Total	**4,138.70**	**100.00%**

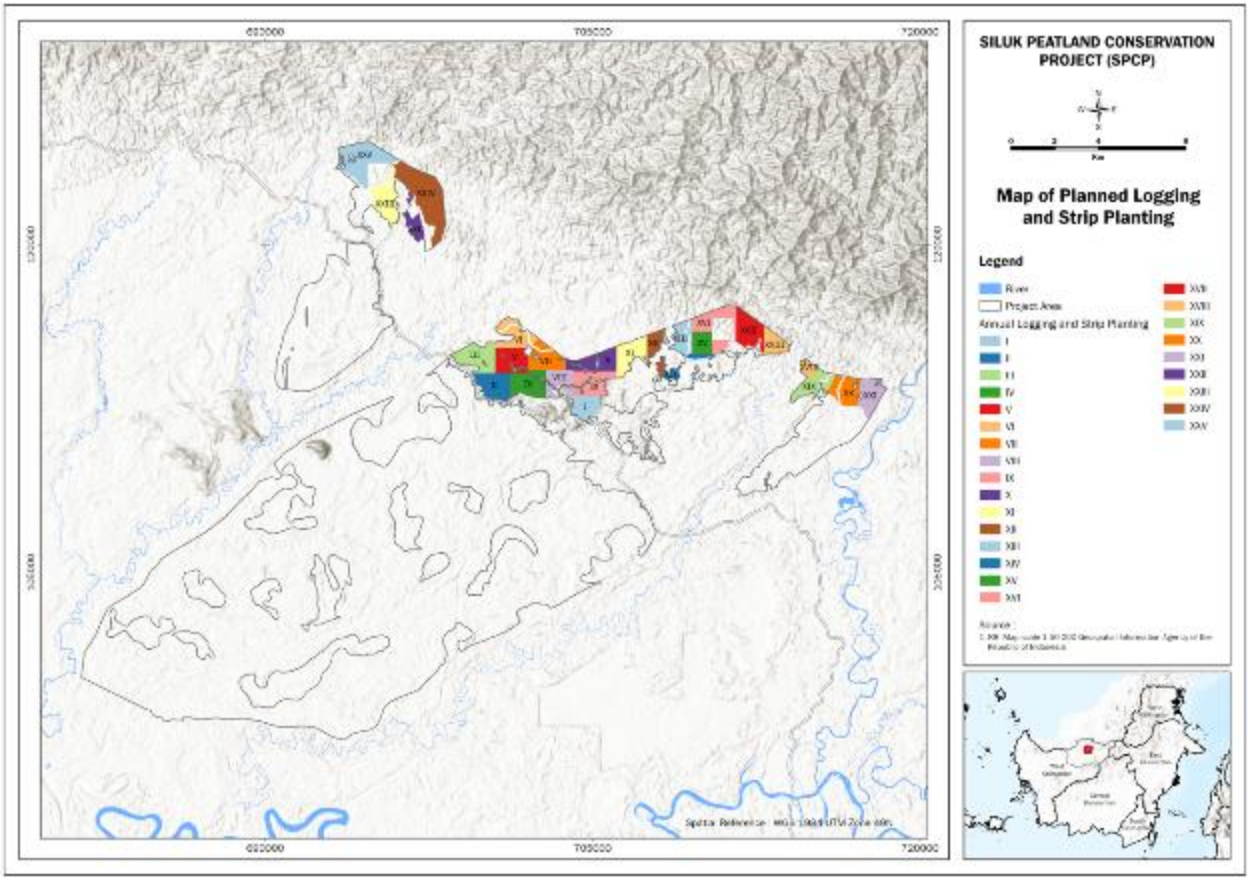


Figure 21. The plan of logging and strip planting in the baseline scenario

Table 13. The plan of logging and strip planting in the baseline scenario

No	Annual Plan	Area (Ha)	No	Annual Plan	Area (Ha)
1	I	144.13	14	XIV	53.65
2	II	167.74	15	XIX	94.57
3	III	194.76	16	XV	176.35
4	IV	179.70	17	XVI	168.17
5	IX	159.78	18	XVII	139.10
6	V	142.78	19	XVIII	129.79
7	VI	153.20	20	XX	141.01
8	VII	127.65	21	XXI	144.61
9	VIII	169.57	22	XXII	77.57
10	X	163.26	23	XXIII	179.31

No	Annual Plan	Area (Ha)	No	Annual Plan	Area (Ha)
11	XI	161.97	24	XXIV	392.30
12	XII	92.82	25	XXV	274.29
13	XIII	110.78			
Total					**3,938.865**

3.1.5.2.4 Baseline Management of REDD-Avoiding Planned Deforestation (REDD-APD) area

For the timber plantation areas, the proposal includes a detailed annual conversion plan, specifying the phased sequence and timing of logging activities across different blocks. This structured approach, illustrated in Figure 22 and further outlined in Table 14, ensures an orderly transition from natural forest to plantation while optimizing resource utilization.

Additionally, the proposal establishes key operational parameters to guide the conversion process. These include logging methods to ensure efficient and controlled timber extraction, access construction to facilitate transportation and infrastructure development, and rotation cycles to regulate planting and harvesting intervals, ensuring sustainable plantation management.

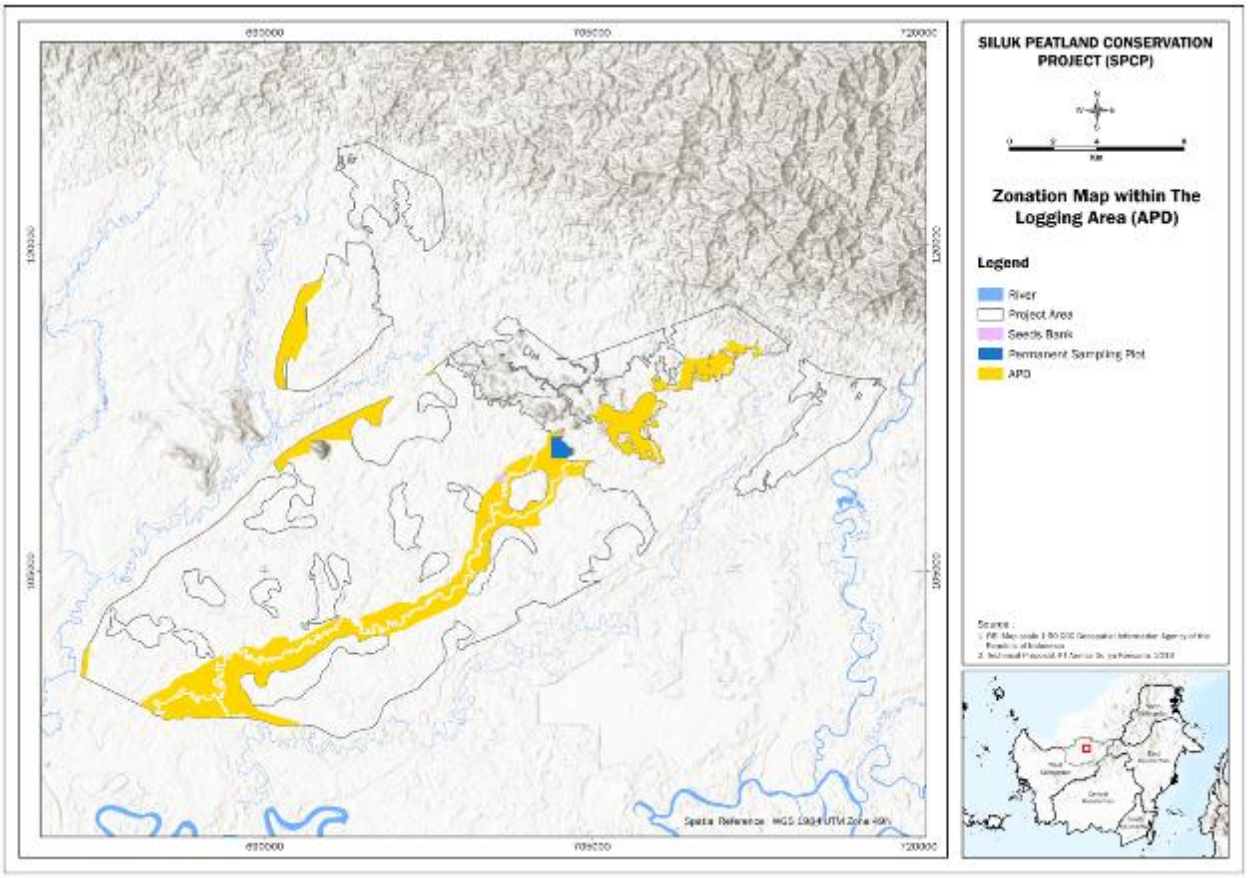


Figure 22. Zonation within the timber plantation area

Table 14. The areas zonation of forest conversion into plantation area

No	Baseline	Luas (Ha)	%
1	Seed banks	36.44	0.82%
2	Permanent Sampling Plot	176.11	3.96%
3	Forest Conversion to Plantation	4,236.47	95.22%
	Total	**4,449.02**	

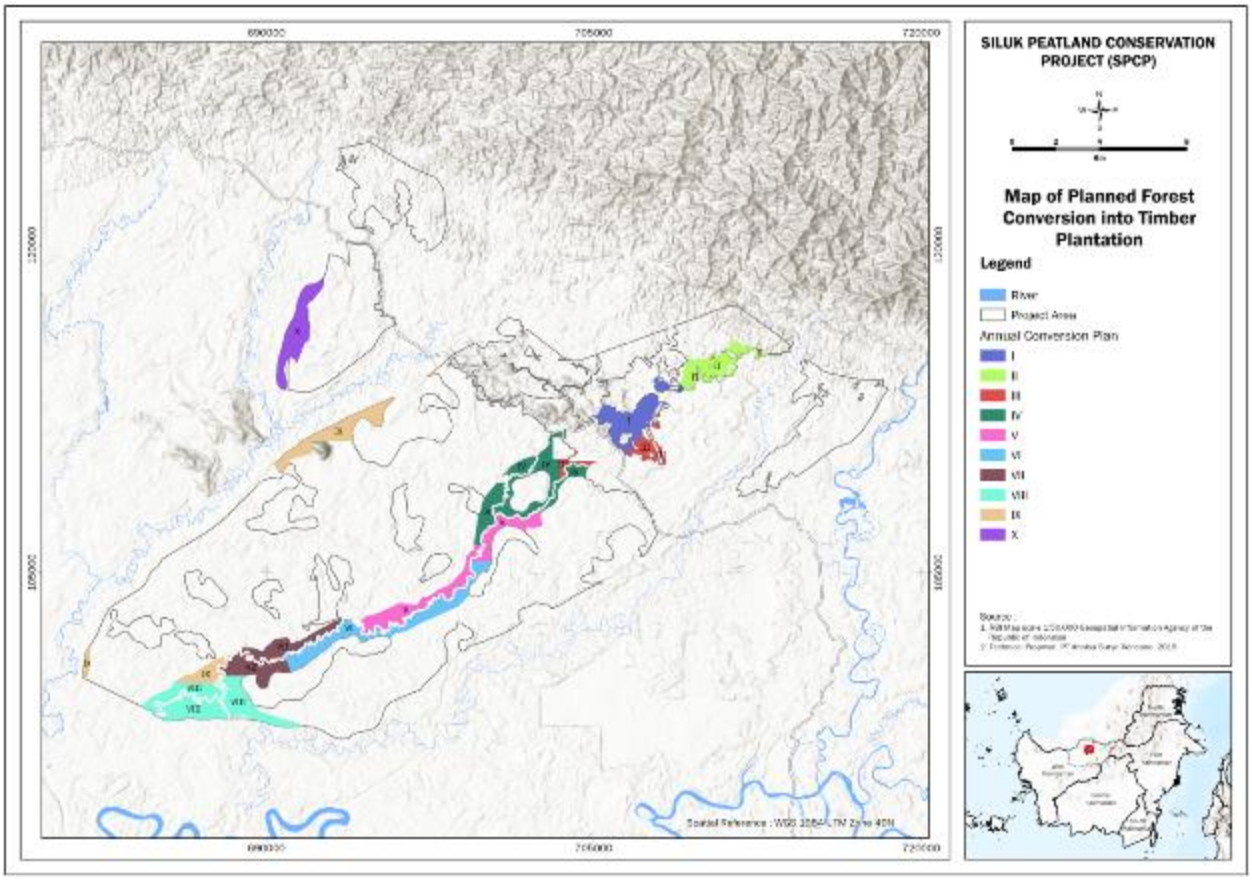


Figure 23. The plan of forest conversion into timber plantation in the baseline scenario

Table 15. The annual plan of forest conversion into timber plantation in the baseline scenario

No	RKT	Area (Ha)
1	I	412.49
2	II	267.86
3	III	167.91
4	IV	542.75
6	V	415.23
7	VI	472.08
8	VII	408.31
5	IX	705.70
9	VIII	501.38
10	X	342.77

Total	**4,236.47**

3.1.5.2.5 Reducing Emissions from Wetlands Rewetting and Conservation (WRC) in peatlands areas impacted by baseline logging operation and forest conversion

3.1.5.2.5.1 Land and water management under baseline scenario

Referring to Technical Proposal Document (*Dokumen Rencana Teknis*) there would be two types of relevant baseline land and water management which would affect GHG from peatland degradation in the absence of SPCP, namely THPB and TPTI (corresponding to APD and APDeg respectively). Tree cover removals in THPB/APD area would increase water loss in areas designated for deforestation (in planting blocks, roads and canals clearances) due to increased evapotranspiration and/or overland flow (more details are given in Section C Annex 3). Drainage canals would be constructed on THPB/APD blocks to maintain annual average water tables at least 80 centimeters depth below soil surface which is required for growing dryland species on Siluk peatland. Drainage spacing was estimated at ca. 100-300 meters interval with ca. 2-3 meters canal width and 3 meters depth.

Roads and railroads would be laid out through swathes of forest opening that, when constructed on peatlands, usually require some degree of stabilization for transportation security and reliability. Stabilization is usually done by means of compaction or vibration using heavy equipment (on mineral soils or shallow peat soils) and consolidation by using roadside drainage. Road surfaces are usually layered with compacted earth piles, timber piles or both, while railroads usually with timber piles. Map of baseline land and water management is given in Figure 24 below,

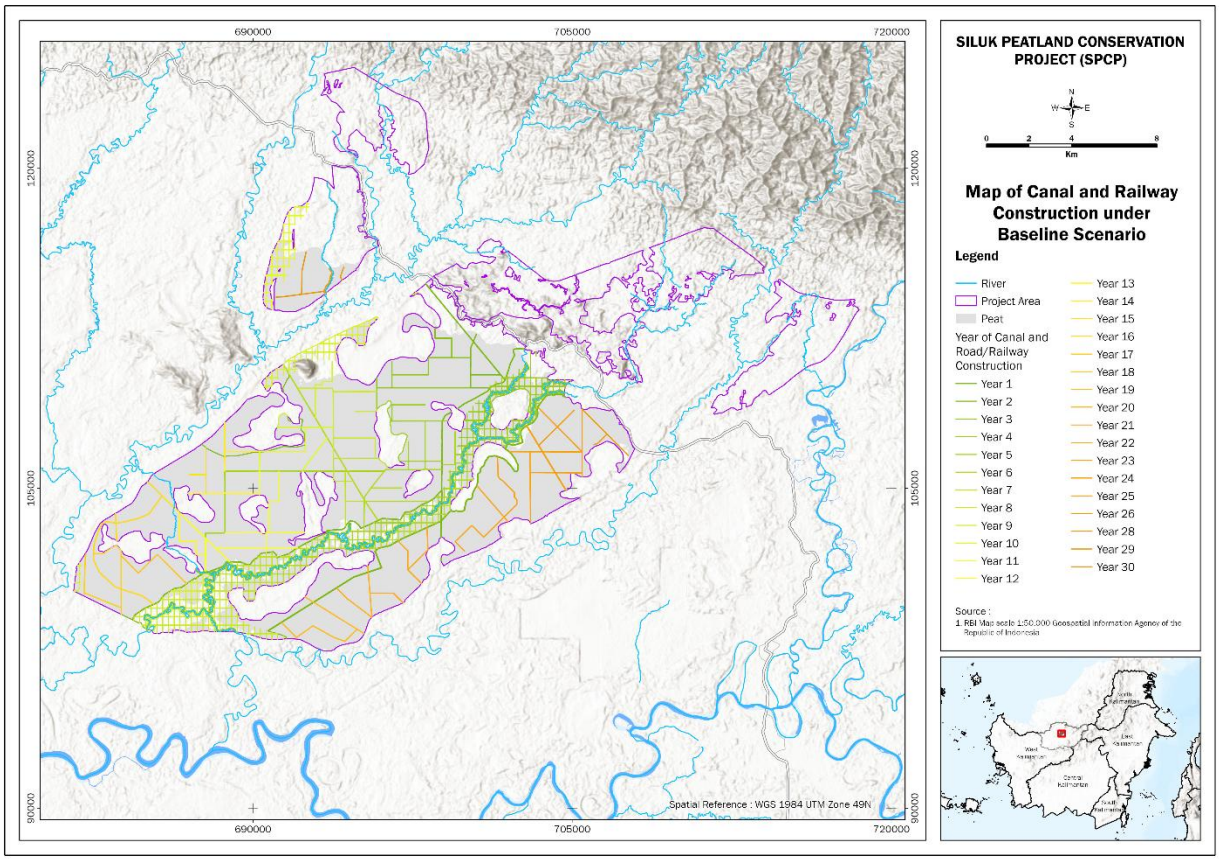


Figure 24. Baseline water management map[10]

Compaction and consolidation increase bulk density of peat soil and, together with peat decomposition, cause land subsidence. In the baseline scenario, as land elevations drop the open swathes would become the sink for lateral water flows from adjacent land in wet seasons. Here the roadside drainage would play double roles: consolidating peat soil for the roads and intercepting lateral flows before reaching the road body then discharging the excess water to nearby outlets.

Deforestation, roads and plantation canals in the baseline scenario would increase human access to the locations and their susceptibility to fire. Baseline agent would implement fire prevention practice, but as evidenced by historical hot spot data throughout similar land use, uncontrolled fire events would be inevitable, since many human-induced factors (such as tendency and common practice of fire use in the vicinity area) are beyond the baseline agent's control. Each year, every new road or canal segment or deforested patch would increase fire probability in the corresponding location and its surroundings. Forest patches that would have been affected by fire were considered as deforested patch and consequently would also increase their fire probabilities.

3.1.5.2.5.2 Land and water management under project scenario

Hydrological integrity of SPC is reflected by two main indicators: forest cover and the presence-absence of artificial drainage. Most of the area, particularly on peatland, is still covered by good tree stands.

[10] This map only shows water management aspect of the scenario. Land management aspect, as mostly driven by deforestation, is shown in **Error! Reference source not found.**

Drainage canals exist as the remains of roadside drainage constructed long ago (in 1980 - 1990) by a former logging company of the SPCP area. Total length of identified canals at present is estimated to be 140,883 meters which are distributed into three segments in two main reaches: northern and middle reaches, as given in Figure 25. The middle reach canal encompasses two peat domes and crosses the Seluan river.

All of the existing canals have not been maintained and have been subjected to gradual deposition over decades of abandonment. We estimated that initial canals were 3 to 5 meters wide and about 2 - 3 meters deep. Today the dimensions have been reduced to about 3.2 meters in width and 0.56 meters in depth based on LIDAR data and preliminary surveys conducted in 2024/2025 (see also Table 16). General canal slope ranges from 0.12% to 0.9% (see also Figure 26).

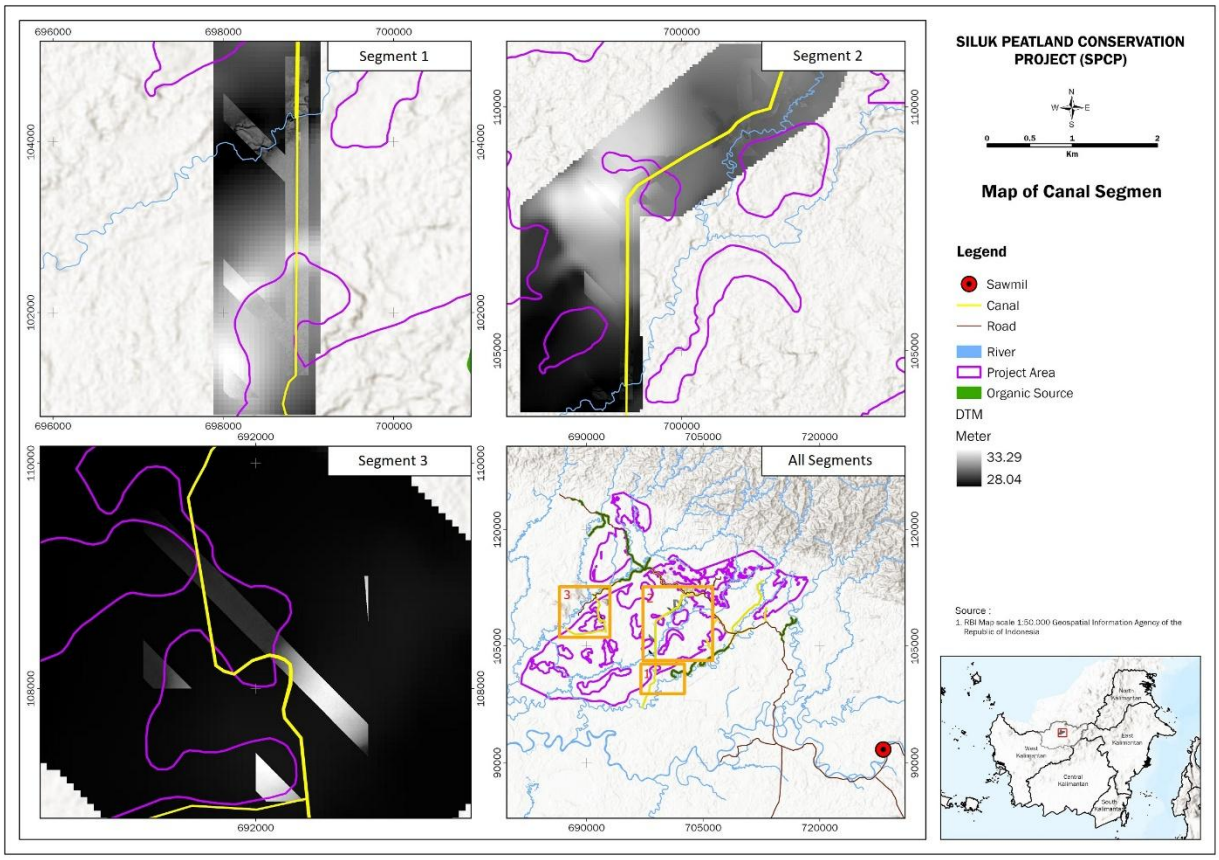


Figure 25. Existing canals in SPCP area

Table 16. Existing canal dimension in SPCP area

Longitude*	Latitude*	Width (m)	Depth (cm)	Source
698847.9	103155.2	3.8	19.5	LIDAR, Terrestrial Survey
698830.1	103155.2	4.4	23.95	LIDAR, Terrestrial Survey

698849.4	102419.8	3.5	5.65	LIDAR, Terrestrial Survey
698820.5	102402.1	4.5	2.7	LIDAR, Terrestrial Survey
698849.8	101657.9	3.2	36.5	LIDAR, Terrestrial Survey
698826.4	101656.8	3.1	39	LIDAR, Terrestrial Survey
698887.5	104252.7	4.1	124.7	LIDAR, Terrestrial Survey
698858.9	103501.4	4	44.3	LIDAR, Terrestrial Survey
698835.9	102763.7	4.4	12.475	LIDAR, Terrestrial Survey
698829.6	101985.2	4.6	26.05	LIDAR, Terrestrial Survey
698855.6	101259.8	4.4	45.1	Terrestrial Survey
703704.6	111563.5	**	20.5	Terrestrial Survey
703704.6	111563.5	**	17.5	Terrestrial Survey
703007.8	111487.9	**	75.5	Terrestrial Survey
703007.8	111487.9	**	82.75	Terrestrial Survey
702303.1	111522.9	4	52.7	Terrestrial Survey
702303.1	111522.9	3.9	31.05	Terrestrial Survey
702080.9	110808.3	5.5	78	LIDAR, Terrestrial Survey
702080.9	110808.3	4.1	22.5	LIDAR, Terrestrial Survey
701828.6	110069.5	2.5	88.25	LIDAR, Terrestrial Survey
701828.6	110069.5	2.4	47.3	LIDAR, Terrestrial Survey
701213.2	109744	3.9	66.1	LIDAR, Terrestrial Survey
701213.2	109744	3.4	45.15	LIDAR, Terrestrial Survey
700592.4	109303.6	3.1	97.625	LIDAR, Terrestrial Survey
700592.4	109303.6	3.8	65.3	LIDAR, Terrestrial Survey
699950.3	108949.3	5.2	62.3	LIDAR, Terrestrial Survey
699950.3	108949.3	5.6	55.3	LIDAR, Terrestrial Survey
701213.2	109744	3.8	24.5	LIDAR, Terrestrial Survey

701213.2	109744	4.1	23.875	LIDAR, Terrestrial Survey
698880	107950.2	2.7	27.5	LIDAR, Terrestrial Survey
698880	107950.2	3.3	20.4	LIDAR, Terrestrial Survey
698884.8	107223.6	3.8	35.55	LIDAR, Terrestrial Survey
698884.8	107223.6	5.1	23.4	LIDAR, Terrestrial Survey
698883	106463.9	3.7	57.05	LIDAR, Terrestrial Survey
698883	106463.9	3.7	52.075	LIDAR, Terrestrial Survey
698878.9	105731.9	3.6	40.25	LIDAR, Terrestrial Survey
698878.9	105731.9	3.8	36.55	LIDAR, Terrestrial Survey
705546.8	105518.6	2.2	106.2	Terrestrial Survey
705546.8	105518.6	2.6	134.89	Terrestrial Survey
705473.2	105776.3	2.4	104.06	Terrestrial Survey
705473.2	105776.3	2.2	130.81	Terrestrial Survey
705445.3	105891.3	2	98.62	Terrestrial Survey
705445.3	105891.3	2.8	128.66	Terrestrial Survey
712967.8	108743.1	1.2	59.96	Terrestrial Survey
712967.8	108743.1	1.2	68.97	Terrestrial Survey
712971	108994.2	1.8	64.3	Terrestrial Survey
712971	108994.2	2	60	Terrestrial Survey
713031	109253	1.8	73.64	Terrestrial Survey
713031	109253	1.6	66.99	Terrestrial Survey
713060.9	109520.7	1.8	69.57	Terrestrial Survey
713060.9	109520.7	1.4	70.89	Terrestrial Survey
713120.9	109772.8	1	37.3	Terrestrial Survey
713120.9	109772.8	1.4	44.99	Terrestrial Survey
713165.3	109895.6	2.6	60.28	Terrestrial Survey

713165.3	109895.6	2	58.17	Terrestrial Survey

*UTM 49S

**Some locations show almost unrecognizable canal bank

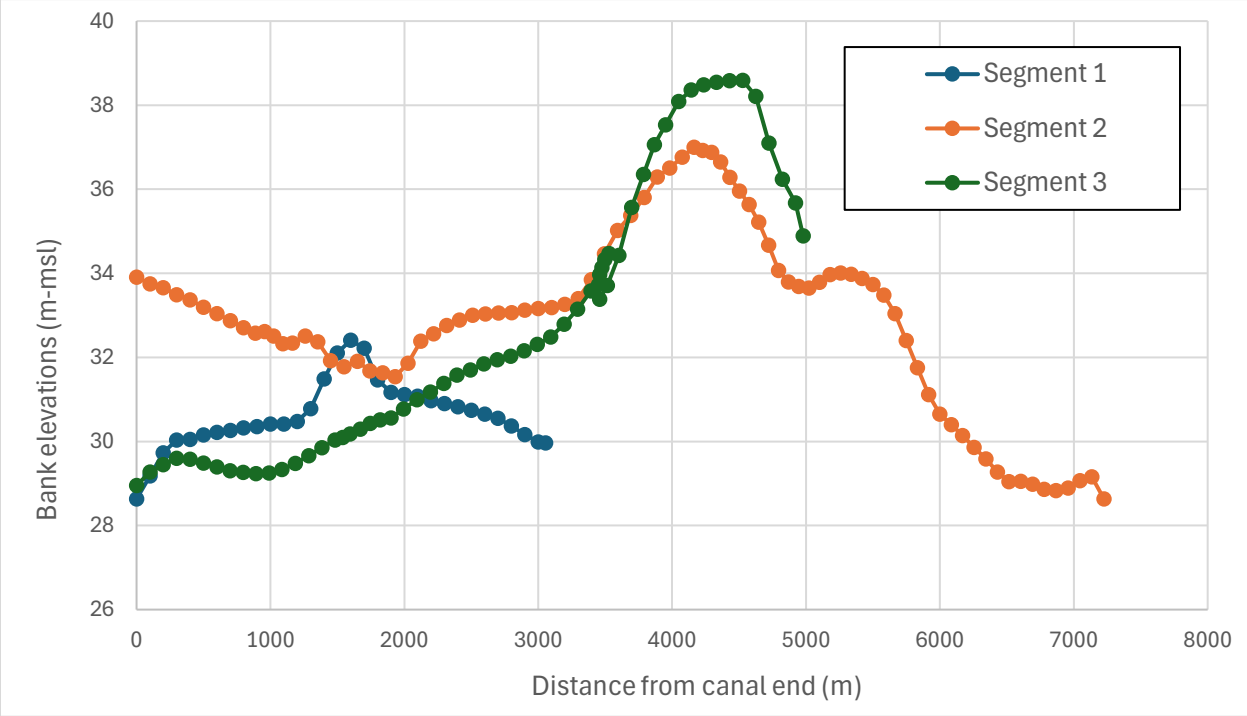


Figure 26. Canal bank elevations

Gradual deposition (or refilling) of canals has helped natural ecosystem recovery by reducing, or completely stopping, canal flow and promoting vegetation regrowth. Preliminary surveys show that most of the canal segments being surveyed have been devoid of significant flow. We cannot conclude yet whether this condition is permanent or merely an intermittent/seasonal pattern. In our ex-ante project scenario calculation, we conservatively assumed the existence of canal flow throughout the year.

In order to sustain the hydrological integrity of SPCP area, we are committed to protect existing forest stand, especially on peatland, facilitate natural vegetation recovery, and reduce unnatural water loss from the water balance. A rewetting program has been planned for 2025 (segment 1), 2026 (segment 2) and 2027 (segment 3).

Technical design of the rewetting will mimic ongoing natural deposition of the canals. In principle, we are accelerating canal-refilling by piling in, or blocking, the channels with organic debris at select locations. Exact canal blocking coordinates will be assessed later based on slope and the presence-absence of- and the magnitude of flow. Organic source will be selected in sustainable way, such as from discarded shrubs, bushes and weed debris by farmers. Tweaks and treatments may be required to

achieve desirable hydraulic properties of the organic filler, and for this, a research project will be conducted to find the most efficient method.

3.1.6 Methodology Deviations (VCS, 3.20)

SPCP did not identify any methodological deviations in the application of VM0007. The project activities and calculations have been carried out in full compliance with the requirements and procedures outlined in the methodology.

3.2 Quantification of Estimated GHG Emission Reductions and Removals

3.2.1 Baseline Emissions (VCS, 3.15)

This section outlines the baseline emissions for each of the four spatially defined project GHG accounting strata: APDeg, APDeg_SP, APD, and WRC (see Section 3.1.3.1). It begins with a description of the method for quantifying carbon stocks in aboveground vegetation, which applies to both APDeg and APD areas. Next, it details the stratification of peat biomass, specifically relevant to WRC areas. The section also presents a comprehensive assessment of baseline fire impacts across the entire Project Area. Finally, baseline emissions for each spatially explicit stratum are analyzed, following the methodologies outlined in the corresponding modules.

3.2.1.1 Tessellation of Above Ground Forest Biomass

The SPCP is committed to producing high-integrity carbon credits to fund the conservation of a unique and biodiverse inland tropical peat swamp forest ecosystem. In order to demonstrate accurate GHG reductions benefits, SPCP used Light Detection and Ranging (LiDAR) technology to precisely estimate project and baseline scenario carbon stocks/fluxes in the form of “wall-to-wall”, or tessellated maps of our project area using “module VT0005 for estimating above-ground forest biomass using remote sensing”. The resulting carbon estimation maps are categorized into three classes: (a) a carbon prediction map for all trees with a diameter greater than 10 cm, (b) a biomass prediction map for trees with a diameter exceeding 30 cm, representing the merchantable volume for peat swamp forest, and (c) a biomass prediction map for trees with a diameter greater than 40 cm, representing the merchantable volume for dryland forest.

In the following section, the project outlines the approach and provides details of data collection and processing, see Figure 27 for an overview. While VT0005 refers to aboveground live forest biomass (ALFB), we use the term AGB instead.

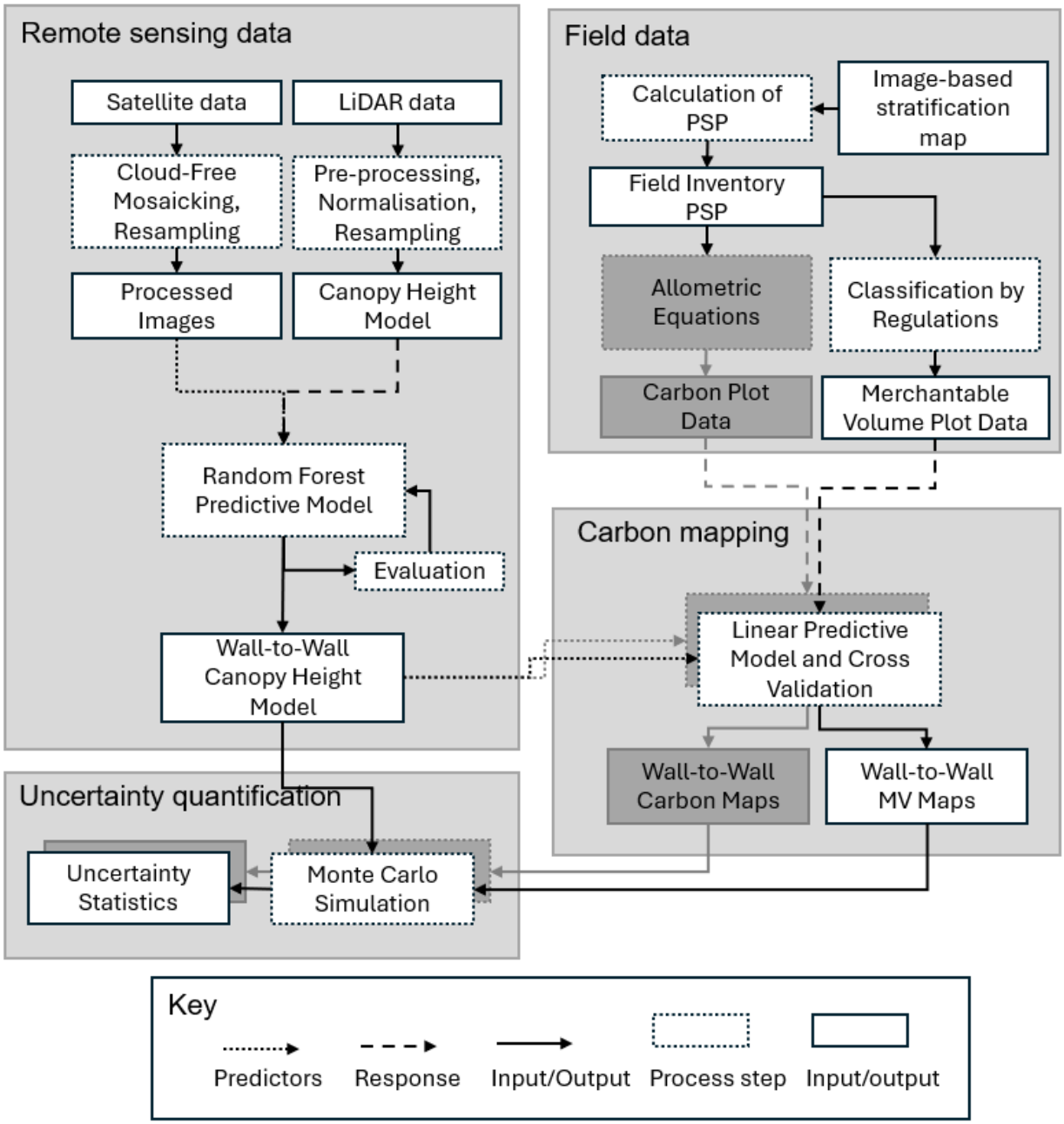


Figure 27. Data collection and processing flow diagram

3.2.1.1.1 Field Inventory

Following VT0005, SPCP uses 45 permanent sample plots (PSPs, distinct from baseline PSPs discussed in 3.1.5.2) for measuring above ground biomass. Forest inventory data collection was conducted from January to April 2023. The procedure of the establishment of PSP and parameter measurement in AGB forest inventory can be found in Annex 1. The forest inventory was carried out across five different strata, including secondary peat swamp forest, secondary dryland forest, shrub swamp, dryland agriculture, and bare land. These strata were defined in a pilot stratification using satellite imagery (Landsat 8 OLI

acquisition on July 22, 2022, Path/Row 119/059), which was classified using visual interpretation methods, and was validated and approved by the Ministry of Environment and Forestry in 2022 as part of the IHMB and IKHB process (government approved for the stratification and estimation of forest production and carbon potential). A total of 45 square nested plots, each covering 0.25 ha (50 x 50 m), were distributed using a stratified systematic approach. The required number of plots per stratum were calculated using the Winrock Plot Calculator[11], with AGB averages and standard deviations from the Indonesian National Forest Reference Level (FREL) for Deforestation, Forest Degradation and Enhancement of Forest Carbon Stock, and a target confidence level of 90%, and error level of 10%.

Within each plot, all trees with ≥10 cm diameter at breast height (DBH) were tagged and the DBH was measured. During the inventory, both local and scientific species names were identified, and general information regarding the condition of the plots was recorded. The full standard operating procedure is available in Annex 1.

The trees are also marked with permanent plastic tags which are carefully nailed into each tree. At each plot corner, the coordinates were measured using a Garmin GPS (reported accuracy – 10 m) and were marked using reflective targets (1 x 1 m) secured into the ground so that the exact plot location can be easily recognized using LiDAR intensity signal. The project recorded taxonomic information, taking leaf samples wherever possible for all tree species.

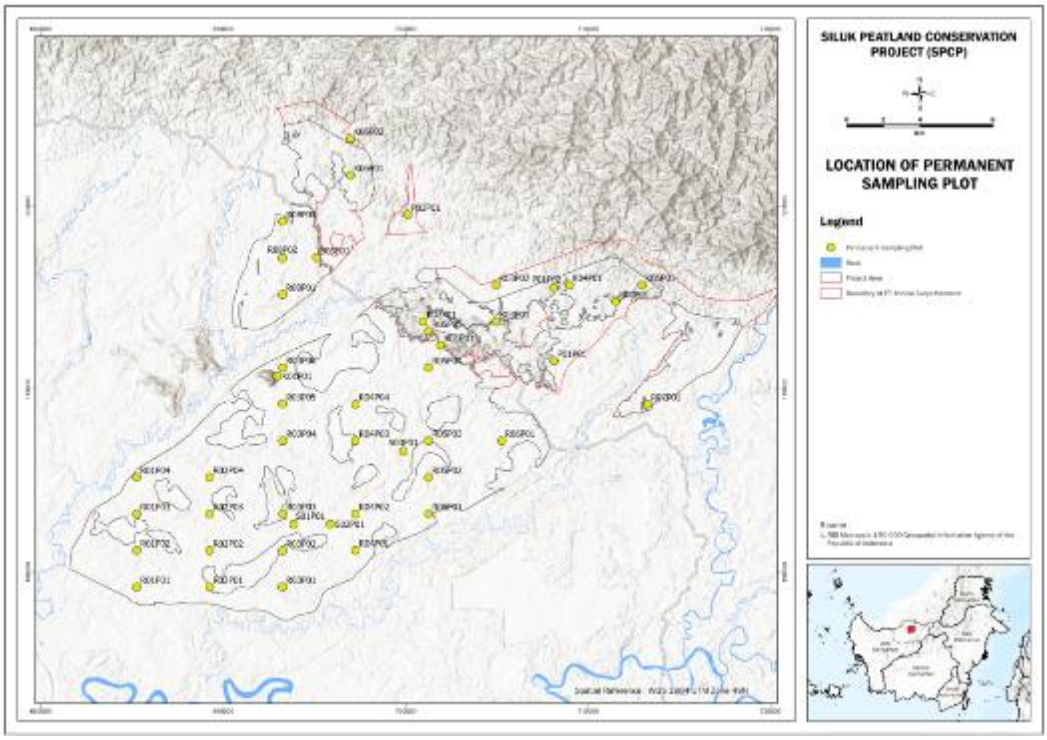


Figure 28. Location of Biomass Permanent Sampling Plot (PSP)

[11] Winrock Plot Calculator is a tool designed to determine the optimal number and size of sample plots needed for forest inventory or biomass estimation. It ensures that sampling is statistically sound, cost-effective, and representative of the forest area

3.2.1.1.2 Above-Ground Biomass (AGB)

The project aimed to produce tessellated carbon and volume density maps. AGB was calculated at the plot level according to the allometric equations from Manuri et al. (2013) utilizing measured diameter at breast height. The allometric equation was identified as the most suitable model for estimating tree biomass and carbon stock of the project area because they were developed within the same ecosystem type and geographic region: secondary dryland forest and secondary peat swamp forest in Kapuas Hulu Regency, West Kalimantan. Furthermore, the equation uses DBH as the single primary variable, as tree height and wood density were excluded due to its high measurement error rate, and it contributes to significant uncertainties in biomass estimation. Plot-level carbon was calculated by multiplying AGB by 0.47 (carbon fraction, IPCC).

Dryland forest equation

$$\ln AGB = -1.9812 + 2.4773 \ln D$$

Peatland forest equation

$$\ln AGB = -1.7767 + 2.4551 \ln D$$

3.2.1.1.3 Merchantable Volume (MV)

Using the same PSP inventory data, merchantable volume was calculated at the plot level. The identified tree species were reclassified from the species to family level and subsequently categorized based on their species group and protected status. This follows the List of Groups and Types of Wood as outlined in the annex of the Ministry of Forestry Decree No. 163/Kpts-II/2003 concerning Grouping of Timber Species as the Basis for Imposition of Forestry Fees. The wood classification is divided into three main categories including a Meranti group (Commercial Group One), a Mixed Forest Wood (Commercial Group Two), and an Ornamental Group.

The protection status of identified tree species is determined in accordance with the Regulation of the Ministry of Environment and Forestry No. P.20/MENLHK/SETJEN/KUM.1/6/2018 concerning Protected Plant and Wildlife Species. This regulation lists fifteen protected tree families, including Dipterocarpaceae, which predominantly constitutes the forested area within the PT ASK concession. However, none of the protected species within this family were found within the concession area. Based on the annex of the regulation, all 8.301 identified trees within the PT ASK concession area has been classified as non-protected species.

In the calculation of timber merchantable volume, the diameter at breast height (DBH) limitation applied is 30 cm for wetland ecosystems and 40 cm for dryland ecosystems. These criteria align with the Regulation of the Ministry of Forestry No. P.65/MENHUT-II/2014 about Revision of Ministry of Forestry Regulation No. P.11/MENHUT-II/2009 concerning Silviculture System on Timber Forest Product Utilization License in Production Forest. According to this regulation, secondary peat swamp forests are managed under the Indonesia Selective Cutting and Planting System (TPTI), which implemented on a

30-year harvest rotation, with trees eligible for harvesting having a DBH of at least 30 cm. In secondary dryland forest, the applicable silviculture system is the Selective Cutting and Line Planting (TPTJ), with a rotation period of 25 years and a DBH requirement of at least 40 cm for harvesting.

The calculation of merchantable volume is limited to trees classified under the Meranti Group (Commercial Group One), Mixed Forest Wood (Commercial Group Two), and Ornamental Wood (Commercial Group Three). This limitation is implemented as the calculation is intended to quantify emissions resulting from timber harvesting activities. Moreover, forest utilization business permit (PBPH) does not harvest protected tree species or those classified under the Ornamental Group. This practice aligns with the Regulation of the Ministry of Environment and Forestry No. P.20/MENLHK/SETJEN/ KUM.1/6/2018, which prohibits the exploitation of protected species.

3.2.1.1.4 LiDAR data acquisition and processing

LiDAR technology utilizes laser pulses to precisely measure the distance between the sensor and target objects. When this measurement is repeated hundreds of thousand times per second from a drone flying above the canopy, it is possible to accurately and precisely model the three-dimensional structure of the forest across the landscape (Figure 29). Forest structure correlates strongly and directly with AGB and forest carbon, especially compared to optical remote sensing methods, which actually measure light reflectance from different plant materials and tend to saturate at higher biomass levels. This method enhances the accuracy of carbon stock estimation and distribution, supporting robust forest monitoring and reporting. LiDAR can also be used to generate high quality digital terrain models (DTM), because the laser pulses penetrate through vegetation canopies to capture the ground surface coordinates. DTMs can be processed further to build a peat depth model by combining it with field peat depth sampling, thus enhancing the accuracy of hydrological modelling and carbon stock estimation in peat area (Section 3.2.1.2).

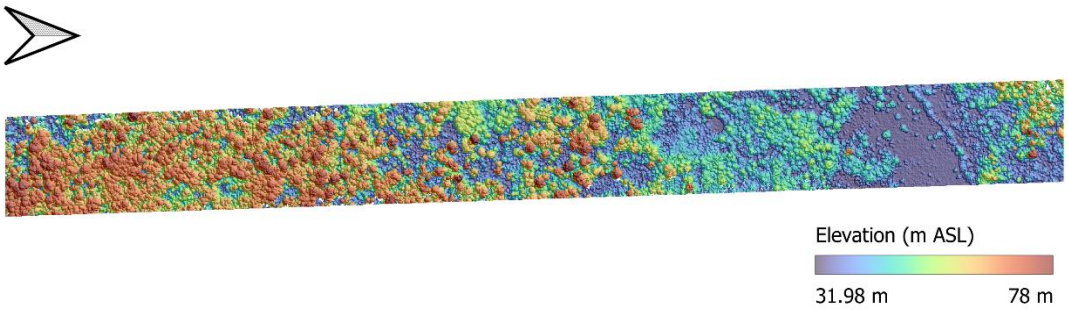


Figure 29. Example of a digital surface model of an example high- and low-density forest area

In September and October 2024, LiDAR data were collected in transects distributed across the entire site, covering approximately 30% of the total project area (11,882 ha in total). The project opted for this extensive and comprehensive transect network of remote sensing sampling units (RSSUs) to ensure that spatial autocorrelation would be adequately captured in the sampling design. This was calculated in a *post-hoc* analysis following generation of the tessellated biomass map and showed that our LiDAR

transects cover approximately 700 km across the entire site, significantly longer than the 1,206 m range of biomass spatial autocorrelation (r = 12 pixels) which was calculated using VT0005 Section 5.1.2.1. Using these equations, and very conservative values for mean Aboveground Live Forest Biomass (AGB = 254 t d.m. ha^{-1}), spatial correlation factor (ρ(d) = ρ(1) = 0.78), number of pixels per RSSU (m = 2(r) = 24), the recommended number of RSSUs of 24 pixels was 163, equating to a minimum survey area of 3,923 ha.

The project used a DJI M350 Matrice multirotor drone and Zenmuse L2 LiDAR scanner (Figure 30) to collect point cloud and RGB ortho mosaic data. This sensor has a vertical/horizontal precision of 4-5 cm, can record 5 pulse returns (giving better canopy penetration), and collects 240,000 points per second. The drone was flown at 180 m at 10 m s^{-1} forward ground speed, with terrain following enabled for all transects. We maintained 50% lateral overlap between out and return legs to maximize data quality and coverage. The lidar datasets were corrected using post-kinematic processing (using *Badan Informasi Geospasial* ground station corrections, station ID: CPUT). In total, the locations of 13 independent control points were recorded using a GNSS receiver to assess geometric accuracy of the LiDAR data, resulting in a combined X, Y, Z RMSE of 0.09 m for the entire survey. A full survey report is available in Annex 4.



Figure 30. Drone operations from a clearing near the project area forest

The resulting LAS file was then noise filtered and classified using Terrasolid software. A digital terrain model was produced at 0.5 m resolution (for peat surface modelling), and used to normalize the point cloud using the LidR package in R.

3.2.1.1.5 Canopy Height Model (CHM) production and tessellation

Above-ground biomass can be predicted successfully from canopy height model (Figure 32). While there are two global CHMs available freely online: META (Mapping Ecosystem and Tree Architecture) from the World Resources Institute (WRI), and the dataset from Lang et al (2023) these models are not as accurate or precise as a CHM produced from airborne LiDAR (see Table 17 for references). However, as our LiDAR dataset is not wall-to-wall, the project leveraged our LiDAR dataset as a training and testing

response variable in a predictive Random Forest model, using these global CHMs among other wall-to-wall satellite predictors to produce a corrected wall-to-wall CHM.

Firstly, a 50 m CHM was produced using the LiDAR dataset alone for the transects where data were available. This was achieved by normalizing the point cloud (DTM subtracted from point elevations) at 10 m resolution to account for microtopographic heterogeneity. After normalization, the CHM was produced at 50 m resolution (as per VT0005) using the lidR package in R. Secondly, a stack of wall-to-wall predictors was prepared in Google Earth Engine (see Table 17), clipped to a 1 km buffer extending beyond the project boundary. Thirdly, a training and testing dataset was created by extracting CHM values for each pixel (n=44,086) as the response variable, with predictor pixel values as the explanatory variables. We created a predictive model with (70/30 split training/testing) in the random forest and caret packages in R. With such a large amount of data points, cross-validation was not necessary. The resulting wall-to-wall CHM is highly accurate RMSE= 2.6 m, R2= 0.87, bias= 0.01 m, (Figure 32), and was then used as the sole predictor in the parametric predictive model used to upscale AGB (Figure 36).

Table 17. Satellite-derived remote sensing predictors used to produce a LiDAR-corrected, wall-to-wall/tessellated Canopy Height Model. These processed datasets were projected to WGS84 UTM 51N, resampled to 50 m (minimum mapping unit) and clipped around a 1 km buff

Remote Sensing Predictor	Bands	Export resolution (m)	Timeframe
Sentinel 2	All optical bands, vegetation indices (NDVI, EVI, MSAVI, NDWI)	10	01/01/2024-31/12/2024
Sentinel 1 SAR	Radar Vegetation Index	10	01/01/2023-31/12/2024
FABDEM[12]	DTM	30	2020
ALOS PALSAR-2 SAR	HH, HV	30	2023
Meta/WRI CHM[13]	CHM	10	2009-2020
ETH (Lang) CHM[14]	CHM	30	2020

12 Hawker, Laurence, Peter Uhe, Luntadila Paulo, Jeison Sosa, James Savage, Christopher Sampson, and Jeffrey Neal. "A 30m global map of elevation with forests and buildings removed." Environmental Research Letters (2022).

13 Tolan, J., Yang, H.I., Nosarzewski, B., Couairon, G., Vo, H.V., Brandt, J., Spore, J., Majumdar, S., Haziza, D., Vamaraju, J. and Moutakanni, T., 2024. Very high resolution canopy height maps from RGB imagery using self-supervised vision transformer and convolutional decoder trained on aerial lidar. Remote Sensing of Environment, 300, p.113888

14 Lang, Nico, Walter Jetz, Konrad Schindler, and Jan Dirk Wegner. "A high-resolution canopy height model of the Earth." arXiv preprint arXiv:2204.08322 (2022).

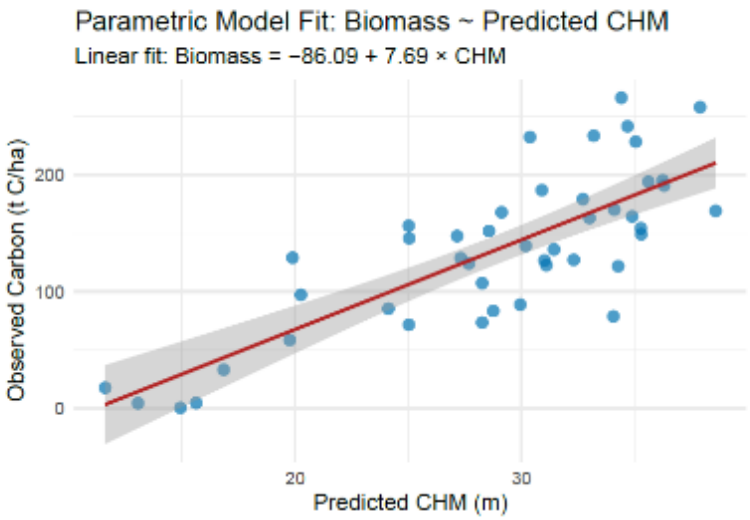


Figure 31. Above-ground forest biomass carbon (from PSPs, n=45) versus wall-to-wall canopy height model (m).

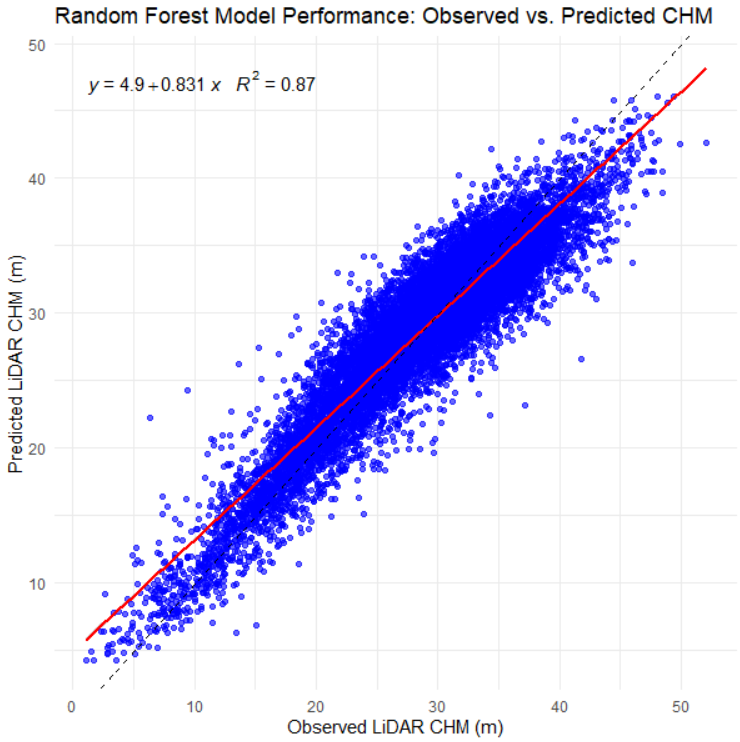


Figure 32. Random forest CHM model performance (n= 13,224), dashed line denote unity

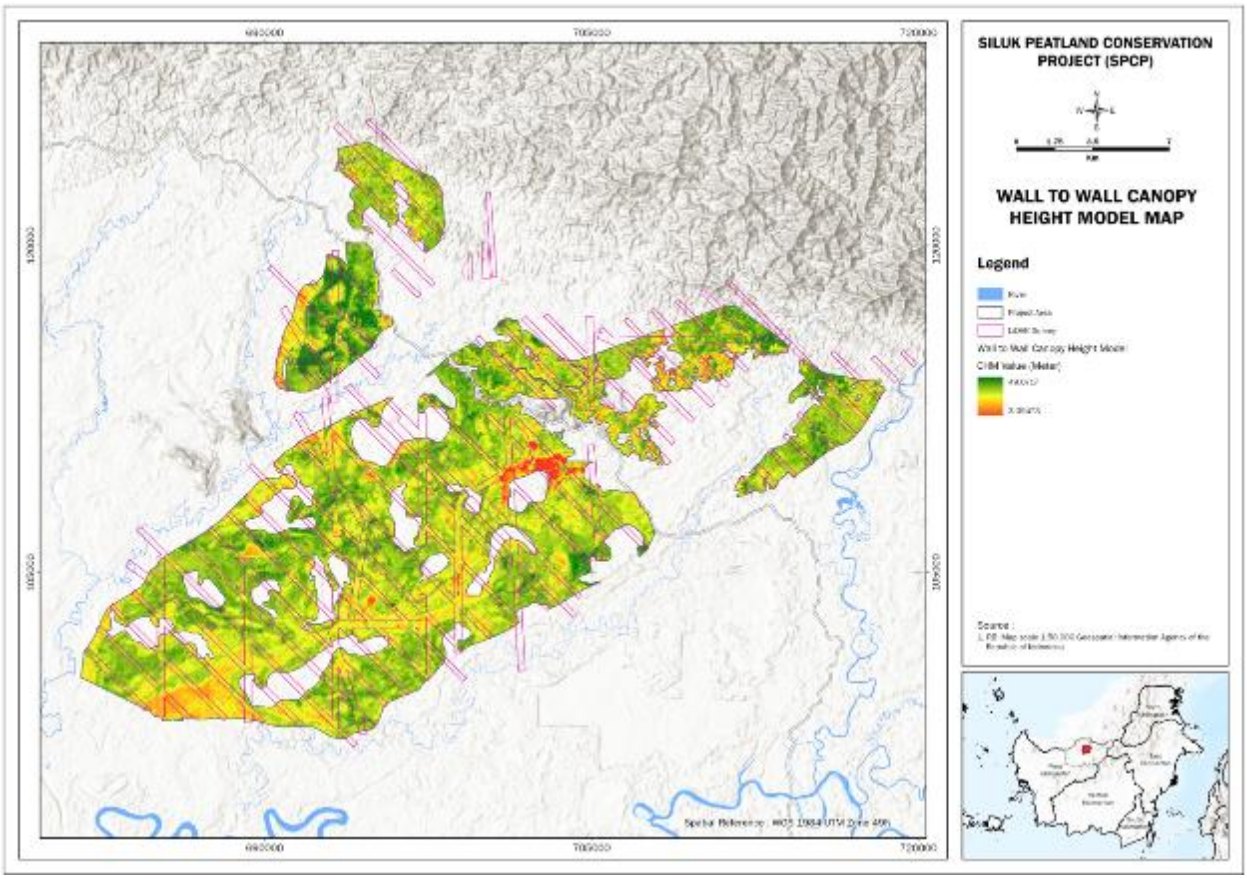


Figure 33. Tessellated canopy height model (m) overlaid with LiDAR survey transects

Using this regression slope, we calculate error statistics which can be used in AGB uncertainty estimation. The error of the wall-to-wall CHM is RMSE = 2.6 m, which translated to AGB using the regression slope, equates to approximately 20 tC ha^{-1} error.

3.2.1.1.6 Above-ground biomass upscaling

To develop a robust biomass estimation model, predictor variables were extracted at PSP locations. These predictors included spectral bands from Sentinel-2, backscatter values from PALSAR, and canopy height estimates derived from LiDAR and other remote sensing sources (Table 17). A correlation analysis revealed that the tessellated CHM (previous section) was the best predictor of AGB and MV, and so was the only predictor used. Figure 31 and Figure 36 demonstrate the spatial relationship between canopy height and AGB, where the average canopy height within 50 m pixels predicts aboveground carbon.

The project implemented a parametric biomass modeling approach consistent with VT0005, using a simple linear regression model to predict aboveground live forest biomass (AGB) from tessellated CHM variable. Given our limited AGB dataset from PSPs (45 locations), this restricted both the training and testing potential of a predictive model, even with cross-validation there is a risk of high variance error metrics due to the limited validation dataset. To maximize the potential of both our PSP data, and LiDAR-predicted CHM, we assessed the precision of our linear regression model (Biomass ~ Predicted_CHM), using Monte Carlo cross-validation validation (Cross-Validation Visualized: A Narrative Guide to Advanced Methods),with 10,000 iterations and a 70/30 train/test split (far exceeding the VT0005 requirements of K ≥10 fold cross validation). For each iteration, RMSE, R^2, and Bias were recorded, and their means were summarized to produce robust model diagnostics. This approach was selected because it has greater sampling diversity (10,000 iterations of training and testing datasets used) than (e.g.) k-fold cross validation, leading to more stable error estimates and a better approximation of real-world variability.

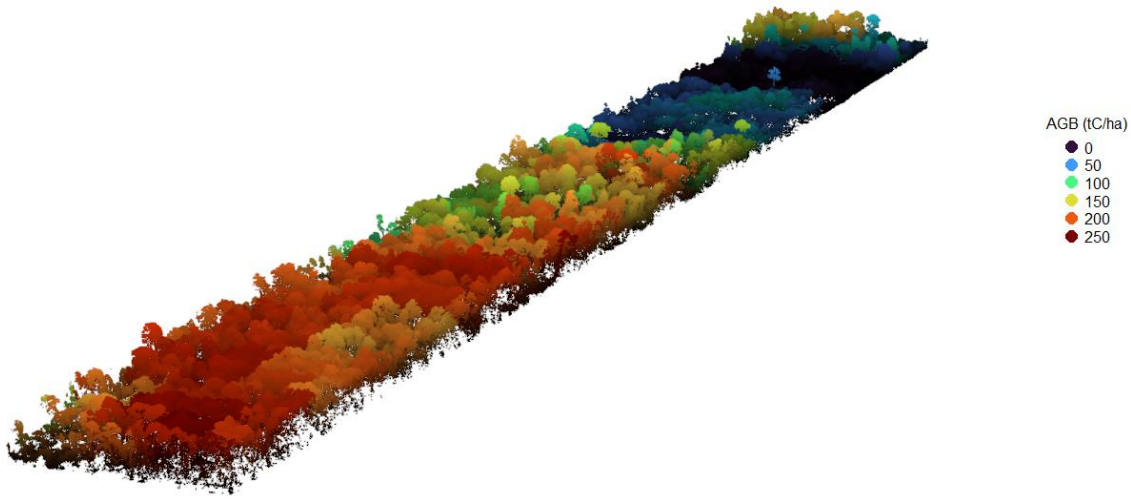


Figure 34. 3D point cloud of a high and low density forest area (as in Figure 33), coloured by above ground carbon density (50 m). The areas with highest average canopy also have the highest carbon density (dark red)

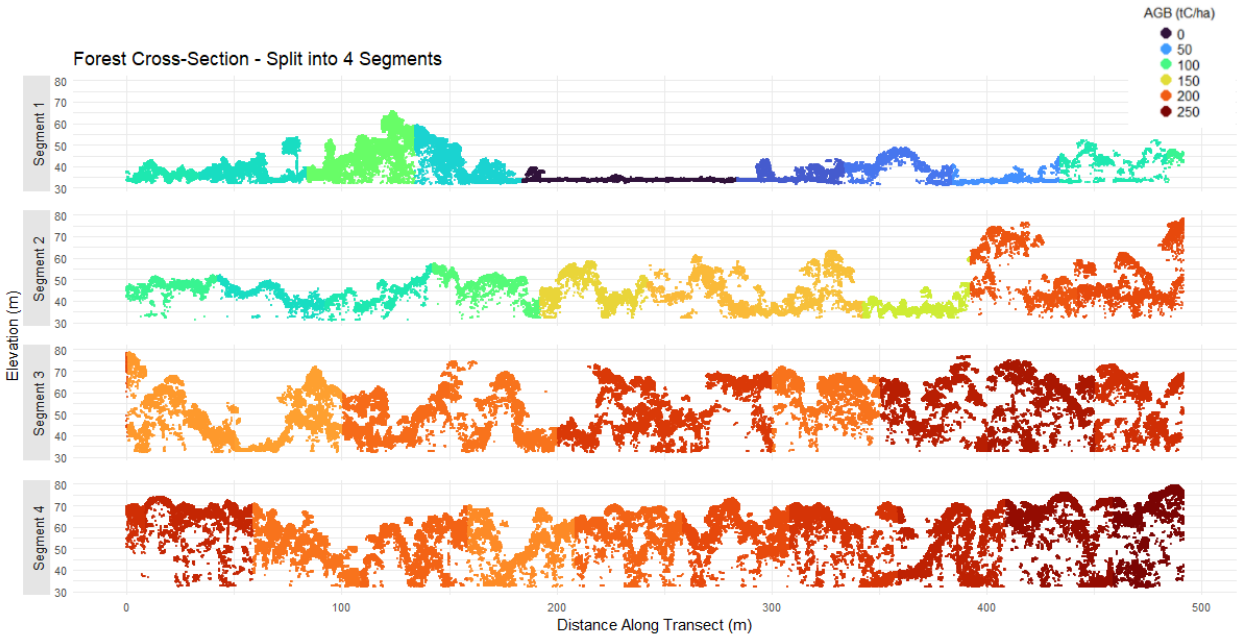


Figure 35. Point cloud cross section of the sample high and low density forest areas shown in Figure 32, coloured by aboveground carbon (50 m resolution)

Following model validation, the final regression model was fit using the training dataset and applied to the wall-to-wall predictor raster to produce a continuous AGB (carbon) prediction map. This satisfies VT0005 requirements for generating a pixel-wise biomass surface using a consistent, interpretable parametric modelling framework.

Table 18. Parametric linear regression model error statistics

Statistic	Stock map		
	Carbon Density (tC ha^{-1})	MV 30 cm (m^3 ha^{-1})	MV 40 cm (m^3 ha^{-1})
RMSE	40.99	74.44	62.40
R^2	0.62	0.38	0.37
Bias	-0.77	-1.02	-1.19

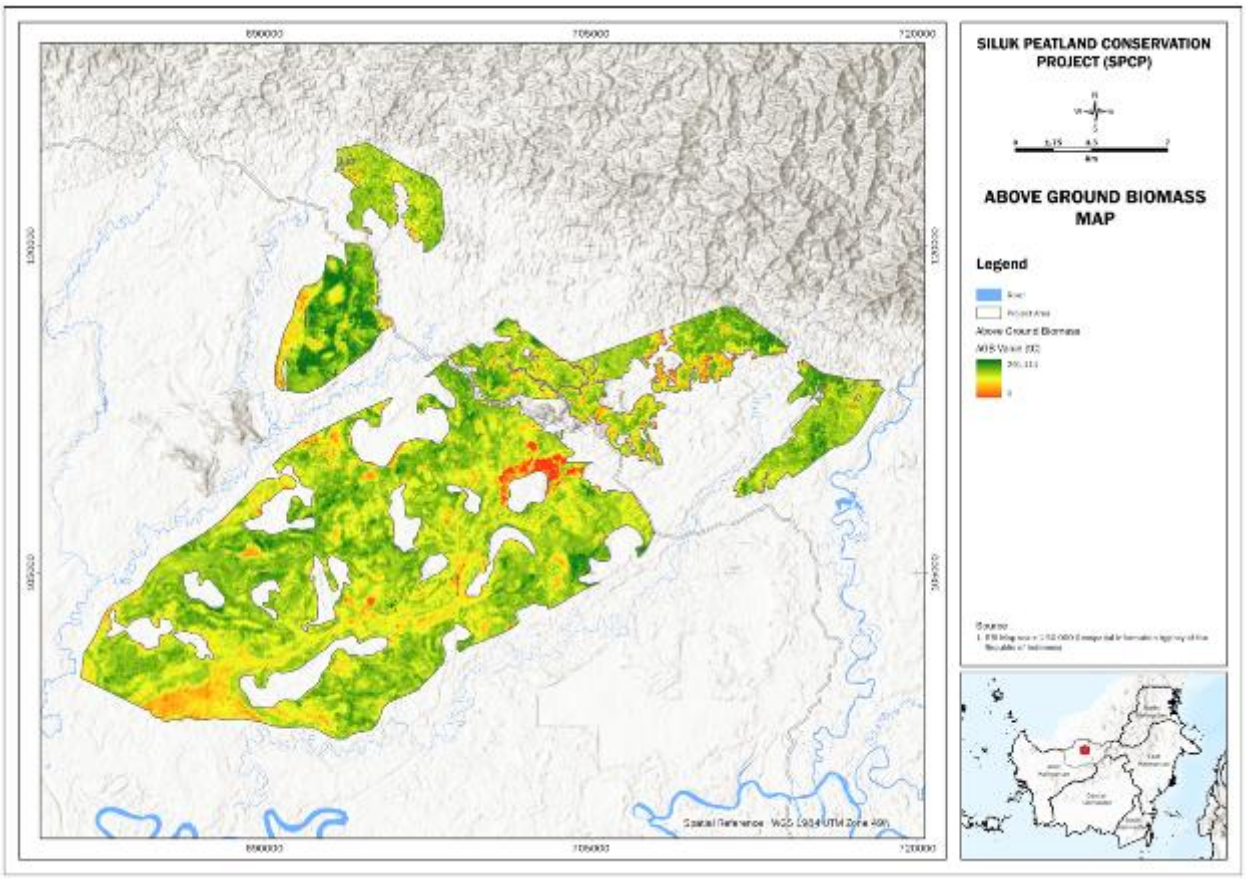


Figure 36. Above Ground Biomass Map

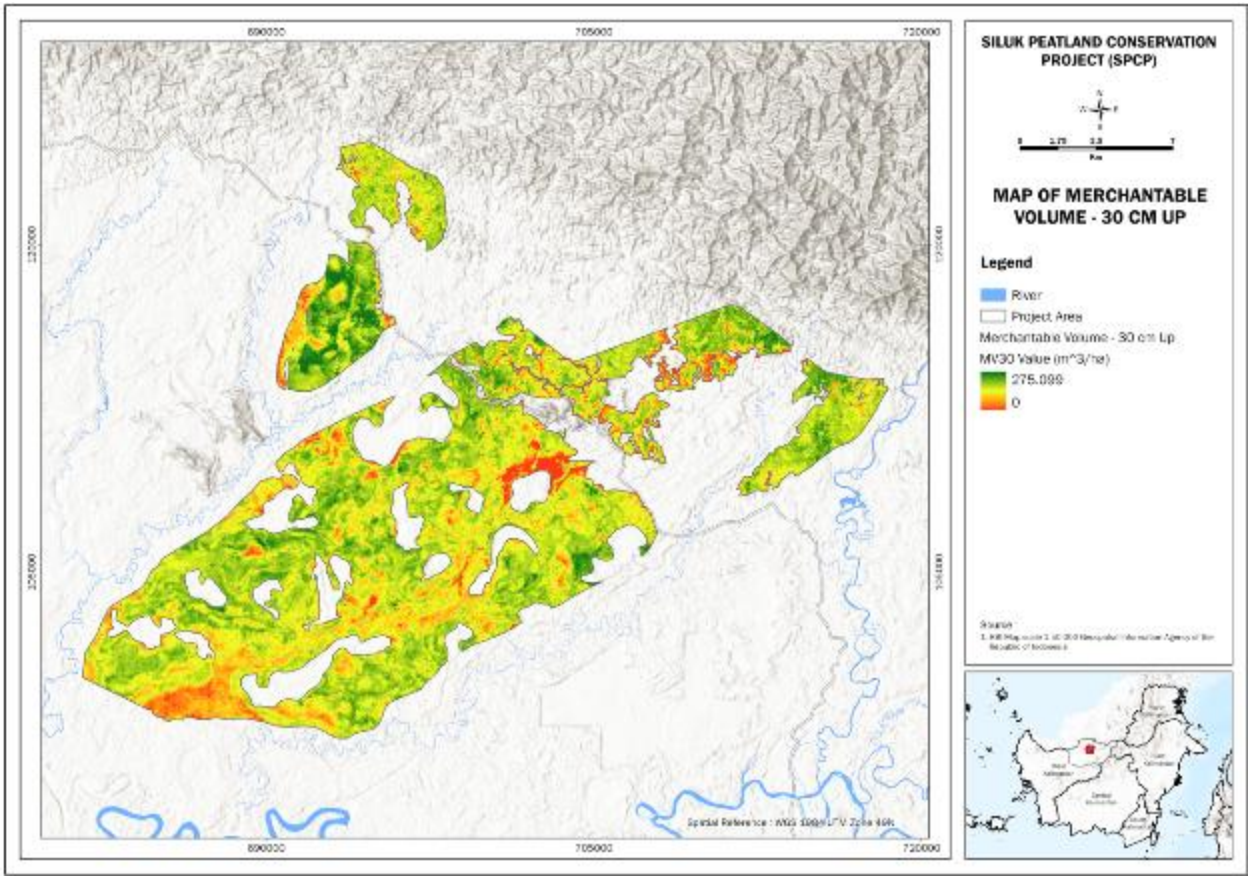


Figure 37. The map of Merchantable Volume - DBH 30 cm up

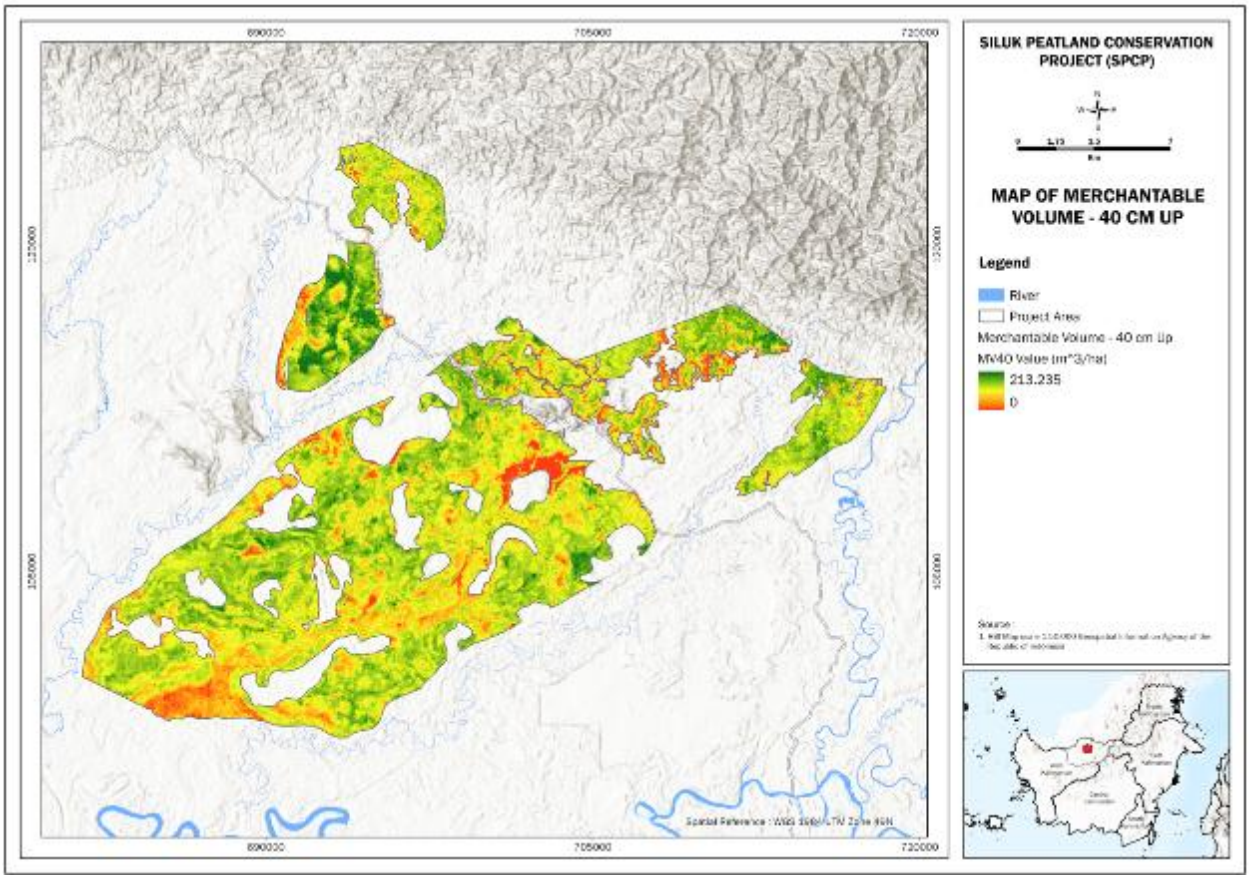


Figure 38. The map of Merchantable Volume - DBH 40 cm up

3.2.1.1.7 Estimation of Aboveground Biomass and Uncertainty

Following X-UNC, uncertainty in baseline carbon stock in eligible pools should be calculated by propagating errors across pools and sources of errors. For the carbon in aboveground biomass ($C_{AB\text{-}tree}$), the sources of error for establishing AGB stock are as follows: a) field data collection errors, b) allometric model errors, c) LiDAR data collection errors, d) LiDAR data processing, e) errors outside of LiDAR predictions.

Here the project describe how the project has made every effort to minimise uncertainty in its project design and standard operating procedures (SOPs).

a) Asner et al (2013)[15] state that *"Measurement errors of trees in the field are generally thought to make a vanishingly small contribution at the plot level".* In general, manual measurements are considered the "reference" datasets against which remote or modelling assessments are compared. Therefore, these errors are considered minimal, and are accounted for in the AGB regression error estimate.

[15] High-fidelity national carbon mapping for resource management and REDD+ | Carbon Balance and Management (Asner et al. 2013)

b) The most appropriate allometric equations were selected because they were derived from destructive harvests conducted locally in both peatland and dryland forests of Kapuas Hulu Regency. Further the allometric models only use DBH, so errors in (e.g.) height or species identification are avoided. These errors are considered minimal, and are accounted for in the AGB regression error estimate.

c) LiDAR data collection errors are deemed *de minimis* because it is a high precision survey technique, with an average XYZ error of 0.08 m compared to GNSS-derived ground control points (see survey report in Annex 4). Furthermore, using VT0005 we calculated that a minimum survey area of 3,933 ha was required, however we collected more than 3 times this area with LiDAR data (11,882 ha) systematically in transects across the entire site. We then used the LiDAR and satellite datasets to create a wall-to-wall canopy height model (56,222 ha) which is over 14 times greater than the minimum survey requirements. These errors are considered de minimis given high accuracy statistics and large sample size and wide distribution of the data.

    1. Further errors can be borne from misalignment of forest inventory PSP locations in the LiDAR datasets- whereby the canopy causes GPS errors and so the wrong field biomass values are assigned to the wrong canopy metrics in the LiDAR data. We avoided this misalignment through laying reflective targets at the corners of PSPs, and then identifying the corners of the plots in the LiDAR data by filtering by "intensity" (i.e. a metric of a target surface's reflectivity, which is higher than vegetation or the forest floor). Therefore, these errors have been reduced as far as possible.

    2. The quality of the CHM relies heavily on the production of a good quality digital terrain model (DTM). The underlying DTM derived from LiDAR was produced using Inverse Distance Weighting methods, then manually filtered, noise controlled and corrected by professional data analysts, resulting in a 0.5 m DTM suitable for hydrological modelling. These errors have been accounted for in the CHM prediction uncertainty.

d) Errors arising from the creation of a wall-to-wall CHM were estimated using the LiDAR dataset to validate model performance. As these errors are not intrinsic, and propagate through to AGB calculations, these were included in the uncertainty calculations.

To holistically capture uncertainty across the modelling chain, we implemented a nested Monte Carlo simulation (10,000 iterations) propagating errors from both stages:

1. CHM prediction uncertainty: (±2.6 m RMSE)

2. AGB regression uncertainty: (±40.99 tC ha^{-1})

In each iteration, this involves the simulation of a site-wide CHM using the wall-to-wall CHM which is perturbed by random noise (each pixel could be perturbed by noise randomly drawn from a normal distribution with standard deviation = 2.6 m). This creates a perturbed CHM map (first stage of error), which is then used to create a site-wide AGB map by applying the regression coefficients from the predictive model. Secondly, this map is perturbed once again using random noise representing the AGB

regression uncertainty (again, random number drawn from the normal distribution with -0.77 tC ha^{-1} bias and 40.99 tC ha^{-1} standard deviation).

This simulation approach allowed for a realistic propagation of prediction uncertainty at both CHM prediction and AGB regression stages across the AOI and enabled estimation of a 95% confidence interval for total carbon (in tonnes C). As per the requirements in VT0005, the project generates uncertainty estimates in the form of percentages (95% CI), R code and model outputs are available to the VVB auditors.

Table 19. Nested Monte Carlo simulation result of stock maps, and uncertainty statistics.

Stock map	Lower 95% CI	Mean stock	Upper 95% CI	Half-width Uncertainty (%)
AGB (t C)	4,905,623	4,913,753	4,921,852	0.17
MV 30 cm (m^3)	4,249,191	4,262,178	4,275,230	0.31
MV 40 cm (m^3)	3,220,571	3,230,983	3,241,537	0.32

3.2.1.2 Stratification of Peat

3.2.1.2.1 Distribution, thickness and carbon stock of peat

This project adopted FAO and USDA definition of peat soils (minimum 0.4 m thickness of organic deposit) as the threshold value to differentiate between peat and mineral soils (Soil Survey Staff, 2022). Peat soil stratification was performed by following field methods set out by VMD0016. Peat depths were sampled in 2021 – 2023 at 120 locations using a manual peat auger along 7 transects arranged perpendicular to the expected topographic contour of the peat domes. The transects were placed randomly and manually/visually distributed on map as even as possible. At each location, at least 3 samples were taken and averaged to control local heterogeneity. The SPCP firstly created a peatland extent dataset by comparing a modelled peat dome surface (Dupuit – Forchheimer parabola to simulate a simple hydrology and long-term equilibrium dome-shaped feature of Siluk peatlands) with a corrected digital terrain model (DTM), whereby DTM values significantly higher than the predicted peat dome model had low probability of being peatland. Peatland extent was conservatively assumed to be limited to a 100 m buffer around riverbanks. Data from field measurements were used to develop a peat soils distribution map, whereby peat thickness was calculated as the difference between a modelled basin elevation (as a function of distance from peatland edge) and peat surface (from the DTM). More details on peat thickness modelling are given in Annex 3. As shown in peat distribution map (Figure 39) below, it can be concluded that 60 percent (17,003.09 hectares) of the project area is covered by peat soils, where 41 percent (11,709.67 hectares) being at least 3 meters thickness. Peat thickness distributions are summarized in Table 20 below.

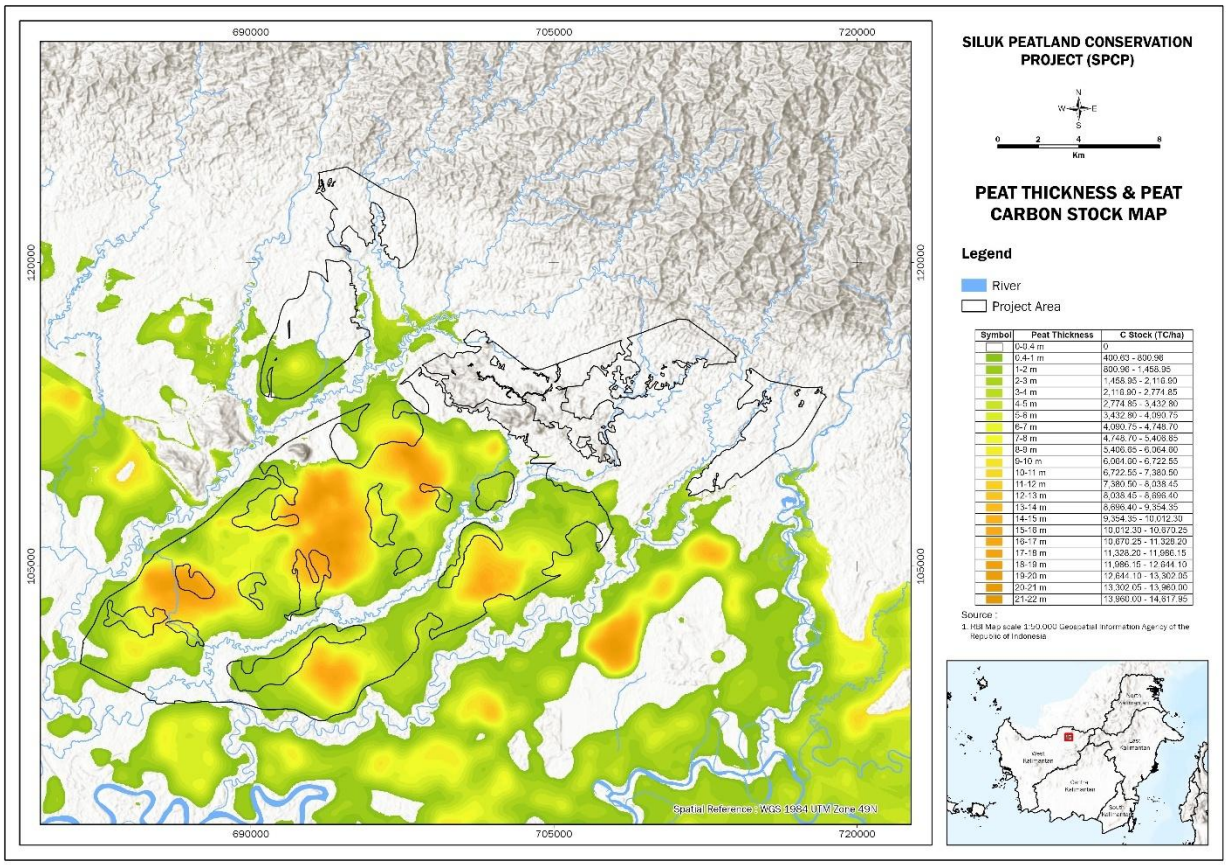


Figure 39. Peat thickness and carbon stock map

Table 20. Peat thickness distributions summary of the project area

Peat thickness (m)	Area (ha)
Non peatland (<0.4)	11,503.09
0.4 – 1	1,122.40
1 – 2	2,074.40
2 – 3	1,946.43
3 – 4	1,603.75
4 – 5	1,310.33
5 – 6	1,330.01
6 – 7	1,142.71

7 – 8	887.47
8 – 9	747.13
9 – 10	618.85
10 – 11	613.82
11 – 12	555.92
12 – 13	494.38
13 – 14	419.54
14 – 15	291.69
15 – 16	241.68
16 – 17	229.51
17 – 18	205.19
18 – 19	494.38
19 – 20	419.54
20 – 21	95.67
21 – 22	8.10
Peatland	17,003.09
Total	**28,506.18**

Carbon stock distributions of peat soils were mapped using the peat thickness distribution data and parameters carbon content (C_c) and Bulk Density (BD) of peat soil. Carbon content of the peat soil was estimated as 0.5 (Page, et.al., 2004). Undisturbed samples for measuring Bulk Density of peat soil were taken in the field between 2021-2023 at 82 locations using steel ring at random depths between 0 – 1.2 m below the soil surface. Bulk densities were measured following standard gravimetric method (Al-Shammary, et.al., 2018).

Vertical variations of bulk density were considered by incorporating vertical bulk density empirical profile of the peat soil. We fitted measured bulk density values against depths from soil surface and obtained the following pattern (More details in Annex 3, Bulk density of peat soils).

$$\rho_b = f_c + \beta e^{-kZ}$$

Where:

ρ_b : Bulk density of peat soil at any depth (kg m^{-3})

β : Top layer incremental factor of bulk density (231.74 kg m^{-3})

f_c : Average base (minimum) bulk density near basal contact (131.59 kg m^{-3})

k : Empirical slope coefficient of the curve, describing the rate of vertical spatial decay of bulk density (8.10 m^{-1})

Z : Variable depths below soil surface (m)

Considering the vertical variations, applying mean function theorem to the above equation, average bulk density over the vertical profile can be calculated as follows

$$\bar{\rho}_{b,i} = \frac{1}{D_i} \int_0^{D_i} (f_c + \beta e^{-kz_i}) dZ$$

Where:

$\bar{\rho}_b$: Vertically averaged Bulk Density of peat soil (g cm^{-3})

D : Peat thickness (m)

f_c : Average minimum bulk density near basal contact of peat soils (g cm^{-3}). An empirically fitted parameter

β : Bulk density increment at (near) soil surface (g cm^{-3}). An empirically fitted parameter.

k : Spatial decay coefficient at vertical direction (m^{-1}). An empirically fitted parameter

Z : Variable depth below soil surface (m)

i : Location index (represented by grid index, see also sub section Spatial and Temporal Discretization)

Carbon stock distributions of peat soil at the project start date were calculated spatially by using formula:

$$C_i = D_i \times C_c \times \overline{\rho}_{b,i} \times 10000$$

Where:

C	:	Peat carbon stock per unit area (tC ha^{-1})
D	:	Peat thickness (m)
C_c	:	Carbon content of peat soil (kg kg^{-1})
$\overline{\rho}_b$	:	Average Bulk Density of peat soil over the soil profile (from top to peat bottom) (g cm^{-3})
i	:	Location index (represented by grid index, see also sub section Spatial and Temporal Discretization)

Carbon stock distributions of peat soils can be mapped by multiplying C stock with area:

$$Cstock_i = C_i \times A_i$$

Where:

$Cstock$	:	Peat carbon stock (tC)
C	:	Peat carbon stock per unit area (tC ha^{-1})
A	:	Area (ha)
i	:	Location index (represented by grid index, see also sub section Spatial and Temporal Discretization)

The total carbon stored in peat soils (thickness >=0.4 m) of the project area at the project start date was estimated at 77,125,126.89 ton C, with average stock of 2,705.56 tC ha^{-1}. Spatial distributions of the carbon stock in peat soil in the Project Area are shown in Figure 39.

3.2.1.2.2 Spatial and temporal discretization

To represent two-dimensional features, a grid-based system was used. The area was divided into regular square cells, each with a size of 3 hectares (173.205 x 173.205 meters). This same grid layout was applied to all 2D features, including the project area, surface elevation, peat thickness distribution, land cover, and others.

For linear features like roads and canals, a separate one-dimensional (1D) partitioning method was used. These features were broken down into segments with nodes spaced 100 meters apart. Although these features are linear, their surface area (a 2D attribute) was recorded in attribute tables.

To ensure accurate alignment between 1D and 2D features, all positions were referenced using geographic coordinates. Grid conformity was maintained by calculating the proportion of area of each feature that falls within individual grid cells. This approach ensures that the spatial data is accurately represented, which is essential for correctly estimating peat emissions.

Temporal discretization was done by partitioning carbon accounting time step (year) into 12 sub-steps (monthly) for baseline scenario and 366 (daily) for project scenario. Time-serial variables involved in hydrological modelling (like rainfall, evapotranspiration, river water levels, etc.) were conformed accordingly by using this time partition scheme. More details on hydrological modelling are given in Annex 3.

3.2.1.3 Baseline emission of avoiding planned degradation in Selective Logging (TPTI or APDeg area)

As prescribed by VMD0006, net GHG emission for planned degradation in the selective logging (TPTI-*Tebang Pilih Tanam Indonesia*) area calculated by applying equation (1) of VMD0006 below.

$$\Delta C_{BSL,planned} = \sum_{t=i}^{t*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t}\right) \quad \text{Equation (1) of VMD0006}$$

Where:

$\Delta C_{BSL,planned}$	Net greenhouse gas emissions in the baseline from planned degradation up to year t*; tCO_2e
$\Delta C_{BSL,i,t}$	Sum of the baseline carbon stock change in all terrestrial pools in stratum i in year t, tCO_2e
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions in the baseline scenario as result of degradation i in year t; $tCO_2e\ yr^{-1}$
I	1,2,3,...M trata
T	1,2,3,...t* years elapsed since the projected start of project activity

Considered de minimis, the GHG emissions resulting from degradation activities ($GHG_{BSL-E,I,t}$) within the TPTI area are conservatively excluded from this calculation. Therefore, the net greenhouse gas emissions in the baseline from planned degradation ($\Delta C_{BSL,planned}$) is equal to Sum of the baseline carbon stock change in all terrestrial pools ($\Delta C_{BSL,I,t}$)

The sum of the baseline carbon stock change resulting from planned degradation is calculated by applying equation (14) of VMD0006. This equation is designed to quantify carbon stock changes across relevant carbon pools under the baseline scenario.

$$\Delta C_{BSL,i,t} = AA_{planned,i,} \times \left(\Delta C_{ABtree,i} - \Delta C_{WP,i} + \Delta C_{ABnon-tree} + \Delta C_{LI,i}\right) + \left(\sum_{t-10}^{t} AA_{planned}\right)\left(\Delta C_{BBtree,i} + \Delta C_{BBnon-tree,i} + \Delta C_{DW,i}\right) * \left(\frac{1}{10}\right) + \left(\sum_{t-20}^{t} AA_{planned,i,t}\right) \times \left(C_{WP100,i}\right) * \left(\frac{1}{20}\right) \quad \text{Equation (14) of VMD0006}$$

Where:

$\Delta C_{BSL,i,t}$	Sum of the baseline carbon stock change in all terrestrial pools in stratum i in year t, tCO_2e

$AA_{planned,i,t}$	Annual area of baseline planned degradation for stratum i in year t; ha
$\Delta C_{ABtree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{WP,i}$	Baseline carbon stock change in wood products in stratum i; tCO2e ha-1
$\Delta C_{ABnon-tree}$	Baseline carbon stock change in aboveground non-tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{LI,i}$	Baseline carbon stock change in litter in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{BBtree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{BBnon-tree,i}$	Baseline carbon stock change in belowground non-tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{DW,i}$	Baseline carbon stock change in dead wood in stratum i; $tCO_2e\ ha^{-1}$
$C_{WP100,i}$	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum i; $tCO_2e\ ha^{-1}$
I	1, 2, 3, … M strata
T	1, 2, 3, … t* years elapsed since the projected start of the project activity

As explained in Section 3.1.3.3, baseline carbon stock changes in litter ($\Delta C_{LI,i}$), non-tree aboveground biomass ($\Delta C_{AB\_non\text{-}tree}$), and non-tree belowground biomass ($\Delta_{CBB\_non\text{-}tree}$) are excluded from the calculation. Meanwhile, baseline carbon stock change in tree belowground biomass (ΔC_{BB_tree}) is excluded in peat swamp forests to avoid double counting with peat biomass but included for dryland forests.

Baseline carbon stock change in aboveground tree biomass (ΔC_{AB_tree}), belowground tree biomass (ΔC_{BB_tree}), and Dead Wood ($\Delta C_{DW,i}$) are respectively calculated by using Equation (6) and (8) and (10) of VMD0006 below;

$$\Delta C_{AB,tree,i} = C_{AB,tree,bsl,i} - C_{AB,tree,post,i} \quad \text{Equation (6) of VMD0006}$$

$$\Delta C_{BB,tree,i} = C_{BB,tree,bsl,i} - C_{BB,tree,post,i} \quad \text{Equation (8) of VMD0006}$$

$$\Delta C_{DW,i} = C_{DW,bsl,i} - C_{DW,post,i} \quad \text{Equation (10) of VMD0006}$$

Where:

$\Delta C_{ABtree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{BBtree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{DW,i}$	Baseline carbon stock change in Dead Wood in stratum i; $tCO_2e\ ha^{-1}$

$C_{AB,tree,bsl,i}$	Forest carbon stock in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{AB,tree,post,i}$	Post-degradation carbon stock in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{BB,tree,bsl,i}$	Forest carbon stock in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{BB,tree,post,i}$	Post-degradation carbon stock in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{DW,bsl,i}$	Forest carbon stock in dead wood in stratum i; $tCO2e\ ha^{-1}$
$C_{DW,post,i}$	Post-deforestation carbon stock in dead wood in stratum i; $tCO2e\ ha^{-1}$
i	1, 2, 3, … M strata.

Considered *de minimis*, the GHG emissions as result of degradation activities ($GHG_{BSL,E,i.t}$) within TPTI area is conservatively excluded in this calculation.

Calculation of baseline carbon stock change in aboveground tree biomass

The carbon stock in aboveground tree biomass subjected to the planned degradation (logging) under baseline scenario calculated by using Equation (2.12) of the 2006 IPCC Guidelines below.

$$L_{wood-removal} = \{H * BCEF_R * (1 + R) * CF\} \qquad \text{equation (2.12) of IPCC 2006}$$

Where:

$L_{wood-removal}$	Carbon stock (aboveground tree biomass) subjected to biomass removals/logging
H	Annual wood removals; m^{-3}. This refers to extracted timber (V_{ex})
$BCEF_R$	Biomass Conversion and Expansion Factor
R	Ratio of belowground biomass to aboveground biomass (Root : Shoot Ratio)
CF	Carbon Fraction

As shown by the equation above, referring to total biomass under baseline scenario which covers both aboveground biomass ($C_{AB,tree,bsl}$) and belowground biomass ($C_{BB,tree,bsl}$). Considering the calculation of those C pools applies different approaches, each pool is separately calculated. For belowground calculation for mineral soil areas, default value of 0.212 was used for root-to-shoot ratio (IPCC, 2006), in which represent tropical forest.

Unlike deforestation where post-deforestation carbon stock reflects the carbon of the planted commodity replacing the forest, planned degradation through selective logging does not involve any replacement with another commodity. Therefore, the post-degradation carbon stock ($C_{AB,tree,post}$ and $C_{BB,tree,post}$) assumed to be zero.

Calculation of carbon stock change in Wood Products (WP)

Baseline carbon stock change in wood products is calculated by using equation (5) of VMD0005 as below:

$$\Delta C_{WP,i} = \sum_{ty=s,w,oir,p,o} C_{XB,ty,i} * \left(1 - WW_{ty}\right) \quad \text{Equation (5) of VMD0005}$$

Where:

$\Delta C_{WP,i}$	Carbon stock entering the wood products pool from stratum *i*; tCO_{2e} ha^{-1}
$C_{XB,ty,i}$	Mean stock of extracted biomass carbon by class of wood product *ty* from stratum *i*; tCO_{2e} ha^{-1}
Ty=s,w,oir,p,o	Wood product class, – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
WW	Wood Waste. Dimensionless

As Indonesia is categorized as a developing country, a value of 24% is applied in this calculation in accordance with the guidance provided in VMD0005.

Mean stock of extracted biomass carbon by class of wood product ($C_{XB,ty,i}$) is calculated by (4) of VMD0005 as below:

$$C_{XB}, ty, i = \frac{1}{A_i} * \sum_{j=1}^{S} \left(V_{ex,ty,j,i} * D_j * CF_j * \frac{44}{12}\right) \quad \text{Equation (4) of VMD0005}$$

Where:

$C_{XB,ty,i}$	Mean stock of extracted biomass carbon by class of wood product *ty* from stratum *i*; tCO_{2e} ha^{-1}
$V_{ex,ty,j,i}$	Volume of timber extracted from within stratum i by species j and wood product class ty; m^3
D_j	Mean wood density of species *j*; t d.m.m^{-3}
CF_j	Carbon fraction of biomass for tree species *j*; t C td.m. $^{-1}$
Ty=s,w,oir,p,o	Wood product class, – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
WW	Wood Waste. Dimensionless

The amount of wood products entering the pool at the time of degradation that is expected to be emitted over a 100-year timeframe. ($C_{WP100,i}$) is calculated in applying equation (6) of VMD0005 as below:

$$C_{WP100,i} = C_{WP,i} - C_{WP,i} * \left(1 - SLF_{pb}\right) * \left(1 - Of_p\right) \quad \text{Equation (4) of VMD0005}$$

Where:

$C_{WP100,i}$	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum *i*; tCO_{2e} ha^{-1}
$C_{WP,i}$	Carbon stock entering wood products pool at time of deforestation from tCO_{2e} ha^{-1}
D_j	Mean wood density of species *j*; t d.m.m^{-3}
SLF_{pb}	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product *ty*; dimensionless
OF_p	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product *ty*; dimensionless

Referring to VMD0005, the value of SLF and OF applied in the calculation is as below:

Tree class (j)	Product type	SLF	OF
Meranti	Sawn wood	0.2	0.86
Other Commercial	Wood base panel	0.1	0.98
Ornamental	Sawn wood	0.2	0.86

Calculation of carbon stock change in Dead Wood (C_{DW})

Biomass loss in the form of Residual Damage (RSD) to surrounding vegetation, commonly referred to as logging damage, is an unavoidable consequence of timber harvesting, regardless of the method employed. In accordance with the equation (14) of VMD0006, it is accounted for as Dead Wood (DW). This inevitable disturbance contributes to additional carbon emissions and must be included in calculations to ensure accurate estimates of greenhouse gas (GHG) emissions.

For the calculation of carbon stock change from residual damage, a factor of 2.3 was applied, based on the study by Pinard and Putz (1996). However, since the technical proposal specifies the implementation of Reduced Impact Logging (RIL), a reduction in residual biomass loss is expected. To account for this, the calculation incorporated findings from Budiaman et al. (2023), which indicate that RIL practices result in a 10.8% reduction in biomass loss from residual damage compared to conventional logging.

The areas subjected to planned degradation within TPTI area

Area of baseline planned degradation ($AA_{planned}$) within TPTI area is limited solely to the productive forest area designated for logging. Areas affected by infrastructure development are treated as deforestation and are therefore accounted for under Planned Deforestation (Section 3.2.1.5).

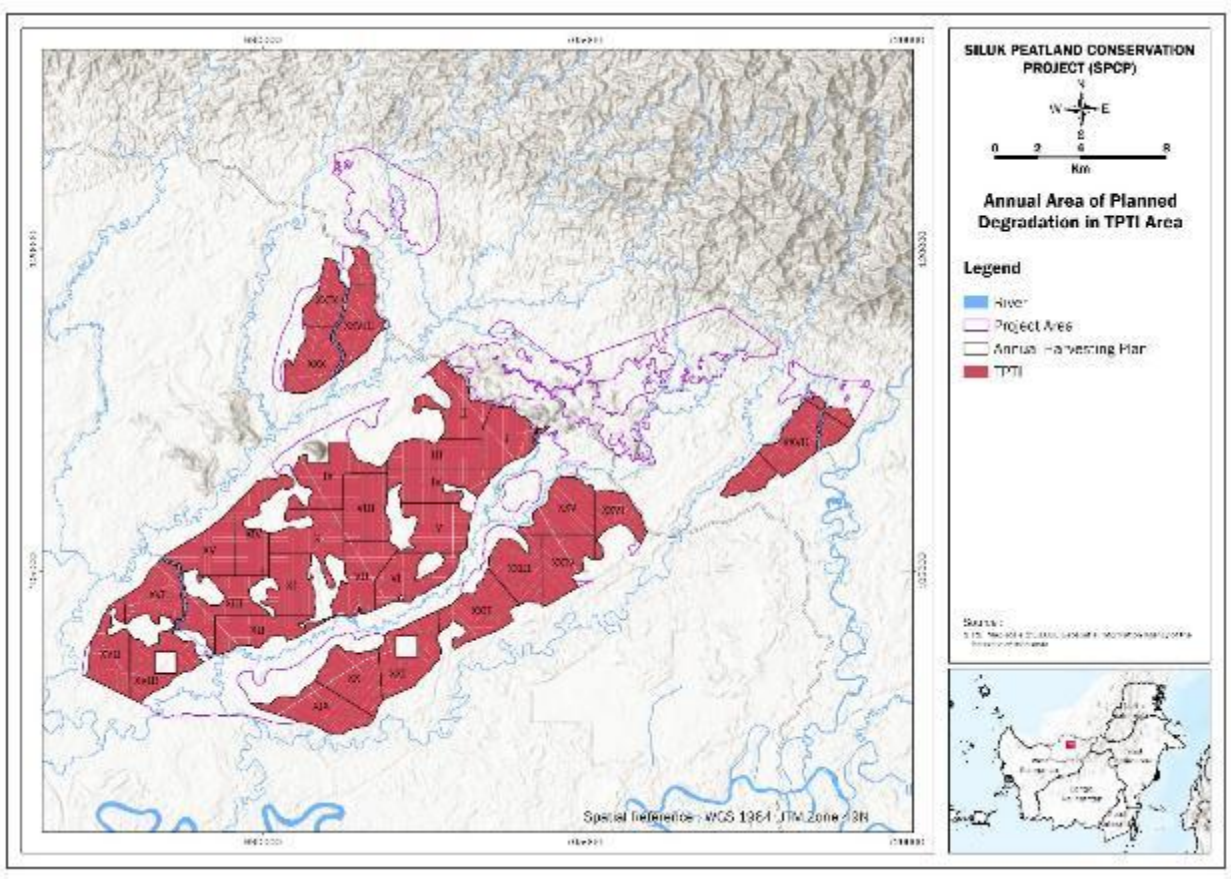


Figure 40. Area of baseline planned degradation within TPTI (APDeg) area

Merchantable volume timber within TPTI (APDeg) area

Based on forest inventory data combined with LiDAR-based analysis, the total merchantable timber volume within the TPTI area is estimated at 2,256,914 m^3. Of this, approximately 1,937,961 m^3 (86%) is located in Peat Swamp Forest (PSF), while the remaining 318,953 m^3 (14%) is found in Dry Land Forest (DLF). As mandated by government regulations, merchantable volume includes only commercial tree species that meet specific diameter thresholds: trees with a DBH of 30 cm or greater in PSF, and DBH of 40 cm or greater in DLF. Species with protected status are excluded from the calculation. Table 21 and Table 22 below present the merchantable volume allocations in the annual logging plans for Peat Swamp Forest and Dry Land Forest, respectively.

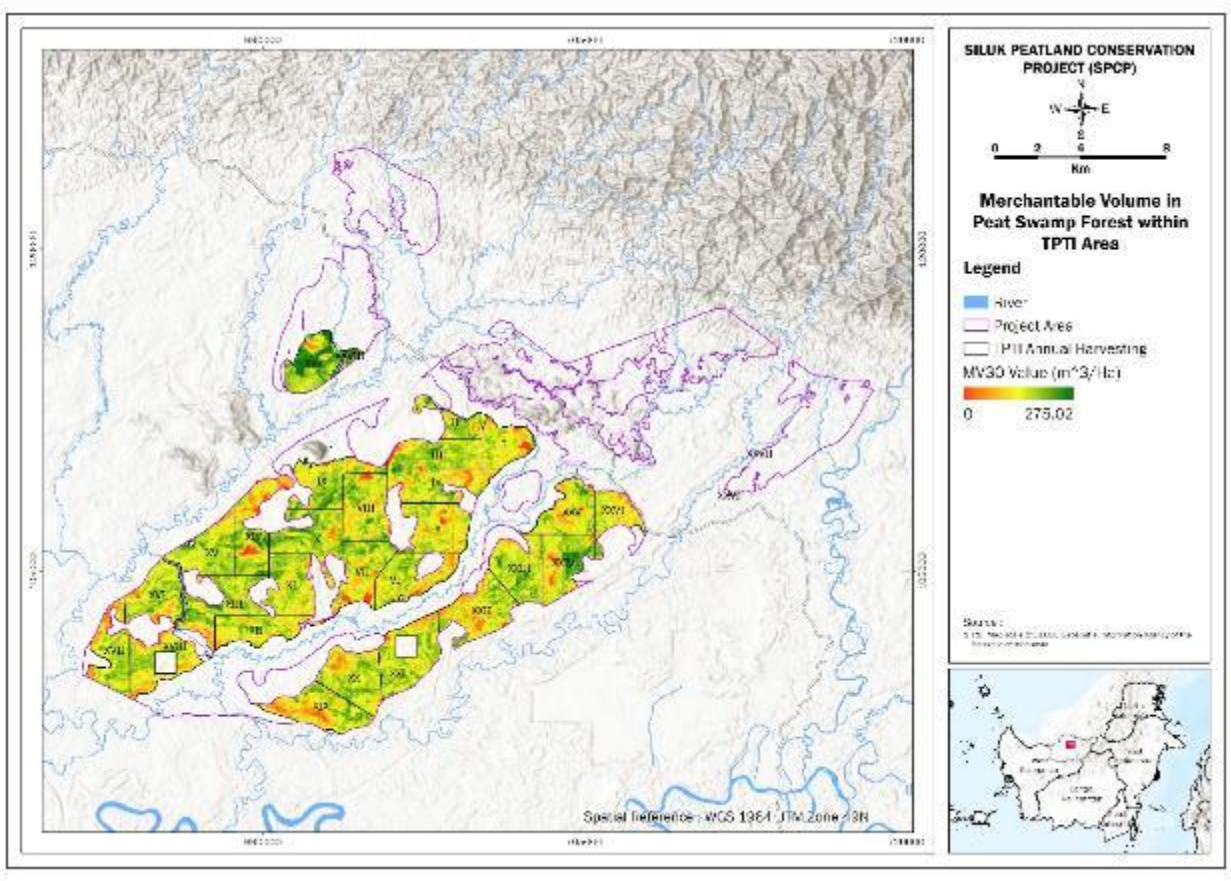


Figure 41. Merchantable volume Map within TPTI (APDeg) area in Peat Swamp Forest

Table 21. Merchantable volume (m^3) within TPTI (APDeg) area in Peat Swamp Forest

Year	Extracted timber (m^3)	Year	Extracted timber (m^3)
2023	46,092.61	2038	71,016.06
2024	37,455.56	2039	63,909.95
2025	78,003.36	2040	64,765.55
2026	71,749.81	2041	75,279.74
2027	72,590.60	2042	82,441.61
2028	68,441.93	2043	86,349.83
2029	68,636.94	2044	79,231.58
2030	80,956.60	2045	80,449.99
2031	75,561.03	2046	76,773.05
2032	88,265.20	2047	63,662.66

2033	74,188.65	2048	44,522.40
2034	59,905.98	2049	0.87
2035	82,761.79	2050	8,690.26
2036	74,701.61	2051	82,963.19
2037	78,592.34	2052	
	Total		**1,937,960.72**

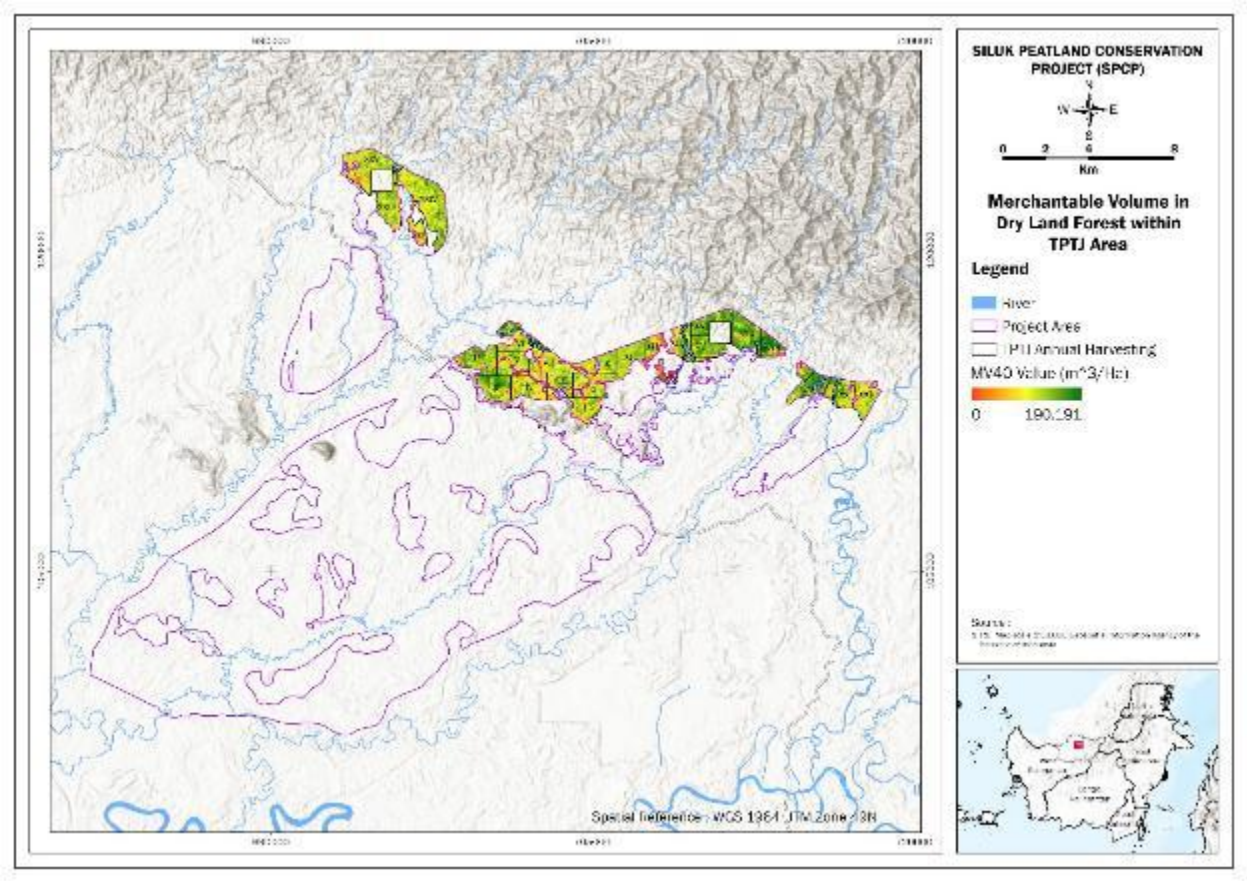


Figure 42. Merchantable volume map within TPTI area in Dry Land Forest

Table 22. Merchantable volume (m^3) within TPTI (APDeg) area in Dry Land Forest

Year	Extracted timber (m^3)	Year	Extracted timber (m^3)
2023	12,944.79	2038	-
2024	35,246.49	2039	4,527.30

2025	-	2040	3,908.36
2026	-	2041	1,186.02
2027	127.49	2042	-
2028	1,225.26	2043	51.27
2029	5,180.95	2044	-
2030	-	2045	-
2031	8,286.35	2046	-
2032	-	2047	9,286.84
2033	-	2048	23,673.02
2034	5,295.91	2049	69,817.44
2035	79.27	2050	66,537.27
2036	60.19	2051	70,833.84
2037	685.22	2052	-
Total			**318,953.30**

The merchantable volume outlined above cannot be directly counted with the actual volume of extracted timber. In accordance with government regulations and standard practices, the merchantable volume must be adjusted by applying a Safety Factor and an Exploitation Factor to derive the extracted volume (V_{ex}). This adjusted volume is then used in the subsequent calculations, as described in the preceding sections.

Net greenhouse gas emissions in the baseline from planned degradation in TPTI (APDeg) area

Based on Equation (14) from VMD0006, the total net GHG emissions in the baseline from planned degradation in the selective logging (TPTI) area is estimated at 6,362,918.22 tCO_2e. This total carbon stock change is distributed across various carbon pools as follows:

- Aboveground tree biomass (ΔC_{AB}): 3,016.229.11 tCO_2e (47.40 %)
- Wood products (ΔC_{WP100}): 716,861.75 tCO_2e (11.27 %)
- Dead wood (ΔC_{DW}): 2,474,520.95 tCO_2e (38.89 %)
- Belowground tree biomass (ΔC_{BB}): 155,306.41 tCO_2e (2.443 %)

The annual net GHG emissions in the baseline from planned degradation in the selective logging (TPTI) area is presented in Table 23 below.

Table 23. Annual net GHG emissions in the baseline from planned degradation in TPTI (APDeg) area

Year	BSL_ΔC_AB	BSL_WP100	BSL_ΔC_DW	BSL_BB	ΔC_BSL_APDeg_TPTI
2023	79,806.31	1,455.03	7,945.55	1,580.46	90,787.34
2024	98,278.09	3,246.84	17,730.15	5,674.43	124,929.50
2025	105,444.36	5,169.30	28,228.23	5,674.43	144,516.31
2026	96,990.85	6,937.64	37,884.67	5,674.43	147,487.59
2027	98,299.76	8,729.84	47,671.43	5,690.01	160,391.04
2028	94,175.58	10,446.85	57,047.59	5,840.35	167,510.37
2029	99,786.46	12,266.16	66,982.37	6,511.40	185,546.38
2030	109,436.52	14,261.41	77,877.91	6,511.40	208,087.23
2031	113,344.26	16,327.90	89,162.50	7,536.70	226,371.37
2032	119,316.24	18,503.28	101,041.67	7,536.70	246,397.88
2033	100,287.66	20,331.72	103,080.80	5,956.25	229,656.43
2034	88,139.42	21,938.68	102,071.39	2,526.54	214,676.03
2035	111,983.91	23,980.37	102,722.47	2,536.42	241,223.18
2036	101,062.44	25,822.94	103,127.84	2,544.03	232,557.27
2037	107,166.81	27,776.81	104,010.65	2,606.82	241,561.09
2038	95,998.97	29,527.07	104,192.19	2,456.48	232,174.70
2039	92,512.97	31,213.76	103,468.04	2,339.47	229,534.24
2040	92,832.87	32,906.29	101,814.97	2,812.44	230,366.57
2041	103,365.85	34,790.86	100,821.52	1,932.40	240,910.63
2042	111,443.95	36,822.71	100,037.75	1,932.40	250,236.81
2043	116,796.35	37,497.11	101,681.36	1,938.61	257,913.43
2044	107,104.65	37,658.04	103,569.54	1,274.34	249,606.57
2045	108,751.69	37,718.34	103,247.74	1,264.47	250,982.23

Year	BSL_ΔC_AB	BSL_WP100	BSL_ΔC_DW	BSL_BB	ΔC_BSL_APDeg_TPTI
2046	103,781.24	37,842.14	103,518.43	1,256.85	246,398.65
2047	98,612.58	37,847.84	102,666.76	2,310.66	241,437.85
2048	92,186.06	37,811.57	102,287.15	5,185.24	237,470.02
2049	94,379.86	37,712.99	102,473.02	12,812.27	247,378.14
2050	101,692.01	37,571.80	103,355.04	20,039.19	262,658.03
2051	173,251.39	32,746.47	94,802.22	23,351.26	324,151.34
Total	**3,016,229.11**	**716,861.75**	**2,474,520.95**	**155,306.41**	**6,362,918.22**

3.2.1.4 Baseline emission of avoiding planned degradation in Selective Logging and Strip Planting area (TPTJ or APDeg_SP)

Net GHG emission for planned degradation in the selective logging and strip planting (TPTJ or APDeg_SP) area calculated by applying equation (1) of VMD0006 below.

$$\Delta C_{BSL,planned} = \sum_{t=i}^{t*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t}\right) \quad \text{Equation (1) of VMD0006}$$

Where:

$\Delta C_{BSL,planned}$	Net greenhouse gas emissions in the baseline from planned degradation up to year t*; tCO2e
$\Delta C_{BSL,i,t}$	Sum of the baseline carbon stock change in all terrestrial pools in stratum i in year t, tCO_2e
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions in the baseline scenario as result of degradation i in year t; $tCO_2e\ yr^{-1}$
I	1,2,3,...M trata
T	1,2,3,...t* years elapsed since the projected start of project activity

Considered de minimis, the GHG emissions resulting from degradation activities ($GHG_{BSL-E,I,t}$) within the TPTI area are conservatively excluded from this calculation. Therefore, the net greenhouse gas emissions in the baseline from planned degradation ($\Delta C_{BSL,planned}$) is equal to Sum of the baseline carbon stock change in all terrestrial pools ($\Delta C_{BSL,I,t}$)

Sum of the baseline carbon stock change in all terrestrial pools ($\Delta C_{BSL,I,t}$) is calculated by applying Equation (14) of VMD0006 below.

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} \times \left(\Delta C_{ABtree,i} - \Delta C_{WP,i} + \Delta C_{ABnon-tree} + \Delta C_{LI,i}\right) + \left(\sum_{t-10}^{t} AA_{planned}\right)\left(\Delta C_{BBtree,i} + \Delta C_{BBnon-tree,i} + \Delta C_{DW,i}\right) * \left(\frac{1}{10}\right) + \left(\sum_{t-20}^{t} AA_{planned,i,t}\right) \times \left(C_{WP100,i}\right) * \left(\frac{1}{20}\right) \quad \text{Equation (14) of VMD0006}$$

Where:

$\Delta C_{BSL,i,t}$	Sum of the baseline carbon stock change in all terrestrial pools in stratum i in year t, tCO_2e
$AA_{planned,i,t}$	Annual area of baseline planned degradation for stratum i in year t; ha
$\Delta C_{ABtree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{WP,i}$	Baseline carbon stock change in wood products in stratum i; tCO2e ha-1
$\Delta C_{ABnon-tree}$	Baseline carbon stock change in aboveground non-tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{LI,i}$	Baseline carbon stock change in litter in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{BBtree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{BBnon-tree,i}$	Baseline carbon stock change in belowground non-tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{DW,i}$	Baseline carbon stock change in dead wood in stratum i; $tCO_2e\ ha^{-1}$
$C_{WP100,i}$	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum i; $tCO_2e\ ha^{-1}$
I	1, 2, 3, … M strata
T	1, 2, 3, … t* years elapsed since the projected start of the project activity

As outlined in Section 3.1.3.3, baseline carbon stock changes in litter ($\Delta C_{LI,i}$), non-tree aboveground biomass ($\Delta C_{AB\_non\text{-}tree}$), and non-tree belowground biomass ($\Delta C_{CBB\_non\text{-}tree}$) are excluded from the calculation. Meanwhile, baseline carbon stock change in tree belowground biomass (ΔC_{BB_tree}) is excluded in peat swamp forests to avoid double counting with peat biomass but included for dryland forests.

Baseline carbon stock change in aboveground tree biomass (ΔC_{AB_tree}), belowground tree biomass (ΔC_{BB_tree}), and Dead Wood ($\Delta C_{DW,i}$) are respectively calculated by using Equation (6) and (8) and (10) of VMD0006 below;

$$\Delta C_{AB,ree,i} = C_{AB,tree,bsl,i} - C_{AB,tree,post,i} \quad \text{Equation (6) of VMD0006}$$

$$\Delta C_{BB,tree,i} = C_{BB,tree,bsl,i} - C_{BB,tree,post,i} \quad \text{Equation (8) of VMD0006}$$

$$\Delta C_{DW,i} = C_{DW,bsl,i} - C_{DW,post,i} \quad \text{Equation (10) of VMD0006}$$

Where:

$\Delta C_{ABtree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$

$\Delta C_{BBtree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{DW,i}$	Baseline carbon stock change in Dead Wood in stratum i; $tCO_2e\ ha^{-1}$
$C_{AB,tree\ ,bsl,i}$	Forest carbon stock in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{AB,tree\ ,post,i}$	Poest-degradation carbon stock in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{BB,tree\ ,bsl,i}$	Forest carbon stock in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{BB,tree\ ,post,i}$	Poest-degradation carbon stock in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{DW,bsl,i}$	Forest carbon stock in dead wood in stratum i; tCO_2e ha-1
$C_{DW,post,i}$	Post-deforestation carbon stock in dead wood in stratum i; tCO_2e ha-1
i	1, 2, 3, … M strata.

Calculation of: 1) carbon stock change in aboveground tree biomass (ΔC_{AB}), 2) carbon stock change in belowground tree biomass (ΔC_{BB}), 3) carbon stock change in wood products (C_{WP100}), and 4) carbon stock change in Dead Wood (ΔC_{DW}) in the TPTJ area follows the same approach and methodology described in Section 3.2.1.3 for the TPTI area.

The areas subjected to planned degradation within APDeg_SP area

Area of baseline planned degradation ($AA_{planned}$) within APDeg_SP area is limited solely to the productive forest area designated for logging. Areas affected by infrastructure development are treated as deforestation and are therefore accounted for under Planned Deforestation (Section 3.2.1.5).

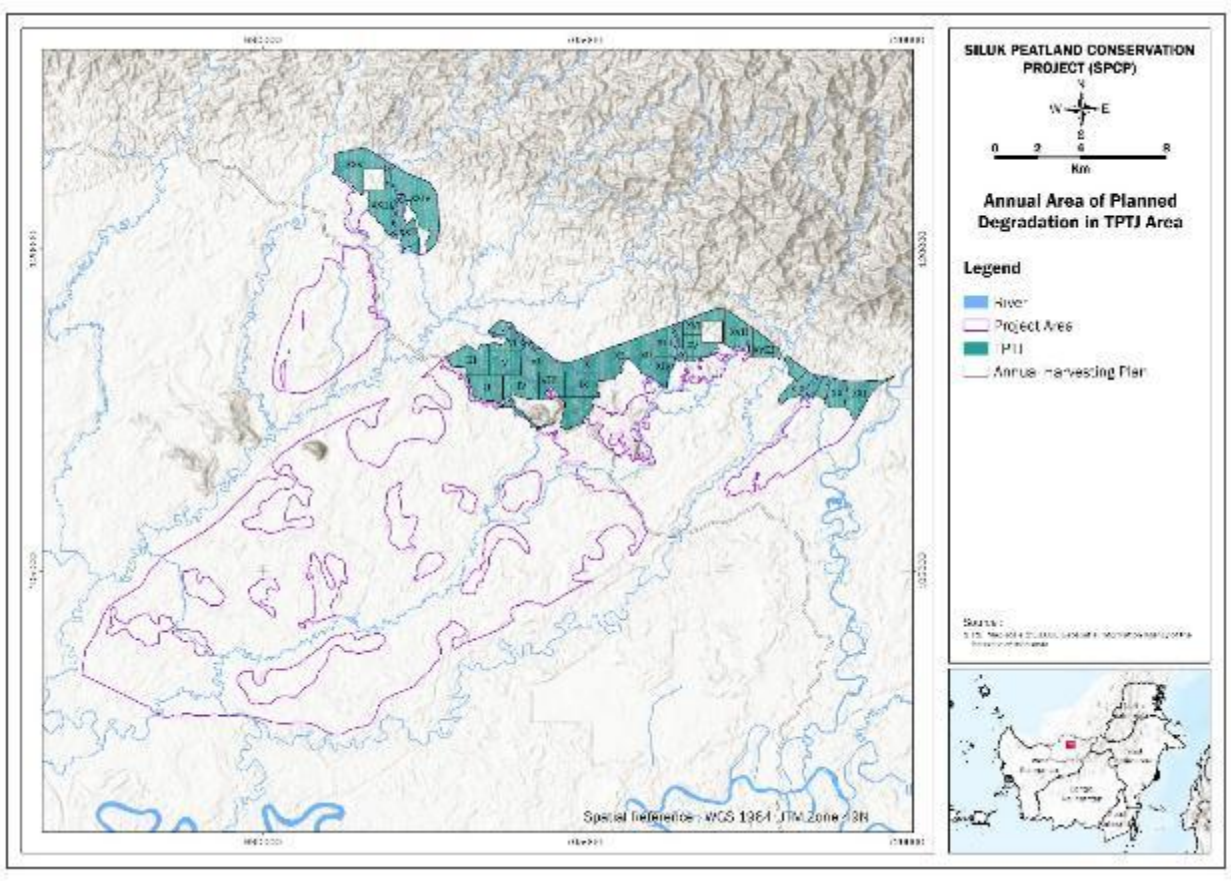


Figure 43. Area of baseline planned degradation within TPTJ (APDeg_SP) area

Merchantable volume timber within TPTJ (APDeg_SP) area

Based on forest inventory data combined with LiDAR-based analysis, the total merchantable timber volume within the TPTJ area is estimated at 313,008.06 m^3, in which all are found in Dry Land Forest (DLF). As mandated by government regulations, merchantable volume includes only commercial tree species with DBH of 40 cm or greater. Species with protected status are excluded from the calculation. Table 24 and Table 25 below present the merchantable volume allocations in the annual logging plans in TPTJ area.

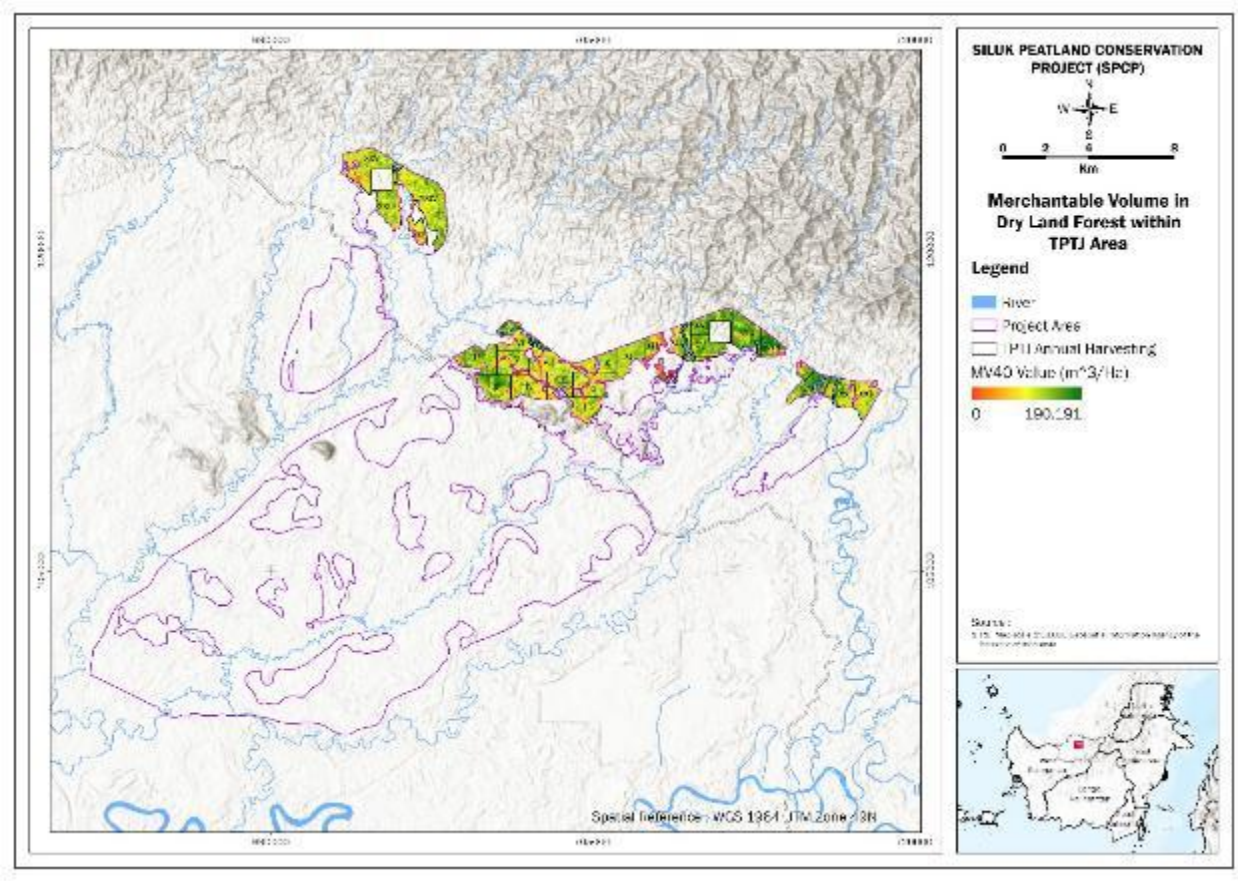


Figure 44. Merchantable volume map within TPTJ (APDeg_SP) area

Table 24. Merchantable volume (m^3) within TPTJ (APDeg_SP) area

Year	Merchantable Timber (m^3)	Year	Merchantable Timber (m^3)
2023	9,639.87	2033	13,415.03
2024	15,153.65	2034	4,661.12
2025	16,702.01	2035	7,962.43
2026	12,073.98	2036	1,708.91
2027	11,633.70	2037	8,327.08
2028	11,722.74	2038	17,441.54
2029	10,844.90	2039	16,943.78
2030	9,543.31	2041	13,490.95
2031	11,764.25	2042	13,158.36
2032	12,107.02	2043	11,500.26

Year	Merchantable Timber (m^3)	Year	Merchantable Timber (m^3)
2044	10,635.84	2047	32,508.64
2045	4,666.77	2048	20,502.44
2046	14,899.48		
Total			**313,008.06**

The merchantable volume outlined above cannot be directly counted with the actual volume of extracted timber. In accordance with government regulations and standard practices, the merchantable volume must be adjusted by applying a Safety Factor and an Exploitation Factor to derive the extracted volume (V_{ex}). This adjusted volume is then used in the subsequent calculations, as described in the preceding sections.

Net greenhouse gas emissions in the baseline from planned degradation in TPTJ area

Based on Equation (14) from VMD0006, the total net GHG emissions in the baseline from planned degradation in the selective logging and strip planting (TPTJ) area is estimated at 1,339.589.05 tCO_2e. This total carbon stock change is distributed across various carbon pools as follows:

- Aboveground tree biomass (ΔC_{AB}): 492,816.54 tCO_2e (36.79%)
- Wood products (ΔC_{WP100}): 112,328.35 tCO_2e (8.39%)
- Dead wood (ΔC_{DW}): 395,363.58 tCO_2e (29.51%)
- Belowground tree biomass (ΔC_{BB}): 339,080.57 tCO_2e (25.31%)

Annual net GHG emissions in the baseline from planned degradation in TPTJ area is presented in Table 25 below.

Table 25. Annual net GHG emissions in the baseline from planned degradation in TPTJ (APDeg_SP) area (tCO2e)

Year	BSL_ΔC_AB	BSL_WP100	BSL_ΔC_DW	BSL_BB	ΔC_BSL_APDeg_TPTJ
2023	13,031.10	237.58	1,297.38	1,200.36	15,766.43
2024	20,484.59	611.06	3,336.83	2,974.70	27,407.18
2025	22,577.65	1,022.69	5,584.67	4,944.94	34,129.95
2026	16,321.52	1,320.27	7,209.65	6,455.47	31,306.90
2027	15,726.35	1,606.99	8,775.37	7,882.13	33,990.85
2028	15,846.71	1,895.91	10,353.08	9,282.32	37,378.02

Year	BSL_ΔC_AB	BSL_WP100	BSL_ΔC_DW	BSL_BB	ΔC_BSL_APDeg_TP TJ
2029	14,660.05	2,163.19	11,812.64	10,623.76	39,259.64
2030	12,900.57	2,398.39	13,097.02	11,790.10	40,186.09
2031	15,902.83	2,688.34	14,680.31	13,254.21	46,525.68
2032	16,366.17	2,986.72	16,309.73	14,730.31	50,392.95
2033	18,134.33	3,317.35	16,817.81	15,133.17	53,402.66
2034	6,300.87	3,432.23	15,405.68	13,991.27	39,130.05
2035	10,763.56	3,628.47	14,229.46	13,001.30	41,622.78
2036	2,310.09	3,670.59	12,834.48	11,759.28	30,574.44
2037	11,256.48	3,875.81	12,389.46	11,302.49	38,824.24
2038	23,577.35	4,305.68	13,159.12	11,915.85	52,958.00
2039	22,904.47	4,723.27	13,979.94	12,521.92	54,129.60
2040	18,236.96	5,055.77	14,511.23	12,920.03	50,723.99
2041	17,787.37	5,380.07	14,698.86	12,967.75	50,834.04
2042	15,545.96	5,663.50	14,617.20	12,872.26	48,698.93
2043	14,377.45	5,688.05	14,243.16	12,576.87	46,885.53
2044	6,308.51	5,429.59	14,243.92	12,548.36	38,530.38
2045	20,141.01	5,385.16	15,177.55	13,352.29	54,056.02
2046	43,944.94	5,888.79	19,322.73	16,975.65	86,132.11
2047	27,715.05	6,107.37	20,961.35	18,510.69	73,294.46
2048	13,031.10	6,056.04	19,911.36	16,497.14	55,495.64
2049	20,484.59	6,162.23	19,670.44	14,549.63	60,866.89
2050	22,577.65	6,338.66	20,102.60	12,985.18	62,004.09
2051	13,601.26	5,288.58	16,630.55	9,561.14	45,081.53
Total	**492,816.54**	**112,328.35**	**395,363.58**	**339,080.57**	**1,339,589.05**

3.2.1.5 Baseline emission of avoiding planned deforestation (APD)

Net GHG emission for planned deforestation in the plantation area (THPB-*Tebang Habis Permudaan Buatan* or Avoiding Planned Deforestation/APD) area calculated by applying equation (1) of VMD0006 below.

$$\Delta C_{BSL,planned} = \sum_{t=i}^{t*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t}\right) \quad \text{Equation (1) of VMD0006}$$

Where:

$\Delta C_{BSL,planned}$	Net greenhouse gas emissions in the baseline from planned degradation up to year t*; tCO_2e
$\Delta C_{BSL,i,t}$	Sum of the baseline carbon stock change in all terrestrial pools in stratum i in year t, tCO_2e
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions in the baseline scenario as result of degradation i in year t; $tCO_2e\ yr^{-1}$
I	1,2,3,...M trata
T	1,2,3,...t* years elapsed since the projected start of project activity

Considered *de minimis*, the GHG emissions resulting from degradation activities ($GHG_{BSL-E,I,t}$) within the TPTI area are conservatively excluded from this calculation. Therefore, the net greenhouse gas emissions in the baseline from planned degradation ($\Delta C_{BSL,planned}$) is equal to the sum of the baseline carbon stock change in all terrestrial pools ($\Delta C_{BSL,I,t}$).

Sum of the baseline carbon stock change in all terrestrial pools ($\Delta C_{BSL,I,t}$) is calculated by applying Equation (14) of VMD0006 below. This equation is designed to account for carbon stock changes across relevant carbon pools under baseline scenario.

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} \times \left(\Delta C_{ABtree,i} - \Delta C_{WP,i} + \Delta C_{ABnon-tree} + \Delta C_{LI,i}\right) + \left(\sum_{t-10}^{t} AA_{planned}\right)\left(\Delta C_{BBtree,i} + \Delta C_{BBnon-tree,i} + \Delta C_{DW,i}\right) * \left(\frac{1}{10}\right) + \left(\sum_{t-20}^{t} AA_{planned,i,t}\right) \times \left(C_{WP100,i}\right) * \left(\frac{1}{20}\right) \quad \text{Equation (14) of VMD0006}$$

Where:

$\Delta C_{BSL,i,t}$	Sum of the baseline carbon stock change in all terrestrial pools in stratum i in year t, tCO_2e
$AA_{planned,i,t}$	Annual area of baseline planned deforestation for stratum i in year t; ha
$\Delta C_{ABtree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{WP,i}$	Baseline carbon stock change in wood products in stratum i; tCO2e ha-1
$\Delta C_{ABnon-tree}$	Baseline carbon stock change in aboveground non-tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{LI,i}$	Baseline carbon stock change in litter in stratum i; $tCO_2e\ ha^{-1}$

$\Delta C_{BBtree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{BBnon-tree,i}$	Baseline carbon stock change in belowground non-tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{DW,i}$	Baseline carbon stock change in dead wood in stratum i; $tCO_2e\ ha^{-1}$
$C_{WP100,i}$	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum i; $tCO_2e\ ha^{-1}$
I	1, 2, 3, … M strata
T	1, 2, 3, … t* years elapsed since the projected start of the project activity

Referring to Section 3.1.3.3, for planned deforestation case, baseline carbon stock changes in litter ($\Delta C_{LI,i}$), non-tree aboveground biomass ($\Delta C_{AB\_non\text{-}tree}$), non-tree belowground biomass ($\Delta C_{BB\_non\text{-}tree}$), dead wood ($\Delta C_{DW,i}$), and carbon stock entering the wood products pool (C_{WP100}) are excluded from the calculation. Meanwhile, baseline carbon stock change in tree belowground biomass (ΔC_{BB_tree}) is excluded in peat swamp forests to avoid double counting with peat biomass but included for dryland forests.

With the exclusion of carbon pools not relevant to the planned deforestation scenario (as explained above), Equation (14) of VMD0006 is applied to account only for carbon stock changes in aboveground tree biomass and belowground biomass, as represented in the following equation.

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} \times \left(\Delta C_{ABtree,i}\right) + \left(\sum_{t-10}^{t} AA_{planned}\right)\left(\Delta C_{BBtree,i}\right) * \left(\frac{1}{10}\right)$$

Where:

$\Delta C_{BSL,i,t}$	Sum of the baseline carbon stock change in all terrestrial pools in stratum i in year t, tCO_2e
$AA_{planned,i,t}$	Annual area of baseline planned deforestation for stratum i in year t; ha
$\Delta C_{ABtree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{BBtree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
i	1, 2, 3, … M strata
T	1, 2, 3, … t* years elapsed since the projected start of the project activity

Baseline carbon stock change in aboveground tree biomass (ΔC_{AB_tree}) and belowground tree biomass (ΔC_{BB_tree}) are respectively calculated by using Equation (6) and (8) and (10) of VMD0006 below.

$$\Delta C_{AB,tree,i} = C_{AB,tree,bsl,i} - C_{AB,tree,post,i} \qquad \text{Equation (6) of VMD0006}$$

$$\Delta C_{BB,tree,i} = C_{BB,tree,bsl,i} - C_{BB,tree,post,i}$$ Equation (8) of VMD0006

Where:

$\Delta C_{ABtree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$\Delta C_{BBtree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{AB,tree\ ,bsl,i}$	Forest carbon stock in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{AB,tree\ ,post,i}$	Poest-degradation carbon stock in aboveground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{BB,tree\ ,bsl,i}$	Forest carbon stock in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
$C_{BB,tree\ ,post,i}$	Poest-degradation carbon stock in belowground tree biomass in stratum i; $tCO_2e\ ha^{-1}$
i	1, 2, 3, … M strata.

As defined in the BL-PL, post-deforestation carbon stocks represent the long-term average carbon stocks on the land use following deforestation. Under the baseline scenario, and as specified in the technical proposal, the post-deforestation carbon stocks are below:

- Plantation area within THPB boundary. Post deforestation land use in this area refers to Sengon (*Paraserianthes falcataria*) plantation, applying 10 years rotation. According to Junaedi and Rizal (2019), long term average carbon stock of sengon plantation estimated to be 26.02 tC ha^{-1}.
- Planting strip area within TPTJ boundary. Post deforestation land use in this area refers Meranti (*Shorea spp*) plantation with the rotation of 25 years. Based on analysis using related reference (Winarti et. Al, 2023, Wahyudi and Panjaitan, and Musakir), long term average carbon stock of Meranti plantation estimated to be 44.48 tC ha^{-1}.
- Canal infrastructure in THPB and TPTI. Post deforestation land use in this area refers to water body. Therefore, long-term average carbon stocks assumed to be zero.
- Road infrastructure and railway. Post deforestation land use refers to Non-Forest vegetation with the C stock of 23.02 tC ha^{-1}.

<u>The areas subjected to planned deforestation</u>

Area of baseline planned deforestation ($AA_{planned}$) includes the entire THPB area (4,228.95 ha), as well as portions of the TPTI (822.58 ha) and TPTJ (704.66 ha) area where infrastructure development occurs, specifically areas designated for the construction of canals and railways (see Figure 45 and Table 26).

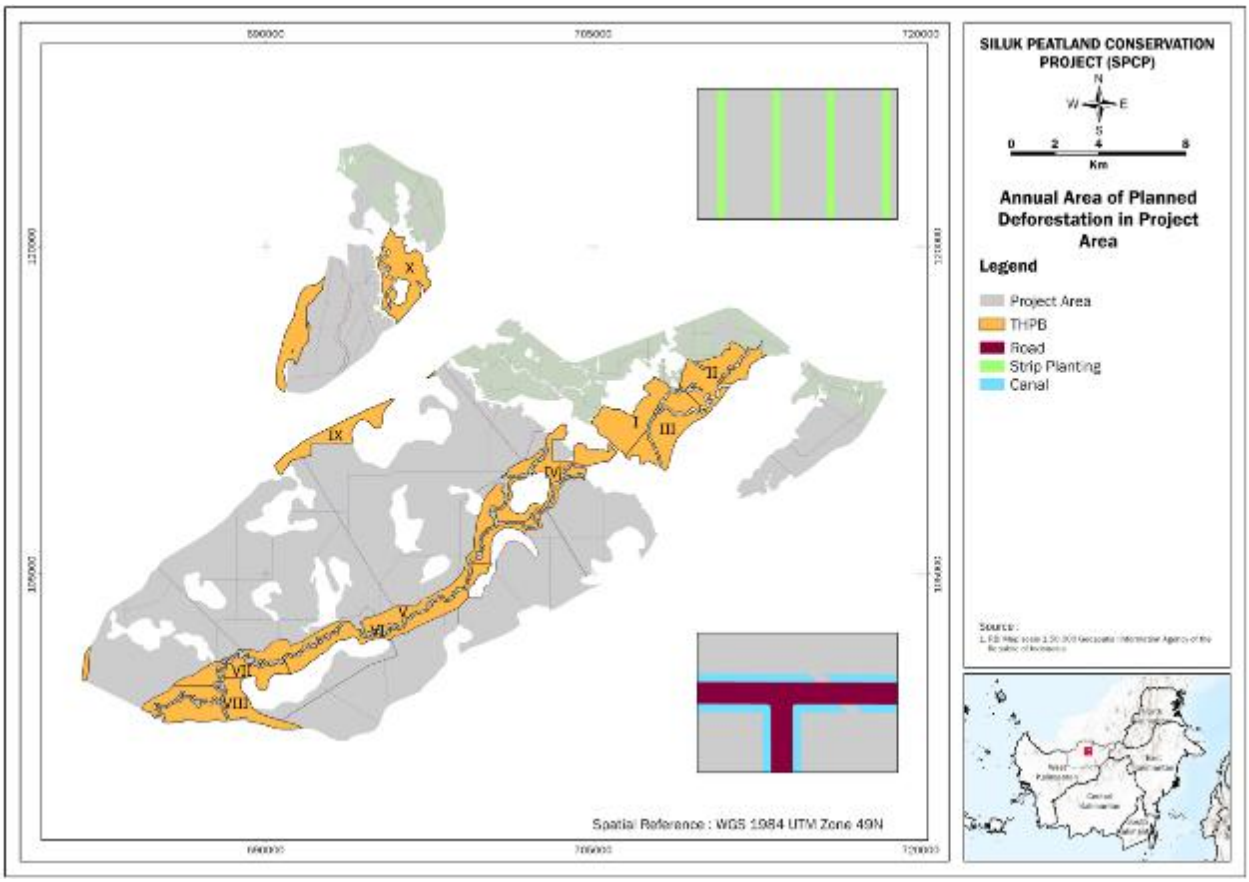


Figure 45. Area of baseline planned deforestation, insets show canal, road and planting configurations in this land-use type.

Table 26. Area (ha) of baseline planned deforestation in APD (THPB) area

Year	Branch road	Branch road	Main road	Branch canal	Tertiary canal	Disposal Canal	Main canal	Plantation area	Total
2023	7.38	5.44	20.75	-	-	0.43	8.23	363.00	405.24
2024	5.52	3.83	-	-	-	-	-	258.51	267.86
2025	3.32	1.51	-	0.44	0.23	28.53	-	133.87	167.91
2026	10.24	-	-	7.62	4.12	-	-	520.76	542.74
2027	8.13	-	-	6.07	3.00	-	-	397.97	415.16
2028	9.35	-	0.83	6.95	3.39	-	0.18	451.24	471.93
2029	7.56	-	-	5.64	3.00	-	-	392.07	408.27
2030	13.41	-	-	10.02	5.04	2.21	-	675.01	705.70

2031	9.30	-	-	6.94	3.58	1.51	-	480.05	501.37
2032	6.76	-	0.01	5.06	2.59	-	-	328.35	342.77
Total	**80.96**	**10.78**	**21.60**	**48.73**	**24.96**	**32.68**	**8.41**	**4,000.83**	**4,228.95**

Table 27. Area (ha) of baseline planned deforestation in TPTI and TPTJ area

Year	Branch road	Skidding road	Main road	Planting strip	Branch canal	Disposal Canal	Main canal	Total
TPTI area								
2023	4.94	12.79	68.88	-	2.88	0.29	23.54	113.31
2024	3.31	12.69	-	-	2.48	-	-	18.48
2025	6.90	12.68	-	-	5.16	0.73	-	25.47
2026	4.84	12.41	-	-	3.62	1.95	-	22.81
2027	4.57	12.42	20.90	-	3.43	-	8.49	49.81
2028	5.82	11.79	12.02	-	4.33	-	4.74	38.70
2029	5.20	13.11	-	-	3.87	0.52	-	22.70
2030	7.27	14.24	-	-	5.43	0.54	-	27.47
2031	4.85	13.84	-	-	3.62	0.31	-	22.61
2032	4.88	13.74	0.00	-	3.65	-	-	22.28
2033	5.05	12.50	-	-	3.77	-	-	21.33
2034	6.36	11.23	6.48	-	4.75	0.08	2.35	31.26
2035	5.20	12.86	-	-	3.89	-	-	21.96
2036	3.12	14.16	-	-	2.33	-	-	19.60
2037	2.32	13.11	-	-	1.73	-	-	17.16
2038	1.77	12.72	13.16	-	1.32	-	5.47	34.46
2039	5.41	11.87	-	-	4.04	0.45	-	21.77

Year	Branch road	Skidding road	Main road	Planting strip	Branch canal	Disposal Canal	Main canal	Total
2040	3.47	10.99	-	-	2.60	-	-	17.06
2041	6.13	14.11	-	-	4.58	-	-	24.82
2042	3.65	13.96	-	-	2.72	-	-	20.32
2043	5.23	13.65	-	-	3.91	-	-	22.79
2044	4.85	14.68	-	-	3.63	-	-	23.16
2045	6.22	13.38	-	-	4.65	-	-	24.25
2046	4.77	12.42	8.11	-	3.56	-	2.80	31.66
2047	5.80	13.32	-	-	4.33	-	-	23.44
2048	4.08	14.46	-	-	2.31	-	-	20.85
2049	2.64	14.08	-	-	-	-	-	16.72
2050	7.51	14.26	8.50	-	0.40	0.01	0.84	31.51
2051	8.47	23.78	-	-	2.55	-	-	34.80
2052	-	-	-	-	-	-	-	-
Total	**144.63**	**391.27**	**138.05**	**-**	**95.52**	**4.89**	**48.23**	**822.58**
TPTJ area								
2023	2.45	4.63	-	20.18	-	-	-	27.26
2024	0.77	4.30	-	23.64	-	-	-	28.71
2025	1.04	6.88	-	27.25	-	-	-	35.17
2026	0.53	5.34	-	25.62	-	-	-	31.49
2027	0.16	4.29	-	22.78	-	-	-	27.23
2028	-	4.81	-	20.26	-	-	-	25.06
2029	-	4.57	-	21.94	-	-	-	26.51
2030	-	3.49	-	18.64	-	-	-	22.13

Year	Branch road	Skidding road	Main road	Planting strip	Branch canal	Disposal Canal	Main canal	Total
2031	-	4.38	-	24.37	-	-	-	28.75
2032	1.00	4.48	1.98	22.98	-	-	-	30.44
2033	2.61	4.05	-	23.23	-	-	-	29.89
2034	1.22	2.40	-	13.34	-	-	-	16.96
2035	0.91	2.92	-	15.98	-	-	-	19.81
2036	0.92	1.35	-	7.65	-	-	-	9.93
2037	7.52	2.18	-	12.70	-	-	-	22.40
2038	0.76	4.71	-	25.65	-	-	-	31.12
2039	1.01	4.23	-	24.24	-	-	-	29.48
2040	0.62	3.27	-	20.35	-	-	-	24.24
2041	0.78	3.92	-	18.86	-	-	-	23.55
2042	0.90	3.47	-	20.47	-	-	-	24.84
2043	0.58	3.87	-	21.01	-	-	-	25.46
2044	1.03	1.76	-	11.16	-	-	-	13.96
2045	0.62	4.61	-	26.24	-	-	-	31.47
2046	3.66	9.61	-	56.86	-	-	-	70.13
2047	1.76	7.17	-	39.75	-	-	-	48.68
Total	30.85	106.69	1.98	565.15	-	-	-	704.66
Grand Total	**175.48**	**497.95**	**140.03**	**565.15**	**95.52**	**4.89**	**48.23**	**1,527.24**

Baseline carbon stock change in aboveground tree biomass ($\Delta C_{ABTree, bsl}$) and belowground Biomass ($\Delta CB_{BTree, bsl}$)

The baseline carbon stock change in aboveground tree biomass ($\Delta C_{AB,tree,BSL}$) is estimated at 2,141,058.25 tCO_2e over the duration of the project period. Of the total emissions, some 1,442,334.32 tCO_2e (67.4 %) occurred in the THPB area, 412,863.08 tCO_2e (19.3 %) in the TPTI area, and

285,860.85 tCO_2e (13.4%) in the TPTJ area.Table 28 presents the baseline carbon stock change in aboveground tree biomass based on designated area throughout project period.

Table 28. Baseline carbon stock change in aboveground tree biomass based on designated area (tCO_2e)

Year	THPB/APD area	TPTI/APDeg area	TPTJ/APDeg_SP area	Total
2023	147,989.99	50,394.70	9,419.05	207,803.74
2024	80,667.86	10,004.01	13,339.74	104,011.61
2025	52,974.15	13,100.36	15,830.97	81,905.48
2026	150,905.51	11,020.08	10,689.68	172,615.27
2027	158,290.85	24,616.37	10,127.16	193,034.38
2028	185,383.73	19,446.88	10,623.23	215,453.83
2029	163,265.20	10,967.06	9,516.12	183,748.38
2030	190,675.08	13,548.48	8,377.30	212,600.86
2031	204,773.94	11,725.36	9,892.62	226,391.92
2032	107,408.02	12,077.24	11,701.35	131,186.61
2033	-	10,846.10	12,697.27	23,543.38
2034	-	15,222.83	4,010.13	19,232.97
2035	-	11,636.47	7,181.79	18,818.26
2036	-	9,488.65	1,498.73	10,987.39
2037	-	9,014.51	11,218.18	20,232.69
2038	-	17,030.52	15,809.69	32,840.21
2039	-	10,352.83	15,459.21	25,812.04
2040	-	8,047.98	11,937.79	19,985.77
2041	-	11,818.70	12,179.50	23,998.20
2042	-	10,127.71	10,106.97	20,234.68
2043	-	11,630.42	9,286.74	20,917.16
2044	-	10,851.72	4,089.53	14,941.25

Year	THPB/APD area	TPTI/APDeg area	TPTJ/APDeg_SP area	Total
2045	-	12,665.46	13,111.12	25,776.58
2046	-	17,219.77	29,519.00	46,738.77
2047	-	11,168.54	18,237.97	29,406.51
2048	-	9,782.83	-	9,782.83
2049	-	8,836.41	-	8,836.41
2050	-	19,110.05	-	19,110.05
2051	-	21,111.03	-	21,111.03
Total	1,442,334.32	412,863.08	285,860.85	2,141,058.25

Baseline carbon stock change in belowground tree biomass ($\Delta C_{BBTree,\ bsl}$)

The baseline carbon stock change in belowground tree biomass ($\Delta C_{BB,tree,BSL}$) is estimated at 281,077.46 tCO_2e over the duration of the project period. This emission represents the loss of carbon stored in tree root systems in mineral soil areas as a result of planned deforestation activities under the baseline scenario. Of the total emissions from belowground biomass, some 228,047.94 tCO_2e (81.1%) occurred in the THPB area, 7,514.18 tCO_2e (2.7%) in the TPTI area, and 45,515.34 tCO_2e (16.2%) in the TPTJ area. Table 29 presents the baseline carbon stock change in belowground tree biomass based on designated area throughout project period.

Table 29. Baseline carbon stock change in belowground tree biomass based on designated area (tCO_2e)

Year	THPB/APD area	TPTI/APDeg area	TPTJ/APDeg_SP area	Total
2023	3,239.14	346.30	162.32	3,747.76
2024	5,114.28	428.61	401.37	5,944.26
2025	6,300.87	433.81	686.54	7,421.23
2026	7,685.51	433.81	865.73	8,985.06
2027	10,506.19	433.81	1,038.26	11,978.26
2028	12,778.44	447.11	1,225.98	14,451.52
2029	15,256.74	461.12	1,387.11	17,104.97

Year	THPB/APD area	TPTI/APDeg area	TPTJ/APDeg_SP area	Total
2030	18,958.19	461.12	1,530.20	20,949.51
2031	21,498.39	490.63	1,694.81	23,683.83
2032	22,804.79	490.65	1,900.34	25,195.78
2033	19,565.66	144.35	1,964.20	21,674.21
2034	17,690.51	85.93	1,785.49	19,561.92
2035	16,503.92	80.77	1,622.99	18,207.67
2036	15,119.28	80.79	1,461.40	16,661.48
2037	12,298.60	82.22	1,503.19	13,884.02
2038	10,026.35	76.91	1,603.17	11,706.44
2039	7,548.05	82.78	1,724.90	9,355.73
2040	3,846.60	89.92	1,797.22	5,733.74
2041	1,306.41	62.79	1,855.91	3,225.10
2042	-	62.77	1,826.75	1,889.52
2043	-	62.77	1,758.55	1,821.32
2044	-	38.88	1,764.26	1,803.14
2045	-	38.84	1,870.96	1,909.81
2046	-	47.15	2,373.91	2,421.07
2047	-	76.69	2,472.65	2,549.34
2048	-	151.96	2,184.96	2,336.93
2049	-	319.41	1,902.09	2,221.50
2050	-	641.46	1,686.68	2,328.14
2051	-	860.83	1,463.38	2,324.22
Total	**228,047.94**	**7,514.18**	**45,515.34**	**281,077.46**

Net Greenhouse Gas Emissions in the Baseline from Planned Deforestation

Under the baseline scenario, net greenhouse gas (GHG) emissions resulting from planned deforestation are estimated at 2,422,135.71 tCO_2e over the project period. Of this total, approximately 2,141,058.25 tCO_2e (88.4%) originates in aboveground tree biomass ($\Delta C_{AB,tree,BSL}$), while the remaining 281,077.46 tCO_2e (11.6%) is attributed to belowground tree biomass ($\Delta C_{BB,tree,BSL}$). Table 30 presents the annual GHG emissions from planned deforestation under the baseline scenario throughout the project period.

Table 30. Annual net greenhouse emissions in the baseline from planned deforestation (tCO2e)

Year	ΔCAB,tree,BSL	ΔCBB,tree,BSL	Total
2023	207,803.74	3,747.76	211,551.51
2024	104,011.61	5,944.26	109,955.87
2025	81,905.48	7,421.23	89,326.71
2026	172,615.27	8,985.06	181,600.32
2027	193,034.38	11,978.26	205,012.64
2028	215,453.83	14,451.52	229,905.35
2029	183,748.38	17,104.97	200,853.35
2030	212,600.86	20,949.51	233,550.37
2031	226,391.92	23,683.83	250,075.75
2032	131,186.61	25,195.78	156,382.39
2033	23,543.38	21,674.21	45,217.58
2034	19,232.97	19,561.92	38,794.89
2035	18,818.26	18,207.67	37,025.93
2036	10,987.39	16,661.48	27,648.86
2037	20,232.69	13,884.02	34,116.71
2038	32,840.21	11,706.44	44,546.65
2039	25,812.04	9,355.73	35,167.77
2040	19,985.77	5,733.74	25,719.51
2041	23,998.20	3,225.10	27,223.30
2042	20,234.68	1,889.52	22,124.20
2043	20,917.16	1,821.32	22,738.48

Year	ΔCAB,tree,BSL	ΔCBB,tree,BSL	Total
2044	14,941.25	1,803.14	16,744.39
2045	25,776.58	1,909.81	27,686.39
2046	46,738.77	2,421.07	49,159.83
2047	29,406.51	2,549.34	31,955.84
2048	9,782.83	2,336.93	12,119.76
2049	8,836.41	2,221.50	11,057.91
2050	19,110.05	2,328.14	21,438.19
2051	21,111.03	2,324.22	23,435.25
Total	**2,141,058.25**	**281,077.46**	**2,422,135.71**

3.2.1.6 Baseline emission of Wetlands Restoration and Conservation (WRC) areas

Calculation was carried out by using spatial-temporally explicit method, i.e. by dividing model area (project area is subset of it) into 23,493 number of cells, each of 3 hectares in size in a standard finite difference schematization. Based on their role in the system we divided our model into 3 parts that were interconnected and working together in unison: water balance, carbon balance, and soil mechanics models.

Water balance model was used to simulate water tables by incorporating Darcy's Law (Darcy, 1856) for saturated flow, Philip (1957) and Penman-Monteith (Monteith, 1965) models for unsaturated soil water depletion and evapotranspiration, Saint Venant (1871) and Manning (1891) equations for surface flow. The essence of this model is that water storage of each cell fluctuates as a function of rainfall input, water removal by evapotranspiration, water output flux to- and input from adjacent cells. All those behaviours are also governed by aquifer properties, climate, and topography. Water balance with finite difference method has been developed for more than a century and has gained a strong foothold in the application of hydrology. Among authors who justified its applications (out of extremely exhaustive list) are Remson, Hornberger and Molz (1971), Goode and Appel (1992), Belitz and Phillips (1993), Anderman and Hill (2000), Chiang and Kinzelbach (2000), Bear and Cheng (2010). A review on commonly used models for peatlands is given by Mozafari, et al. (2023).

Carbon balance model comprised of simple peat decomposition and combustion models, by which carbon and dry mass losses were simulated to reduce aquifer volume and to alter topography of the peatland. These alterations in turn would also alter peatland water balance behaviour. Peat decomposition rates (as GHG emissions in unit mass per unit area per unit time) were modelled as a linear function of water table depth. Equivalent subsidence of the GHG emissions were reverse

calculated by using GHG molecular mass, peat bulk density and carbon content. Meanwhile, combustions were modelled as burn scars (in unit length) on soil surface, that were later converted to GHG emissions (in unit mass per unit area per unit time) by using IPCC default factors.

In the soil mechanic model, we simulated the reduction of aquifer volume, and the subsidence of soil surface associated with the changes in mechanical balance in peat soil as the results of water losses and increased mechanical load (consolidation, compaction, and shrinkage). Aquifer volume reductions, when not accompanied by mass reductions, would result in increased bulk density. The latter would affect the rate of GHG emissions from peat combustions. We employed Terzaghi's model for consolidation (Terzaghi, et.al., 1959, Verruijt, 2001) and simple linear models for compaction (Proctor test) and shrinkage (shrinkage box test), both later were empirical.

Project duration was divided into 1 year time-steps (Carbon Accounting Step), while for hydrological modelling (see more details in Annex 3) the carbon accounting time step was further divided into 12 sub steps (monthly) for baseline scenario and 366 sub-steps (daily) for ex-ante project scenario. Baseline scenario calculation was done in one run covering 100 years period. For ex-ante project scenario, the calculation was done in one run covering 1 year period, assuming the results would be very similar to those of the next iterations providing no significant changes would occur in the hydrological system other than rewetting impacts. For simplicity, rewetting impacted areas were assumed to manifest within 1000 m distance both sides from the rewetted canals. Assuming successful rewetting program, peat emissions within the rewetting impact areas were deemed zero starting from the onset times of each corresponding rewetted canal segments. In Figure 46 we show the conceptual framework of model inputs, processes and outputs.

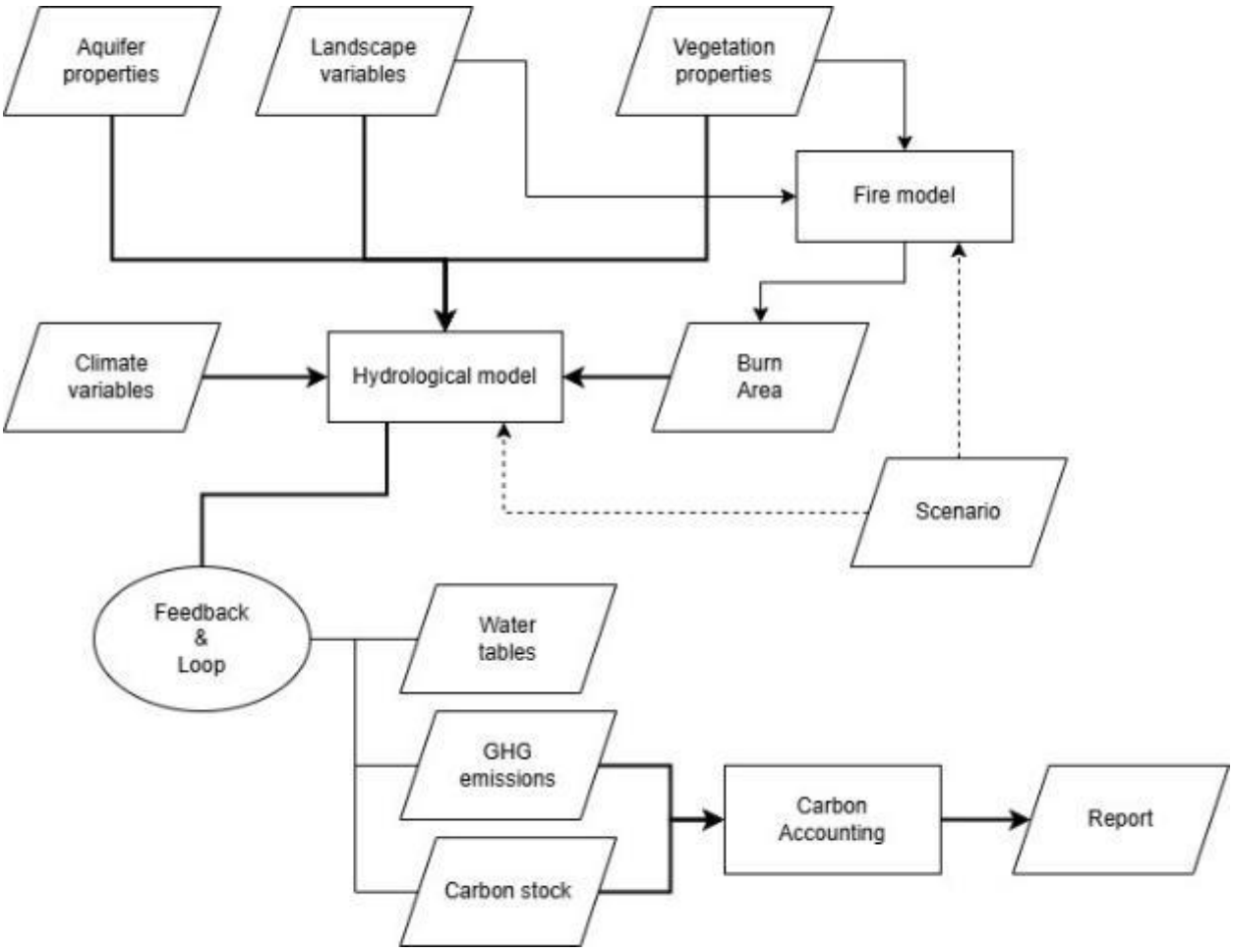


Figure 46. The conceptual framework of model inputs, processes and outputs

Using the GHG project boundary described in Section 3.1.1 and results of the stratification described in Section 3.2.1.2, the net baseline GHG emissions from peat soils were calculated by using Equation (1) provided in VMD0042 (BL-PEAT), by excluding the peat-ditch term from the equation:

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

Where:

$GHG_{BSL-PEAT}$: Net GHG emissions in the WRC baseline scenario on peatland up to year t* (tCO_2e)

$GHG_{peatsoil-BSL}$: GHG emissions from the peat soil within the project boundary in the baseline scenario ($tCO_2e\ ha^{-1}\ yr^{-1}$)

$GHG_{peatburn-BSL}$: GHG emissions from burning of peat in the base line scenario ($tCO_2e\ ha^{-1}\ yr^{-1}$)

$A_{peatsoil-BSL}$	:	Area of peatland (not open water, not burnt) in the baseline scenario (ha)
$A_{peatburn-BSL}$	:	Area of peat in the baseline scenario (ha)
i	:	1, 2, 3, … M, Index of grid in Project Area
t	:	1, 2, 3, … t* times elapsed since the project start (yr)

Calculations were carried out in a spatially explicit, dynamic fashion to ensure the following restrictions in our model:

(1) Carbon stock depletion is consistent with subsidence

Spatial-temporally explicit scheme helps our model in tracking where, when and the quantity of carbon release and stock changes. In this way, every unit of emission is always associated with equivalent unit of dry mass and carbon stock losses from existing stocks, and equivalent unit of subsidence of peat soils.

(2) Total carbon emissions do not exceed total carbon stock or total available stock for emission.

Carbon stock may be depleted after prolonged emissions. Once this happens carbon emissions from peat oxidation are no longer possible. Peat depletion manifests as subsidence. Every time land subsides the soil surface gets closer to the peat base. In many cases, peat bases are lower than the minimum possible drainage depth (i.e., Drainability Elevation Limit, DEL a.k.a. ultimate drainage base). Carbon stock below DEL is not available for emissions, unless the responsible baseline agent is proven to be able and intent to apply mechanical pumping for years in order to maintain water table levels well below the DEL. In this project we conservatively assumed that the baseline agent is not able or willing to apply mechanical pumping in the future.

Available stock for emissions in each grid cell was determined based on corresponding surface elevation, DEL, and peat thickness. It is equivalent with the term depletable peat volume per unit area, or available peat thickness for subsidence, and can be written as follows:

$$L_{Avail,i} = Z_{Top0,i} - Z_{base,i}$$

Peat depletion base Z_{base} for each cell was evaluated from the relative position of DEL to the basal contact elevation of peat soils. The site-wide surface elevation dataset (or Digital Terrain Model) was created using LiDAR data along the survey transects (from ground-classified LiDAR returns), and using an iterative gap-filling technique (whereby the Forest and Buildings Removed Digital Elevation Model dataset was corrected using distance-weighted blending, so that the LiDAR data were treated as reference data (never corrected), and the FABDEM data were locally integrated to produce a seamless DEM). The DEL was calculated as a function of distance from the closest water body. More details on surface elevation and DEL mapping are given in Annex 3. For each cell, if DEL was at higher elevation than peat basal contact, then Z_{base} equals DEL

$$Z_{Base,i} = DEL_i$$

Otherwise:

$$Z_{Base,i} = Z_{Top0,i} - L_{Peat0,i}$$

Where:

L_{Avail} : Available thickness of peat soils for subsidence (m)

Z_{base} : Depletion base of peat soils (m-msl)

Z_{Top} : Initial surface elevation of peat soils in cell at start date (m-msl)

L_{Peat0} : Initial thickness of peat soils in cell at start date (m)

DEL : Drainability Elevation Limit (m-msl)

i : Index of grid in Project Area

Water table depths were estimated by using a spatially explicit, dynamic, hydrological model over the baseline period. Main input for this model includes precipitation (measured on site, and Climate Hazards Group Infrared Precipitation Station data, CHIRPS), aquifer properties (among others: hydraulic conductivity measured in situ) and canal hydraulic properties (among others: measured dimension and slope). As many as 21 dipwells were installed to measure actual water table depth in the field from November 23, 2022– April 22, 2025. Model parameters were calibrated by using water table depth data and the least square method. More details on hydrological modelling are given in Annex 3.

A general rule was applied for every cell that as the water table drops below DEL, the water table at that position was limited to DEL (i.e., the lowest possible water table at a position respective to its surrounding natural drainage).

Drainage, fires, intense drying and mechanical compaction induces subsidence of peat surface. Subsidence attributed directly to drainage comprises consolidation and loss to microbial decomposition of peat soil. Fires also induce peat loss, but at a faster rate than microbial decomposition does. Intense drying induces shrinkage, and mechanical compaction causes compaction of peat soils.

Subsidence due to peat decomposition for each cell was reverse-calculated using equivalent dry mass loss and bulk density profile of peat soil (see also Annex 3):

$$S_{Decomp-BSL,i,t} = \frac{\Delta M_{BSL,i,t}}{f_{c,BSL,i,t}} - \frac{\beta_{BSL,i,t}}{k f_{c,BSL,i,t}} \mathrm{Exp}\left(-kD_{BSL,i,t}\right) \times \left(\mathrm{Exp}\left(k\frac{\Delta M_{BSL,i,t}}{M_{BSL,i,t}} D_{BSL,i,t}\right) - 1\right)$$

$$\Delta M_{BSL,i,t} = GHG_{peatsoil-BSL,i,t} \times \frac{12}{44}$$

Where

S : Subsidence of peat soil (m yr^{-1})

ΔM : Equivalent dry mass loss due to microbial decomposition of peat soil (m yr^{-1})

M : Dry mass density of peat soil, i.e. total dry mass of peat substrate from top to bottom of the peat soil per unit surface area (kg m^{-2})

β : Top layer incremental factor (kg m^{-3})

f_c : Base bulk density (kg m^{-3})

k : Empirical slope coefficient of the curve (m^{-1})

D : Peat thickness of the soil profile (m)

i : Grid index in the Project Area

t : 1, 2, 3, … t* time elapsed since the start of the project activity (years)

$Decomp$: Subscript indicating decomposition

BSL : Subscript indicating baseline scenario

Equivalent subsidence due to peat combustion for each cell was directly derived from burn scar depth plus associated shrinkage that follows. Burn scar depths were set to be dependent on cells' individual burning history as listed in Table 31.

With the application of drainage in the baseline scenario peat soils were expected to undergo rapid initial subsidence in the few weeks to few months after first drainage and is considered as one-time event. This rapid subsidence was assumed to be completed within a year. The location and timing of cells experiencing initial subsidence were set to match the time of the onset of drainage. Rapid initial subsidence comprises consolidation, and shrinkage (if also followed by deforestation). Compaction is simulated in areas with heavy traffic or intense human access along roads/railroads and managed deforested areas.

Both shrinkage and compaction were calculated by using measured shrinkage and compaction properties of peat soils and are treated as one time event. The depth of peat soils undergone shrinkage and compaction is limited to the upper phreatic zone. In this project an estimate maximum value of 40 cm was used both for shrinkage and compaction depths

$$Shrink_{BSL,i} = c_{shrink} \times D_{shrink}$$

$$Compact_{BSL,i} = c_{comp} \times D_{comp}$$

Where:

$Shrink_{BSL}$: Shrinkage of peat soil in baseline scenario (m yr^{-1})

$Compact_{BSL}$: Compaction of peat soil in baseline scenario (m yr^{-1})

c_{comp} : Compaction coefficient derived from Proctor Test (-)

c_{shrink} : Shrinkage coefficient derived from Shrinkage Test (-)

D_{shrink} : Shrinkage depth of the upper soil (m)

D_{comp} : Compaction depth of the upper soil (m)

i : Index of grid in Project Area

One-dimensional consolidation model from Terzaghi (Terzaghi, et.al., 1996; Verruijt, 2001) was used in modelling consolidation as given below:

$$Consol_{BSL,i,t} = L_{0,i,t} \times C_p \times (1 - n_{i,t}) \times log \frac{P_{i,t}}{P_{o,i}}$$

Where:

$Consol_{BSL}$: Rapid initial subsidence associated with consolidation upon first drainage application (m yr^{-1})

L_0 : Initial peat thickness before consolidation (m)

C_p : Primary consolidation index (m)

n : Porosity of peat soils (-)

P_o : Initial effective stress acting over the entire column of peat soils before drainage (Pa)

P : Post-drainage effective stress acting over the entire column of peat soils (Pa)

i : Index of grid in Project Area

t : 1, 2, 3, … t* time elapsed since the start of the project activity (years)

Considering all the subsidence components, the total subsidence in each cell equals the summation of the consolidation, shrinkage, compaction, burn scar, and subsidence due to microbial decomposition of peat:

$$Sub_{BSL,i,t} = Consol_{BSL,i,t} + S_{Decomp-BSL,i,t} + D_{peatburn-BSL,i,t} + Shrink_{BSL,i,t} + Compact_{BSL,i,t}$$

Where:

$Sub_{BSL,i,t}$: Subsidence in baseline scenario (m yr^{-1})

$Consol_{BSL,i,t}$: Rapid initial subsidence associated with consolidation in baseline scenario (m yr^{-1})

$S_{Decomp-BSL,i,t}$: Subsidence due to microbial decomposition of peat in baseline scenario (m yr^{-1})

$D_{peatburn-BSL,i,t}$: Fire scar depth in baseline scenario (m yr^{-1})

$Shrink_{BSL,i,t}$: Shrinkage of peat soil in baseline scenario (m yr^{-1})

$Compact_{BSL,i,t}$: Compaction of peat soil in baseline scenario (m yr^{-1})

t : 1, 2, 3, … t* time elapsed since the start of the project activity (years)

i : Index of grid in Project Area

Peat thickness and topography in cells were subsequently updated as the time advances in the calculation run:

$$Peat_{BSL,i,t+1} = Peat_{BSL,i,t} - Sub_{BSL,i,t} \times \Delta t$$

$$Top_{BSL,i,t+1} = Top_{BSL,i,t} - Sub_{BSL,i,t} \times \Delta t$$

Where:

$Peat_{BSL}$: Peat thickness in baseline scenario (m)

Top_{BSL} : Soil surface elevation in baseline scenario (m)

Sub_{BSL} : Subsidence in baseline scenario (m/yr)

Δt : Time interval (1 year)

t : 1, 2, 3, … t* time elapsed since the start of the project activity (years)

i : Index of grid in Project Area

Soil deformation such as those caused by peat decomposition, combustion, consolidation and shrinkage reduce the volume of peat soil. Volume reduction with the absence of soil mass loss increases soil bulk density of peat soils. Meanwhile, Volume loss accompanied by mass loss may or may not change bulk density but certainly will reduce dry mass density. Dry mass density of peat soil at any cell at any time was calculated as follows (more details are given in Annex 3):

$$M_{i,t} = f_{c,i,t} D_{i,t} + \frac{\beta_{i,t}}{k_i}(1 - e^{-k_i D_{i,t}})$$

$$\overline{\rho}_{b,i,t} = \frac{M_{i,t}}{D_{i,t}}$$

Where

M : Dry mass density of peat soil, i.e. total dry mass of peat substrate from top to bottom of the peat soil per unit surface area (kg m^{-2})

$\overline{\rho}_b$: Average bulk density of peat soil over soil column. i.e. from top to bottom of the peat soil (kg m^{-3})

β : Top layer incremental factor (kg m^{-3})

f_c : Base bulk density (kg m^{-2})

k : Empirical slope coefficient of the curve (m^{-1})

D : Peat thickness of the soil profile (m)

i : Grid index in the Project Area

t : 1, 2, 3, … t* time elapsed since the start of the project activity (years)

More details on bulk density, dry mass density of peat soils, and their interrelationships with peat decomposition, consolidation, compaction and shrinkage is given in Annex 3.

Baseline GHG Emissions from peat decomposition

GHG emissions from peat soils in this project area are defined as CO_2 emissions resulting from the oxidation of drained peat soils, omitting other potential gases, as set out in the GHG accounting boundaries. This project adopted a water table proxy 90 tCO_2e ha^{-1} yr^{-1} based on published values (Hooijer, et al. 2006; Hooijer, et al. 2010; Jauhianen, et al. 2012; Couwenberg and Hooijer, 2013; Carlson et al. 2015) for this calculation, as given below:

Annual average water table depths of cells were used as proxy to calculate peat emissions associated with microbial decomposition of peat soils.

$$GHG_{peatsoil-BSL,i,t} = \mathrm{c} \times WTD_{i,t}$$

Where:

$GHG_{peatsoil-BSL}$: GHG emissions from microbial decomposition of peat soil within the project boundary (tCO_2e ha^{-1} yr^{-1})

WTD : Annual average water table depth (m-ss)

c : Proxy constant (tCO_2e ha^{-1} yr^{-1} m^{-1}) (in this project: 90)

i : Index of grid in Project Area

t : 1, 2, 3, … t* time elapsed since the start of the project activity (years)

Having modelled the water table depth for each cell, CO_2 emissions from peat oxidation were calculated by using a water table proxy. Peat oxidations were conservatively set to zero wherever and whenever water table has reached DEL or remaining peat thickness in the corresponding cell became equal or less than 0.2 meters[16]. Moreover, whenever and wherever cell water table depth exceeded 1 meter, CO_2 emissions from peat oxidation were capped to 90 $tCO_2e\ ha^{-1}\ yr^{-1}$ for the corresponding cell.

Baseline Fire Modelling

The SPCP approach for modelling fire occurrence combined logistic regression to estimate extent of fire occurrence and Monte Carlo simulations to predict the distribution of fire occurrence in the baseline period, full details of the approach are found in Annex 3. The logistic regression component produced risk maps based on fire hotspot data (2015 – 2024) from MODIS and VIIRS, as well as the following variables: (1) Distance to frequently accessed drainage canals, (2) Distance to less frequently accessed drainage canals, (3) Distance to normal roads and highways, (4) Distance to small tracks and dirt roads, (5) Distance to navigable rivers, (6) Distance to less navigable rivers, (7) Distance to settlements (village, cities/towns), (8) Distance to farms and other agricultural lands, (9) Land cover type (forest or non-forest) over a 1,574,923.4 ha focal area. Focal area delineation was based on consideration on the anthropogenic (ethnicity, state of development the area) and landscape similarities to the project area. As proven in a regression analysis, anthropogenic factors play the most prominent role in determining hotspot distribution.

From this analysis, a value of 3.82% was derived as the annual percentage of area burnt (AAB%) and was then used to determine a threshold for annual area burnt (AAB) under baseline scenario as follows:

$$AAB = AAB\% \times A_{Fire}$$

Where:

AAB : Annual area burnt (ha $year^{-1}$)

$AAB\%$: Percentage of annual area burnt (% $year^{-1}$)

A_{Fire} : Project Area susceptible to fire (ha)

The annual number of fire cells (project area grids that would catch fire) was calculated by dividing the annual area burnt by cell size

$$N_{Fire} = \frac{AAB}{Cellsize}$$

[16] For most mineral soils, the upper 0.2 meters of organic layer is considered top-soil or the O-horizon (Soil Surfey Staff, 2023). The project conservatively assumed that once peat thickness had been reduced to 0.2 meter, the organic layer would have become an O-layer of a mineral soil, and the peat emission would cease

Where:

N_{Fire} : Annual number of fire cells, rounded to the nearest integer (year^{-1})

AAB : Annual area burnt (ha year^{-1})

$Cellsize$: Cell size (ha)

Baseline fire events were simulated using a Monte Carlo simulation. Using parameters calculated in logistic regression process, for each year in the baseline period starting from the start date, Fire Scores for every cell in A_{Fire} were calculated by using Fire Probability values and random numbers as follows.

$$FS_i = \frac{c \times Rand_i + P_i}{c + 1}$$

Where:

FS : Fire score (-)

P : Fire probability (-)

$Rand$: Random number (decimal)

i : Index of grid in Project Area susceptible to fire

c : Random weight coefficient (integer, empirically fitted: 100)

The random weight coefficient was optimized by minimizing residuals of Observed Mean Distance (OMD) statistic between modelled hot spot (in model area) versus historical data (in the focal area) by trying values between 1 - 200. It was found that at c ≥ 100 the residuals have become small enough and convergence, and can be applied in our model

For each year, the fire scores were then sorted in descending order and the upper portion of the sorted rows, from the first row to the N_{Fire} row, were selected as the realization of the fire incidents for the corresponding year.

Every realization of fire incident in individual cells was recorded during the simulation over baseline period. Every time the same cell was burnt it added to its cumulative count history, and the burn scar depth parameter value for the respective cell was adjusted accordingly. Conservatively, no peat combustion was assumed to take place wherever peat thickness was less than 0.2 meters.

Model accuracy was assessed using a confusion matrix approach, whereby modeled/predicted locations of fire events were compared to historical hotspot detections (from the last 10 years). As the accuracy score is sensitive to sample size, the sample size was increased until the accuracy stabilized (where sample size has no effect). This modelling approach correctly predicted hotspot locations 75.5% of the time, when compared to historical observations (Annex 3 for further details).

GHG emissions from combustion of peat soil were calculated using equation (3) of module VMD0013 (E-BPB) as follows:

$$GHG_{peatburn-BSL,i,t} = \sum_{g=1}^{G} \left(P_{i,t} \times G_{g,i} \times 10^{-3} \times GWP_g \right)$$

Where:

$GHG_{peatburn}$	:	GHG emissions due to peat burning in the baseline scenario ($tCO_2e\ ha^{-1}\ yr^{-1}$)
P	:	Average mass of peat burnt in the baseline scenario (t d.m. ha^{-1})
G	:	Emission factor for gas (kg t^{-1} d.m. burnt)
GWP	:	Global warming potential for gas g ($tCO_2\ tg^{-1}$)
P	:	1, 2, 3 … G GHGs including carbon dioxide, methane and nitrous oxide (unitless)
i	:	1, 2, 3 … cell index (unitless)
t	:	1, 2, 3, … t* Time elapsed since the start of the project activity (year)
BSL	:	Subscript indicating baseline scenario

The average mass of peat carbon burnt for a particular stratum was estimated based on burn scar depth as follows:

$$P_{i,t} = D_{peatburn,i,t} \times BD_{upper,i,t} \times 10^4$$

$$BD_{upper,i,t} = f_{c,i,t} \times D_{eatburn,i,t} + \frac{\beta_{i,t}}{k} \times \left(e^{-kD_{petburn},i,t} - 1 \right)$$

Where:

P	:	Average mass of peat burnt in the baseline scenario (td.m. ha^{-1})
β	:	Top layer incremental factor (kg m^{-3})
f_c	:	Base bulk density (kg m^{-3})
k	:	Empirical slope coefficient of the curve (1/m)
$D_{peatburn}$	:	Average fire scar depth (m)
BD_{upper}	:	Bulk density of the upper peat (g cm^{-3})

i : 1, 2, 3 … cell index (unitless)

t : 1, 2, 3, … t* Time elapsed since the start of the project activity (year)

Table 31. The default value of multiplied peat-burning used for emission calculation

Parameters	Value	Unit	Source
1st burning burn scar depth	0.18	m	Page, et.al. (2014)
2nd burning burn scar depth	0.14	m	Page, et.al. (2014)
>3rd burning burn scar depth	0.04	m	Page, et.al. (2014)
EF CO2 Peat combustion	1.703	g g^{-1}	Christian, et.al. (2003)
EF CH4 Peat combustion	0.0208	g g^{-1}	Christian, et.al. (2003)
EF N2O Peat combustion	0.00027	g g^{-1}	Hatano, et.al. (2016)
GWP CO2	1	-	IPCC Fifth Assessment Report, 2014 (AR6)
GWP CH4	27	-	IPCC Fifth Assessment Report, 2014 (AR6)
GWP N2O	273	-	IPCC Fifth Assessment Report, 2014 (AR6)

Total baseline GHG emissions from WRC activity were counted as the summation of GHG from Peat decomposition and peat combustion on a yearly basis as given in the following Table 32.

Table 32. Baseline emissions from WRC activity in $tCO_2e\ yr^{-1}$

Year	Peat Decomposition	Peat Combustion	Total Emission
2023	143,336.80	155,971.35	299,308.15
2024	169,048.10	138,228.12	307,276.22

Year	Peat Decomposition	Peat Combustion	Total Emission
2025	239,730.09	154,319.21	394,049.30
2026	311,540.87	167,128.73	478,669.60
2027	374,045.93	184,702.00	558,747.93
2028	448,605.29	175,012.14	623,617.42
2029	501,999.45	156,668.81	658,668.26
2030	570,728.60	181,212.73	751,941.33
2031	621,353.17	237,594.87	858,948.04
2032	658,185.64	174,668.08	832,853.72
2033	705,984.90	209,884.05	915,868.95
2034	753,069.34	204,412.72	957,482.06
2035	794,963.27	188,749.72	983,712.99
2036	840,833.05	208,721.48	1,049,554.52
2037	880,593.77	252,131.63	1,132,725.40
2038	928,608.31	245,903.09	1,174,511.41
2039	963,232.69	240,506.59	1,203,739.28
2040	997,190.59	290,682.54	1,287,873.12
2041	1,029,924.94	286,717.90	1,316,642.84
2042	1,068,075.11	319,421.80	1,387,496.92
2043	1,114,611.03	295,004.09	1,409,615.12
2044	1,146,350.95	273,856.63	1,420,207.58
2045	1,184,546.87	276,740.47	1,461,287.34
2046	1,221,379.09	316,023.95	1,537,403.04
2047	1,246,998.74	331,873.12	1,578,871.86
2048	1,245,767.95	311,122.28	1,556,890.23
2049	1,239,657.83	291,891.03	1,531,548.87
2050	1,236,360.95	329,332.07	1,565,693.02

Year	Peat Decomposition	Peat Combustion	Total Emission
2051	1,230,750.17	340,792.96	1,571,543.13
2052	1,231,884.31	292,617.40	1,524,501.70
2053	1,227,630.80	274,142.41	1,501,773.21
2054	1,217,959.15	279,107.14	1,497,066.29
2055	1,212,997.06	286,611.25	1,499,608.31
2056	1,206,443.08	302,745.86	1,509,188.94
2057	1,201,263.53	290,662.44	1,491,925.97
2058	1,196,704.86	269,183.81	1,465,888.68
2059	1,188,760.70	284,766.09	1,473,526.79
2060	1,182,926.27	251,577.16	1,434,503.42
2061	1,177,453.13	262,426.71	1,439,879.83
2062	1,171,441.53	286,209.99	1,457,651.52
2063	1,164,287.04	256,502.46	1,420,789.50
2064	1,159,940.95	331,805.25	1,491,746.20
2065	1,151,435.40	293,269.05	1,444,704.44
2066	1,145,628.51	282,010.27	1,427,638.78
2067	1,139,640.54	305,743.69	1,445,384.23
2068	1,130,509.21	266,398.95	1,396,908.16
2069	1,121,712.30	259,111.26	1,380,823.56
2070	1,113,253.17	264,379.26	1,377,632.43
2071	1,104,374.58	244,399.45	1,348,774.04
2072	1,097,348.76	251,390.96	1,348,739.72
2073	1,091,979.71	259,427.02	1,351,406.73
2074	1,082,998.76	253,908.60	1,336,907.36
2075	1,075,552.48	265,882.60	1,341,435.08
2076	1,069,277.61	266,556.18	1,335,833.80

Year	Peat Decomposition	Peat Combustion	Total Emission
2077	1,061,815.77	247,920.61	1,309,736.38
2078	1,053,894.97	254,814.10	1,308,709.06
2079	1,045,115.72	236,504.68	1,281,620.40
2080	1,036,096.64	296,270.51	1,332,367.15
2081	1,028,963.57	267,332.60	1,296,296.18
2082	1,021,156.70	240,890.63	1,262,047.34
2083	1,013,478.41	257,196.43	1,270,674.83
2084	1,005,932.60	229,746.40	1,235,679.00
2085	999,053.14	218,313.82	1,217,366.96
2086	991,124.70	257,209.26	1,248,333.96
2087	982,045.23	274,464.40	1,256,509.63
2088	975,056.09	242,471.21	1,217,527.30
2089	967,019.21	293,441.48	1,260,460.69
2090	959,959.77	257,287.90	1,217,247.67
2091	950,937.58	236,351.89	1,187,289.47
2092	939,896.34	252,760.63	1,192,656.97
2093	932,621.75	225,756.55	1,158,378.30
2094	923,706.78	236,068.00	1,159,774.78
2095	913,905.22	221,202.59	1,135,107.81
2096	906,263.82	214,610.85	1,120,874.66
2097	896,832.61	226,748.36	1,123,580.97
2098	887,933.06	245,944.90	1,133,877.96
2099	879,105.55	221,082.62	1,100,188.17
2100	869,709.05	231,399.47	1,101,108.52
2101	860,466.98	209,230.03	1,069,697.01
2102	853,201.55	223,400.28	1,076,601.83

Year	Peat Decomposition	Peat Combustion	Total Emission
2103	842,458.16	224,741.85	1,067,200.01
2104	832,375.76	243,825.93	1,076,201.68
2105	824,709.55	188,416.21	1,013,125.76
2106	814,633.83	218,143.80	1,032,777.63
2107	805,058.73	211,616.96	1,016,675.69
2108	797,800.65	227,488.08	1,025,288.73
2109	787,844.61	222,170.31	1,010,014.92
2110	779,278.71	223,594.45	1,002,873.15
2111	771,332.51	224,621.50	995,954.01
2112	763,322.24	223,494.19	986,816.43
2113	753,788.45	225,494.03	979,282.48
2114	746,616.98	216,409.84	963,026.82
2115	738,128.63	239,303.63	977,432.26
2116	728,162.88	208,776.47	936,939.36
2117	718,344.08	226,919.40	945,263.49
2118	707,449.69	249,346.49	956,796.18
2119	698,639.62	191,478.10	890,117.72
2120	689,977.18	236,982.83	926,960.02
2121	681,148.00	251,761.54	932,909.53
2122	670,173.39	193,766.61	863,940.00

3.2.2 Project Emissions (VCS, 3.15)

3.2.2.1 Project emissions from REDD area (TPTI, TPTJ, THPB)

3.2.2.1.1 Project emissions as a result of deforestation

Based on historical records, deforestation has occurred within the concession area, indicating a potential risk of continued forest loss. Accordingly, emissions from deforestation are anticipated and included in the project scenario for the REDD area. The project aims to implement a range of interventions and mitigation measures to gradually reduce and ultimately halt deforestation within a

ten-year period. The projected total deforested area over this period is estimated at 84 hectares, as shown in Table 33.

Table 33. Projected area of deforestation within project area (ha)

Year	TPTI area	THPB area	TPTJ area	Project area
2023	5	5	4	14
2024	5	5	4	14
2025	4	5	4	13
2026	4	3	3	10
2027	3	3	3	9
2028	3	3	3	9
2029	2	2	2	6
2030	2	2	2	6
2031	1	1	1	3
2032	-	-	-	-
…	-	-	-	-
2051	-	-	-	-
Total	29	29	26	84

As outlined in the M-REDD methodology, GHG emissions from deforestation are calculated using the equation (3) of VMD0015 below.

$$\Delta C_{P,DefPA,i,t} = \sum_{u=1}^{U}\left(A_{DefPA,u,i,t} * \Delta C_{poolsP,Def,u,i,t}\right) \quad \text{equation 3 of VMD0015}$$

Where:

$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i in year t; tCO_2e
$A_{DefPA,u,i,t}$	Area of recorded deforestation in the project area stratum i converted to land use u in year t; ha
$\Delta C_{poolsP,Def,u,i,t}$	Net carbon stock changes in all pools in the project case in land use u in stratum i in year t; $tCO_2e\ ha^{-1}$
u	1, 2, 3, …U post-deforestation land uses
i	1, 2, 3, … M strata.

In this calculation, the pre-deforestation land use is classified as forest, while the post-deforestation land use is classified as non-forest. Based on this transition, carbon stock change due to deforestation is estimated at 465.09 tCO_2e per hectare.

Applying equation (3) of VMD0015, the ex-ante emissions resulting from deforestation over the project period are estimated to be 39,068 tCO_2e. A detailed summary of the annual ex-ante GHG emissions from deforestation is provided in Table 34.

Table 34. Ex-ante GHG emissions (tCO_2e) from deforestation in project area

Year	TPTI area	TPTJ area	THPB area	Project area
2023	2,325	2,325	1,860	6,511
2024	2,325	2,325	1,860	6,511
2025	1,860	2,325	1,860	6,046
2026	1,860	1,395	1,395	4,651
2027	1,395	1,395	1,395	4,186
2028	1,395	1,395	1,395	4,186
2029	930	930	930	2,791
2030	930	930	930	2,791
2031	465	465	465	1,395
2032	-	-	-	-
...	-	-	-	-
2051	-	-	-	-
Total	13,488	13,488	12,092	39,068

3.2.2.1.2 Project emissions as a result of forest degradation

Per VMD0015, a ground-based monitoring approach was adopted. As part of this approach, a Participatory Rural Appraisal (PRA) will be conducted with communities living around the project area to assess whether there is a potential risk of forest degradation by illegal logging.

Should the Participatory Rural Appraisal (PRA) identify a potential risk of illegal logging activities, a field sampling process will be carried out to assess the area of possible forest degradation. The specific area potentially subject to due to forest degradation ($A_{DegW,i}$) will be determined based on the estimated distance of logging penetration from various access points, using data collected during PRA. These access points may include roads, rivers, previously cleared areas, or any other identified entry routes that provide access to the forest.

The area potentially subject to forest degradation ($A_{DegW,i}$) will be sampled by surveying several transects of known length and width across the access buffer area (equal in area to at least 1% of $A_{DegW,i}$) to determine the presence or absence of new tree stumps. Where limited sampling provides evidence that trees are being removed in the buffer area, then systematic sampling will be implemented based on a detailed sampling plan. The sampling plan will be designed using plots systematically placed over the buffer zone so that they sample at least 3% of the area of the buffer zone ($A_{DegW,i}$). Per VMD00015, the field survey will be carried out every 5 years. During the survey, the diameter of tree stumps will be measured and conservatively assumed to be the same as the DBH. Especially for tree with buttress, the project will determine a ratio of the diameter at DBH to the diameter of buttress at the same height above ground as the measured stumps, The same allometric equation used for baseline carbon stock calculation would be used to estimate the carbon stock loss due to logging.

The net carbon stock changes as a result of degradation is calculated by equation (8) of VMD0015.

$$\Delta C_{P,DegW,i,t} = A_{DegW,i} * \frac{C_{DegW,i,t}}{AP_i}$$ equation 8 of VMD0015

Where:

$\Delta C_{P,DegW,i,t}$	Net carbon stock changes as a result of degradation in stratum i in the project area in year t; tCO_2e
$A_{DegW,i}$	Area potentially impacted by degradation processes in stratum i; ha
$C_{DegW,i,t}$	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum i in year t; tCO_2e
AP_i	Total area of degradation sample plots in stratum i; ha
i	1, 2, 3, …M strata
T	1, 2, 3, … t* years elapsed since the start of the project activity

SPCP is committed to eliminating illegal logging within the project area by implementing a comprehensive approach that includes community development, capacity building, awareness raising, and engagement of local authorities. Through community development initiatives, the project will provide alternative livelihoods and economic opportunities to reduce dependency on illegal logging. Capacity building efforts will support local communities (prioritizing loggers) with the necessary skills and resources to support the project in relevant programs including forest monitoring and patrols. Additionally, awareness campaigns will educate communities on the importance of protecting natural resources and promote sustainable land-use practices. By integrating these strategies, SPCP is confident that illegal logging can be fully eradicated within ten years from the project's start date.

Applying equation (8) VMD0015, ex-ante GHG emissions resulting from illegal logging within REDD area under the project scenario are estimated to be 169,833.33 tCO_2e, occurring between 2023 and 2034.

A summary of the annual GHG emissions from illegal logging throughout the project's lifetime is provided in Table 35. In this calculation, carbon emissions from fossil fuel combustion have been conservatively excluded.

Table 35. Ex-ante GHG emission resulting from illegal logging in the project scenario

Year	$CDegW,l,t$ (tCO_2e)	Api (ha)	ADegW (ha)	$\Delta CDegW,l,t$ (tCO_2e)
TPTI area				
2023	500	9	300	16,666.67
2024	500	9	300	16,666.67
2025	300	9	300	10,000.00
2026	300	9	300	10,000.00
2027	100	9	300	3,333.33
2028	100	9	300	3,333.33
2029	50	9	300	1,666.67
2030	50	9	300	1,666.67
2031	40	9	300	1,333.33
2032	30	9	300	1,000.00
2033	20	9	300	666.67
2034	10	9	300	333.33
Total				**66,666.67**
TPTJ area				
2023	200	6	200	6,666.67
2024	200	6	200	6,666.67
2025	200	6	200	6,666.67
2026	200	6	200	6,666.67
2027	100	6	200	3,333.33
2028	100	6	200	3,333.33
2029	50	6	200	1,666.67
2030	50	6	200	1,666.67

Year	CDegW,l,t (tCO_2e)	Api (ha)	ADegW (ha)	ΔCDegW,l,t (tCO_2e)
2031	25	6	200	833.33
2032	10	6	200	333.33
2033	-	6	200	-
2034	-	6	200	-
Total				**37,833.33**
THPB area				
2023	500	9	300	16,666.67
2024	500	9	300	16,666.67
2025	300	9	300	10,000.00
2026	300	9	300	10,000.00
2027	100	9	300	3,333.33
2028	100	9	300	3,333.33
2029	80	9	300	2,666.67
2030	50	9	300	1,666.67
2031	30	9	300	1,000.00
2032	-	9	300	-
2033	-	9	300	-
2034	-	9	300	-
Total				**65,333.33**
Grand Total				**169,833.33**

3.2.2.1.3 Net carbon stock change as a result of natural disturbances

Historical records indicate that the project area has not experienced natural disturbances such as windstorms, wildfires, or insect outbreaks. However, uncontrolled burning have been documented in the past within and surrounding areas, identifying it as a potential risk that must be taken into account in the project scenario.

The project assumes that uncontrolled burning would affect approximately 87 hectares of Forest and 61 hectares of Non-Forest areas. Based on this assumption, and using the methodological approach

provided in VMD0013 (Module E-BPB), ex-ante greenhouse gas (GHG) emissions resulting from uncontrolled burning are estimated at 30,380.26 tCO_2e over the period from the project start until 2031 (see Table 36).

Table 36. Ex-ante greenhouse gas (GHG) emissions resulting from uncontrolled burning

Year	Burnt areas (ha)		Emission (tCO_2e)		
	Forest	Non-Forest	Forest	Non-Forest	Total
TPTI area					
2023	5	1	1,449.39	84.60	1,533.99
2024	5	1	1,449.39	84.60	1,533.99
2025	4	1	1,159.51	84.60	1,244.12
2026	4	-	1,159.51	-	1,159.51
2027	3	-	869.63	-	869.63
2028	3	-	869.63	-	869.63
2029	2	-	579.76	-	579.76
2030	2	-	579.76	-	579.76
2031	1	-	289.88	-	289.88
...	-	-	-	-	-
2051	-	-	-	-	-
Total	**29**	**3**	**8,406.45**	**253.81**	**8,660.27**
TPTJ area					
2023	5	-	1,449.39	-	1,449.39
2024	5	-	1,449.39	-	1,449.39
2025	4	-	1,159.51	-	1,159.51
2026	4	-	1,159.51	-	1,159.51
2027	3	-	869.63	-	869.63
2028	3	-	869.63	-	869.63
2029	2	-	579.76	-	579.76
2030	2	-	579.76	-	579.76

Year	Burnt areas (ha)		Emission (tCO_2e)		
	Forest	Non-Forest	Forest	Non-Forest	Total
2031	1	-	289.88	-	289.88
...	-	-	-	-	-
2051	-	-	-	-	-
Total	**29**	**-**	**8,406.45**	**-**	**8,406.45**
THPB area					
2023	5	10	1,449.39	846.05	2,295.44
2024	5	10	1,449.39	846.05	2,295.44
2025	4	8	1,159.51	676.84	1,836.35
2026	4	8	1,159.51	676.84	1,836.35
2027	3	6	869.63	507.63	1,377.26
2028	3	6	869.63	507.63	1,377.26
2029	2	4	579.76	338.42	918.18
2030	2	4	579.76	338.42	918.18
2031	1	2	289.88	169.21	459.09
...	-	-	-	-	-
2051	-	-	-	-	-
Total	29	58	8,406.45	4,907.08	13,313.54
Grand Total	**87**	**61**	**25,219.36**	**5,160.90**	**30,380.26**

3.2.2.1.4 GHG emissions as a result of deforestation and degradation activities

Considering its exclusion in the baseline scenario, greenhouse gas emissions resulting from deforestation and degradation activities within the project area under the project case ($GHG_{P\text{-}E,l,t}$) are likewise excluded from the calculation. This approach ensures consistency and comparability between the baseline and project scenarios, aligning with the principle of conservativeness in emissions accounting.

3.2.2.1.5 Net GHG emissions of REDD in the project scenario

The net GHG emissions in the project scenario ($\Delta C_{WPS-REDD}$) are calculated as the sum of carbon stock changes resulting from deforestation, forest degradation, and natural disturbances, along with GHG emissions from deforestation and degradation activities, as presented in the equation (1) of VMD0015.

$$\Delta C_{WPS-REDD} = \sum_{t=1}^{t*} \sum_{i=1}^{M} \left(\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t} \right)$$ equation (1) of VMD0015

Where:

$\Delta C_{WPS-REDDt}$	Net GHG emissions in the REDD project scenario up to year t*; tCO_2e
$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum i in year t; tCO_2e
$\Delta C_{P,Deg,i,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum i in year t; tCO_2e
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum i in year t; tCO_2e
$GHG_{P-E,it}$	GHG emissions as a result of deforestation and degradation activities within the project area in the project case in stratum i in year t; tCO_2e

By applying the equation above, the ex-ante net GHG emissions in the project scenario within REDD area are estimated to be 239,281.57 tCO_2e. A detailed breakdown of these calculations is provided in Table 37, which presents the projected annual emissions under the project scenario.

Table 37. Ex-ante net GHG emissions in the project scenario since the start of the project activity in REDD area (tCO_2e)

Year	$\Delta C_{P,DefPA}$	$\Delta C_{P,DegPA}$	$\Delta C_{P,DistPA}$	$\Delta C_{WPS-REDD}$
TPTI area				
2023	2,325.47	16,666.67	1,533.99	20,526.13
2024	2,325.47	16,666.67	1,533.99	20,526.13
2025	1,860.38	10,000.00	1,244.12	13,104.50
2026	1,860.38	10,000.00	1,159.51	13,019.89
2027	1,395.28	3,333.33	869.63	5,598.25
2028	1,395.28	3,333.33	869.63	5,598.25
2029	930.19	1,666.67	579.76	3,176.61

Year	$\Delta C_{P,DefPA}$	$\Delta C_{P,DegPA}$	$\Delta C_{P,DistPA}$	$\Delta C_{WPS-REDD}$
2030	930.19	1,666.67	579.76	3,176.61
2031	465.09	1,333.33	289.88	2,088.31
2032	-	1,000.00	-	1,000.00
2033	-	666.67	-	666.67
2034	-	333.33	-	333.33
Total	**13,487.75**	**66,666.67**	**8,660.27**	**88,814.69**
TPTJ area				
2023	2,325.47	6,666.67	1,449.39	10,441.53
2024	2,325.47	6,666.67	1,449.39	10,441.53
2025	2,325.47	6,666.67	1,159.51	10,151.65
2026	1,395.28	6,666.67	1,159.51	9,221.46
2027	1,395.28	3,333.33	869.63	5,598.25
2028	1,395.28	3,333.33	869.63	5,598.25
2029	930.19	1,666.67	579.76	3,176.61
2030	930.19	1,666.67	579.76	3,176.61
2031	465.09	833.33	289.88	1,588.31
2032	-	333.33	-	333.33
Total	**13,487.75**	**37,833.33**	**8,406.45**	**59,727.54**
THPB area				
2023	1,860.38	16,666.67	2,295.44	20,822.48
2024	1,860.38	16,666.67	2,295.44	20,822.48
2025	1,860.38	10,000.00	1,836.35	13,696.73
2026	1,395.28	10,000.00	1,836.35	13,231.63
2027	1,395.28	3,333.33	1,377.26	6,105.88
2028	1,395.28	3,333.33	1,377.26	6,105.88
2029	930.19	2,666.67	918.18	4,515.03
2030	930.19	1,666.67	918.18	3,515.03

Year	$\Delta C_{P,DefPA}$	$\Delta C_{P,DegPA}$	$\Delta C_{P,DistPA}$	$\Delta C_{WPS-REDD}$
2031	465.09	1,000.00	459.09	1,924.18
2032	-	-	-	-
Total	**12,092.47**	**65,333.33**	**13,313.54**	**90,739.34**
Grand Total	**39,067.97**	**169,833.33**	**30,380.26**	**239,281.57**

3.2.2.2 Project emissions from WRC area

Project emissions for WRC activity were quantified by using equation (1) set out in VMD0064 (M-Peat), by excluding all irrelevant components, as follows:

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

Where:

$GHG_{WPS-PEAT}$	:	Net GHG emissions in the WRC project scenario (tCO_2e)
$A_{peatsoil-WPS}$	:	Area of peatland relevant cell for peat decomposition in the project scenario (ha)
$A_{peatburn-WPS}$	:	Area of relevant cell for peat burnt in the project scenario (ha)
$GHG_{peatsoil-WPS}$	:	Peat emissions due to decomposition of peat soil of relevant cell in the project scenario (ha)
$GHG_{peatburn-WPS}$	:	Peat emissions due to combustion of peat soil of relevant cell in the project scenario (ha)
i	:	Cell index
M	:	Total number of relevant cells
t	:	Time (year)
t^*	:	Crediting period

SPCP employed the same procedures and model as those applied to the baseline scenario, by substituting relevant input parameters and variables to match the case for the project scenario, such as land use, hydraulic parameters, etc. For ex-ante project emissions, the project assume no fire would occur under project management, hence the peat fire component would be accounted as zero throughout project duration. For ex-post quantification, actual fire occurrence will be monitored (cf. monitoring section) and the associated GHG emissions will be accounted by using equation (3) of

module VMD0013 (E-BPB). Summary of ex-ante project emissions for WRC activity is given in the following Table.

Table 38. Project emissions in WRC area in $tCO_2e\ yr^{-1}$

Year	Peat Decomposition	Peat Combustion	Total
2023	94,138.49	-	94,138.49
2024	94,138.49	-	94,138.49
2025	94,138.49	-	94,138.49
2026	91,980.08	-	91,980.08
2027	55,189.45	-	55,189.45
2028	26,534.32	-	26,534.32
2029	26,534.32	-	26,534.32
2030	26,534.32	-	26,534.32
2031	26,534.32	-	26,534.32
2032	26,534.32	-	26,534.32
2033	26,534.32	-	26,534.32
2034	26,534.32	-	26,534.32
2035	26,534.32	-	26,534.32
2036	26,534.32	-	26,534.32
2037	26,534.32	-	26,534.32
2038	26,534.32	-	26,534.32
2039	26,534.32	-	26,534.32
2040	26,534.32	-	26,534.32
2041	26,534.32	-	26,534.32
2042	26,534.32	-	26,534.32
2043	26,534.32	-	26,534.32
2044	26,534.32	-	26,534.32

Year	Peat Decomposition	Peat Combustion	Total
2045	26,534.32	-	26,534.32
2046	26,534.32	-	26,534.32
2047	26,534.32	-	26,534.32
2048	26,534.32	-	26,534.32
2049	26,534.32	-	26,534.32
2050	26,534.32	-	26,534.32
2051	26,534.32	-	26,534.32
2052	26,534.32	-	26,534.32
2053	26,534.32	-	26,534.32
2054	26,534.32	-	26,534.32
2055	26,534.32	-	26,534.32
2056	26,534.32	-	26,534.32
2057	26,534.32	-	26,534.32
2058	26,534.32	-	26,534.32
2059	26,534.32	-	26,534.32
2060	26,534.32	-	26,534.32
2061	26,534.32	-	26,534.32
2062	26,534.32	-	26,534.32
2063	26,534.32	-	26,534.32
2064	26,534.32	-	26,534.32
2065	26,534.32	-	26,534.32
2066	26,534.32	-	26,534.32
2067	26,534.32	-	26,534.32
2068	26,534.32	-	26,534.32

Year	Peat Decomposition	Peat Combustion	Total
2069	26,534.32	-	26,534.32
2070	26,534.32	-	26,534.32
2071	26,534.32	-	26,534.32
2072	26,534.32	-	26,534.32
2073	26,534.32	-	26,534.32
2074	26,534.32	-	26,534.32
2075	26,534.32	-	26,534.32
2076	26,534.32	-	26,534.32
2077	26,534.32	-	26,534.32
2078	26,534.32	-	26,534.32
2079	26,534.32	-	26,534.32
2080	26,534.32	-	26,534.32
2081	26,534.32	-	26,534.32
2082	26,534.32	-	26,534.32
2083	26,534.32	-	26,534.32
2084	26,534.32	-	26,534.32
2085	26,534.32	-	26,534.32
2086	26,534.32	-	26,534.32
2087	26,534.32	-	26,534.32
2088	26,534.32	-	26,534.32
2089	26,534.32	-	26,534.32
2090	26,534.32	-	26,534.32
2091	26,534.32	-	26,534.32
2092	26,534.32	-	26,534.32

Year	Peat Decomposition	Peat Combustion	Total
2093	26,534.32	-	26,534.32
2094	26,534.32	-	26,534.32
2095	26,534.32	-	26,534.32
2096	26,534.32	-	26,534.32
2097	26,534.32	-	26,534.32
2098	26,534.32	-	26,534.32
2099	26,534.32	-	26,534.32
2100	26,534.32	-	26,534.32
2101	26,534.32	-	26,534.32
2102	26,534.32	-	26,534.32
2103	26,534.32	-	26,534.32
2104	26,534.32	-	26,534.32
2105	26,534.32	-	26,534.32
2106	26,534.32	-	26,534.32
2107	26,534.32	-	26,534.32
2108	26,534.32	-	26,534.32
2109	26,534.32	-	26,534.32
2110	26,534.32	-	26,534.32
2111	26,534.32	-	26,534.32
2112	26,534.32	-	26,534.32
2113	26,534.32	-	26,534.32
2114	26,534.32	-	26,534.32
2115	26,534.32	-	26,534.32
2116	26,534.32	-	26,534.32

Year	Peat Decomposition	Peat Combustion	Total
2117	26,534.32	-	26,534.32
2118	26,534.32	-	26,534.32
2119	26,534.32	-	26,534.32
2120	26,534.32	-	26,534.32
2121	26,534.32	-	26,534.32
2122	26,534.32	-	26,534.32

3.2.3 Leakage Emissions (VCS 2.5, 3.2, 3.6, 3.15, 4.3)

3.2.3.1 Activity Shifting Leakage

Since this project was built on the acquisition of an existing logging company, whose land and water management schemes were designed in advance, the baseline scenario of SPCP is therefore categorized as a planned deforestation/drainage with identifiable unique agent, i.e. the logging company PT Annisa Surya Kencana. Furthermore, PT ASK does not manage any other forest concession areas. With a new company goal and a new management in place, with no intention to resume the baseline land use nor to create the same baseline land use somewhere else, this project deemed **zero activity shifting leakage** throughout project period. Referring to VMD0009 (LK-ASP) module, the following table provides a summary of the leakage emissions of the project.

Table 39. Summary of the leakage emissions of the project

Year	$LKA_{planned}$	ΔC_{BSL}	$GHG_{LK,E}$	Total
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
...				
100	0	0	0	0

3.2.3.2 Ecological Leakage

Water management of SPCP is very unlikely to cause harmful ecological effects on its surrounding area, on the contrary it may provide ecological benefits. The water balance of ombrogenic tropical peatlands are mostly governed by rainfall and evapotranspiration while groundwater flow usually contributes less than 7 percent of the balance (Hirano, et al., 2015; Ritzema and Jansen, 2008; Wosten et al., 2006; Toby, et al., 2024). Based on 2024 data from our rainfall station it can be shown that evapotranspiration and surface flow make 69.3% and 26.4% contributions, respectively, while groundwater flow contributes 4.4% to the water balance.

Rewetting activities such as canal blocking, in essence, work by improving total storage in peat aquifer, with minor effects on groundwater flow to the surrounding. Increasing aquifer storage in an area does not affect its adjacent area on a large scale. There may be significant water table raise along its periphery to a limited extent, within few meters to few hundred meters, with diminishing impacts with distance. This water table raise would benefit vegetation growth instead of being harmful and may also reduce peat emissions in the affected area.

Nevertheless, following VMD0044 (LK-ECO) module, this project will install up to 10 monitoring wells in peatland surrounding the project to be able to detect ecological leakage. For ex-ante calculation, GHG emission from ecological leakage is deemed zero.

3.2.3.3 Emissions from market effect leakage (LK-ME)

REDD projects that prevent emissions from deforestation driven by timber harvesting as part of the baseline activities are required to account for market leakage emissions occurring within the national boundaries. Additionally, if such leakage-driven deforestation is expected to result in peatland degradation, the associated emissions must be included under LK-ME, in accordance with Equation (1) of VMD0011.

$$\Delta C_{LK-ME} = LK_{MarketEffects,timber} + LK_{MarketEffects,FW/C} + LK_{MarketEffects,Peat}$$

Where:

ΔC_{LK-ME}	Net greenhouse gas emissions due to market-effects leakage (tCO2e)
$LK_{MarketEffects,timber}$	Total GHG emissions due to market-effects leakage through decreased timber harvest (tCO_2e)
$LK_{MarketEffects,FW/C}$	Total GHG emissions due to market-effects leakage through decreased harvest of fuelwood and charcoal sold into regional and/or national markets (tCO_2e)
$LK_{MarketEffects,Peat}$	Total GHG emissions due to market-effects leakage through decreased timber, fuelwood and charcoal harvest resulting in increased peatland drainage (tCO-e)

Under baseline scenario, SPCP would have avoided emissions by preventing selective logging (APDeg and APDeg_SP). As a result of project implementation, a reduction in wood harvest within the project area is expected. This may potentially lead to a shift in timber production to other areas of the country

to compensate for the reduced supply. Based on this, the emission from market effect leakage through decreased timber ($LK_{MarketEffects,timber}$) is calculated. As the baseline does not include deforestation driven by fuelwood or charcoal production, emissions from these activities ($LK_{MarketEffects,FW/C}$) are excluded. Since 2019, Presidential Instruction No. 5 permanently prohibits new timber production licenses on peatlands in Indonesia. In line with this, the Ministry of Environment and Forestry (KLHK) regularly updates the Indicative Map for the Suspension of New Permits (PIPPIB) every six months. Given these legal restrictions, it is neither legally nor practically possible for the SPCP to cause deforestation leakage on other peatlands. Therefore, emissions due to market-effects leakage through decreased timber, fuelwood and charcoal harvest resulting in increased peatland drainage ($LK_{MarketEffects,Peat}$) is excluded. Based on this, Net greenhouse gas emissions due to market-effects leakage (ΔC_{LK-ME}) is equal to total GHG emissions due to market-effects leakage through decreased timber harvest ($LK_{MarketEffects,timber}$).

The calculation of total GHG emissions due to market-effects leakage through decreased timber harvest was done following Equation (2) of VMD0011 below.

$$LK_{MarketEffects,timber} = \sum_{i=1}^{M} \left(LF_{ME} \times LK_{MAF} \times AL_{T,i} \right)$$

Where:

$LK_{MarketEffects,timb}$	Total GHG emissions due to market-effects leakage through decreased timber harvest (tCO2e)
LF_{ME}	Leakage factor for market-effects calculations (dimensionless)
LK_{MAF}	Leakage management adjustment factor (dimensionless)
$LK_{MarketEffects,Peat}$	Total GHG emissions due to market-effects leakage through decreased timber, fuelwood and charcoal harvest resulting in increased peatland drainage (t CO2e)
$AL_{T,i}$	Summed emissions from timber harvest in stratum i in the baseline case potentially displaced through implementation of the project (tCO2e)
i	1, 2, 3, …M strata (dimensionless)

Calculation of LF_{ME} was carried out by assessing the proportion of total biomass made up of merchantable commercial species ($PMPi$) for each stratum (Forest Type; Peat Swamp Forest or PSF and Dry Land Forest or DLF). This is then compared to the average proportion of merchantable biomass across each forest type ($PMLFT$). Using field data, this is estimated that PMP for PSF is at 24.5% and for PMPDLF at 18.9%. For calculating PMLFT, national average logging potential for dryland forests based on official government data was used, with relevant forest biomass values sourced Forest Reference Emission Level (FREL, 2022). Since PMLFT exceeds PMP for both forest types by more than 15%, therefore a default LF_{ME} value of 0.2 is applied.

Assuming there is no leakage management by ASK, therefore LK_{MAF} defaults at 1.

To calculate GHG emissions from timber harvest in stratum i in the baseline case laced through implementation of carbon project (ALT,i), equations (4) from VMD0011 were applied.

$$AL_{T,i} = \sum_{t=1}^{t} \left(C_{BSL,XBT,i,t} \right)$$

Where:

$AL_{T,i}$	Summed emissions from timber harvest in stratum i in the baseline case laced through implementation of carbon project (tCO2e)
$C_{BSL,XBT,i,t}$	Carbon emission due to displaced timber harvests in the baseline scenario in stratum i in year t (tCO2e)
i	1, 2, 3, …M strata in the project scenario
t	1, 2, 3, … t* time elapsed since the start of the project activity (years)

Annual Carbon emission due to timber harvests in the baseline scenario was calculated using equation (5) from VMD0011 below.

$$C_{BSL,XE,i,t} = \left(\left(V_{BSL,XE,i,t} \times D_{mn} \times CF \right) + \left(V_{BSL,XE,i,t} \times LDF \right) + \left(V_{BSL,XE,i,t} \times LIF \right) \right) \times \frac{44}{12}$$

Where:

$C_{BSL,XBT,i,t}$	Carbon emission due to timber harvests in the baseline scenario in stratum i in year t (tCO_2e)
$V_{BSL,XE,i,t}$	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum i in year t (m^3)
D_{mn}	Mean wood density of commercially harvested species (td.m m^{-3})
CF	Carbon fraction of biomass for commercially harvested species j (tC t d.m.$^{-1}$)
LDF	Logging damage factor (tC m^{-3})
LIF	Logging infrastructure factor (tC m^{-3})
i	1, 2, 3, …M strata in the project scenario
t	1, 2, 3, … t* time elapsed since the start of the project activity (years)

Using the equation above, emissions arising from market effects leakage over the project lifetime estimated at 1,597,987.81 tCO_2e. Table 40 outlines the annual emissions arising from market effects leakage

Table 40. Emissions (tCO_2e) from Market Effect Leakage (LK-ME) from SPCP

Year	LF_{ME}	LK_{MAF}	$AL_{T,i}$	$LK_{ME,t}$
2023	0.20	1.00	248,699.70	49,739.94
2024	0.20	1.00	258,347.24	51,669.45
2025	0.20	1.00	283,479.42	56,695.88
2026	0.20	1.00	286,544.42	57,308.88
2027	0.20	1.00	282,647.83	56,529.57
2028	0.20	1.00	263,980.48	52,796.10
2029	0.20	1.00	290,039.31	58,007.86
2030	0.20	1.00	289,094.13	57,818.83
2031	0.20	1.00	305,453.56	61,090.71
2032	0.20	1.00	294,547.20	58,909.44
2033	0.20	1.00	268,297.19	53,659.44
2034	0.20	1.00	239,522.81	47,904.56
2035	0.20	1.00	271,148.18	54,229.64
2036	0.20	1.00	262,631.58	52,526.32
2037	0.20	1.00	253,802.39	50,760.48
2038	0.20	1.00	265,744.47	53,148.89
2039	0.20	1.00	269,556.79	53,911.36
2040	0.20	1.00	266,298.17	53,259.63
2041	0.20	1.00	295,095.21	59,019.04
2042	0.20	1.00	293,780.38	58,756.08
2043	0.20	1.00	302,916.72	60,583.34
2044	0.20	1.00	283,173.93	56,634.79
2045	0.20	1.00	283,645.90	56,729.18
2046	0.20	1.00	335,744.57	67,148.91
2047	0.20	1.00	319,043.14	63,808.63

Year	LF_{ME}	LK_{MAF}	$AL_{T,I}$	$LK_{ME,t}$
2048	0.20	1.00	232,682.93	46,536.59
2049	0.20	1.00	212,335.83	42,467.17
2050	0.20	1.00	210,498.78	42,099.76
2051	0.20	1.00	267,655.68	64,237.36
Total	5.80	29.00	7,936,407.93	1,597,987.81

3.2.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals (VCS, 3.15, 4.1)

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
State, in tCO2e, the expected total GHG benefit to date.	37,829,938.71 tCO_2e (NER) 33,290,333 tCO_2e (VCU)

3.2.4.1 Ex-ante Net GHG emission reductions from Avoiding Planned Degradation

The ex-ante total net GHG emission reductions from the Avoided Planned Degradation activity are calculated in accordance with Equation (2) of the VMD0007 module, as outlined below.:

$$NERR_{REDD-APDeg} = \Delta C_{BSL-REDD-APDeg} - \Delta C_{WPS-REDD-APDeg} - \Delta C_{LK-REDD-APDeg}$$

Where:

$NER_{REDD-APDeg}$	Total net GHG emission reductions of the REDD-APDeg project activity up to year t* (tCO_2e)
$\Delta C_{BSL-REDD-APDeg}$	Net GHG emissions in the REDD-APDeg baseline scenario up to year t* (tCO_2e)
$\Delta C_{WPS-REDD-APDeg}$	Net GHG emissions in the REDD-APDeg project scenario up to year t* – from Module MREDD (tCO_2e)
$\Delta C_{LK-REDD-APDeg}$	Net GHG emissions due to leakage from the REDD-APDeg project activity up to year t* (tCO_2e)

By applying the equation presented above, the ex-ante net greenhouse gas (GHG) emission reductions resulting from Avoiding Planned Degradation (APDeg) over the project lifetime are estimated to be 6,274,103.53 tCO_2e as shown in Table 41.

Table 41. ex-ante net greenhouse gas (GHG) emission reductions (tCO_2e) resulting from Avoiding Planned Degradation (APDeg)

Year	BSL_ΔC_AGB_APDeg	WPS_ΔC_AGB_APDeg	LK	NER_APDeg
2023	90,787.34	20,526.13	-	70,261.20
2024	124,929.50	20,526.13	-	104,403.37
2025	144,516.31	13,104.50	-	131,411.82
2026	147,487.59	13,019.89	-	134,467.70
2027	160,391.04	5,598.25	-	154,792.79
2028	167,510.37	5,598.25	-	161,912.12
2029	185,546.38	3,176.61	-	182,369.77
2030	208,087.23	3,176.61	-	204,910.62
2031	226,371.37	2,088.31	-	224,283.06
2032	246,397.88	1,000.00	-	245,397.88
2033	229,656.43	666.67	-	228,989.76
2034	214,676.03	333.33	-	214,342.70
2035	241,223.18	-	-	241,223.18
2036	232,557.27	-	-	232,557.27
2037	241,561.09	-	-	241,561.09
2038	232,174.70	-	-	232,174.70
2039	229,534.24	-	-	229,534.24
2040	230,366.57	-	-	230,366.57
2041	240,910.63	-	-	240,910.63
2042	250,236.81	-	-	250,236.81
2043	257,913.43	-	-	257,913.43
2044	249,606.57	-	-	249,606.57

Year	BSL_ΔC_AGB_APDeg	WPS_ΔC_AGB_APDeg	LK	NER_APDeg
2045	250,982.23	-	-	250,982.23
2046	246,398.65	-	-	246,398.65
2047	241,437.85	-	-	241,437.85
2048	237,470.02	-	-	237,470.02
2049	247,378.14	-	-	247,378.14
2050	262,658.03	-	-	262,658.03
2051	324,151.34	-	-	324,151.34
Total	**6,362,918.22**	**88,814.69**	**-**	**6,274,103.53**

3.2.4.2 Ex-ante Net GHG emission reductions from Avoiding Planned Degradation and Strip Planting

Ex-ante total net GHG emission reductions from the Avoiding Planned Degradation and Strip Planting are calculated following equation (2) from VM0007 as follows:

$$NERR_{REDD-APDeg\_SP} = \Delta C_{BSL-REDD-APDeg\_SP} - \Delta C_{WPS-REDD-APDeg_{SP}} - \Delta C_{LK-REDD-APDeg\_SP}$$

Where:

$NER_{REDD-APDeg\_SP}$	Total net GHG emission reductions of the REDD-APDeg_SP project activity up to year t* (tCO_2e)
$\Delta C_{BSL-REDD-APDeg\_SP}$	Net GHG emissions in the REDD-APDeg_SP baseline scenario up to year t* (tCO_2e)
$\Delta C_{WPS-REDD-APDeg\_SP}$	Net GHG emissions in the REDD-APDeg_SP project scenario up to year t* – from Module MREDD (tCO_2e)
$\Delta C_{LK-REDD-APDeg\_SP}$	Net GHG emissions due to leakage from the REDD-APDeg_SP project activity up to year t* (tCO_2e)

By applying the equation presented above, the ex-ante net greenhouse gas (GHG) emission reductions resulting from Avoiding Planned Degradation and strip planting (APDeg_SP) over the project lifetime are estimated to be 1,279,861.51 tCO2e as shown in Table 42.

Table 42. ex-ante net greenhouse gas (GHG) emission reductions resulting from Avoiding Planned Degradation and strip planting (APDeg_SP)

Year	BSL_ΔC_AGB_APDeg_SP	WPS_ΔC_AGB_APDeg_SP	LK	NER_APDeg_SP
2023	15,766.43	10,441.53	-	5,324.90
2024	27,407.18	10,441.53	-	16,965.65
2025	34,129.95	10,151.65	-	23,978.30
2026	31,306.90	9,221.46	-	22,085.44
2027	33,990.85	5,598.25	-	28,392.59
2028	37,378.02	5,598.25	-	31,779.77
2029	39,259.64	3,176.61	-	36,083.03
2030	40,186.09	3,176.61	-	37,009.48
2031	46,525.68	1,588.31	-	44,937.37
2032	50,392.95	333.33	-	50,059.61
2033	53,402.66	-	-	53,402.66
2034	39,130.05	-	-	39,130.05
2035	41,622.78	-	-	41,622.78
2036	30,574.44	-	-	30,574.44
2037	38,824.24	-	-	38,824.24
2038	52,958.00	-	-	52,958.00
2039	54,129.60	-	-	54,129.60
2040	50,723.99	-	-	50,723.99
2041	50,834.04	-	-	50,834.04
2042	48,698.93	-	-	48,698.93
2043	46,885.53	-	-	46,885.53
2044	38,530.38	-	-	38,530.38
2045	54,056.02	-	-	54,056.02
2046	86,132.11	-	-	86,132.11
2047	73,294.46	-	-	73,294.46

Year	BSL_ΔC_AGB_APDeg_SP	WPS_ΔC_AGB_APDeg_SP	LK	NER_APDeg_SP
2048	55,495.64	-	-	55,495.64
2049	60,866.89	-	-	60,866.89
2050	62,004.09	-	-	62,004.09
2051	45,081.53	-	-	45,081.53
Total	**1,339,589.05**	**59,727.54**	**-**	**1,279,861.51**

3.2.4.3 Ex-ante Net GHG emission reductions from Avoiding Planned Deforestation

The ex-ante total net GHG emission reductions resulting from the REDD project activity are calculated in accordance with Equation (2) of the VM0007 module, as outlined below.

$$NERR_{REDD-APD} = \Delta C_{BSL-REDD-APD} - \Delta C_{WPS-REDD-APD} - \Delta C_{LK-REDD-APD}$$

Where:

$NER_{REDD-APD}$	Total net GHG emission reductions of the REDD-APD project activity up to year t* (tCO2e)
$\Delta C_{BSL-REDD-APD}$	Net GHG emissions in the REDD-APD baseline scenario up to year t* (tCO2e)
$\Delta C_{WPS-REDD-APD}$	Net GHG emissions in the REDD-APD project scenario up to year t* – from Module MREDD (tCO2e)
$\Delta C_{LK-REDD-APD}$	Net GHG emissions due to leakage from the REDD-APD project activity up to year t* (tCO2e)

By applying the equation presented above, the ex-ante net greenhouse gas (GHG) emission reductions resulting from the avoidance of planned deforestation over the entire project lifetime have been estimated to total 2,331,396.37 tCO_2e, as shown annually by Table 43**Error! Reference source not found.**.Table 43. Ex-ante GHG emission reductions from REDD-APD project within project period

Year	BSL_ΔC_AGB_APD	WPS_ΔC_AGB_APD	LK	NER_APD
2023	211,551.51	20,822.48	-	190,729.02
2024	109,955.87	20,822.48	-	89,133.39
2025	89,326.71	13,696.73	-	75,629.98
2026	181,600.32	13,231.63	-	168,368.69
2027	205,012.64	6,105.88	-	198,906.76

Year	BSL_ΔC_AGB_APD	WPS_ΔC_AGB_APD	LK	NER_APD
2028	229,905.35	6,105.88	-	223,799.47
2029	200,853.35	4,515.03	-	196,338.32
2030	233,550.37	3,515.03	-	230,035.34
2031	250,075.75	1,924.18	-	248,151.57
2032	156,382.39	-	-	156,382.39
2033	45,217.58	-	-	45,217.58
2034	38,794.89	-	-	38,794.89
2035	37,025.93	-	-	37,025.93
2036	27,648.86	-	-	27,648.86
2037	34,116.71	-	-	34,116.71
2038	44,546.65	-	-	44,546.65
2039	35,167.77	-	-	35,167.77
2040	25,719.51	-	-	25,719.51
2041	27,223.30	-	-	27,223.30
2042	22,124.20	-	-	22,124.20
2043	22,738.48	-	-	22,738.48
2044	16,744.39	-	-	16,744.39
2045	27,686.39	-	-	27,686.39
2046	49,159.83	-	-	49,159.83
2047	31,955.84	-	-	31,955.84
2048	12,119.76	-	-	12,119.76
2049	11,057.91	-	-	11,057.91
2050	21,438.19	-	-	21,438.19
2051	23,435.25	-	-	23,435.25
Total	**2,422,135.71**	**90,739.34**	**-**	**2,331,396.37**

3.2.4.4 Ex-ante Net GHG emission reduction from WRC

Table 43. Ex-ante GHG emission reductions from REDD-APD project within project period

Year	BSL_ΔC_AGB_APD	WPS_ΔC_AGB_APD	LK	NER_APD
2023	211,551.51	20,822.48	-	190,729.02
2024	109,955.87	20,822.48	-	89,133.39
2025	89,326.71	13,696.73	-	75,629.98
2026	181,600.32	13,231.63	-	168,368.69
2027	205,012.64	6,105.88	-	198,906.76
2028	229,905.35	6,105.88	-	223,799.47
2029	200,853.35	4,515.03	-	196,338.32
2030	233,550.37	3,515.03	-	230,035.34
2031	250,075.75	1,924.18	-	248,151.57
2032	156,382.39	-	-	156,382.39
2033	45,217.58	-	-	45,217.58
2034	38,794.89	-	-	38,794.89
2035	37,025.93	-	-	37,025.93
2036	27,648.86	-	-	27,648.86
2037	34,116.71	-	-	34,116.71
2038	44,546.65	-	-	44,546.65
2039	35,167.77	-	-	35,167.77
2040	25,719.51	-	-	25,719.51
2041	27,223.30	-	-	27,223.30
2042	22,124.20	-	-	22,124.20
2043	22,738.48	-	-	22,738.48
2044	16,744.39	-	-	16,744.39
2045	27,686.39	-	-	27,686.39
2046	49,159.83	-	-	49,159.83

Year	BSL_ΔC_AGB_APD	WPS_ΔC_AGB_APD	LK	NER_APD
2047	31,955.84	-	-	31,955.84
2048	12,119.76	-	-	12,119.76
2049	11,057.91	-	-	11,057.91
2050	21,438.19	-	-	21,438.19
2051	23,435.25	-	-	23,435.25
Total	**2,422,135.71**	**90,739.34**	**-**	**2,331,396.37**

3.2.4.5 Ex-ante Net GHG emission reduction from WRC

Ex-ante GHG Net Emission Reductions (NER) from WRC project are calculated by using equation (6) of VM0007 as below.

$$NER_{WRC} = GHG_{BSL-WRC} - GHG_{WPS-WRC} - GHG_{LK-WRC}$$

Where:

NER_{WRC}	Total net GHG emission reductions of WRC project up to year t* (tCO2e)
$\mathrm{GHG}_{BSL-WRC}$	Net GHG emissions in the WRC baseline scenario up to year t* (tCO2e)
$\mathrm{GHG}_{WPS-\mathrm{WRC}}$	Net GHG emissions in the WRC project scenario up to year t* – from Module MREDD (tCO2e)
$\mathrm{GHG}_{LK-\mathrm{WRC}}$	Net GHG emissions due to leakage from WRC project activity up to year t* (tCO2e)

By applying the equation presented above, the ex-ante net greenhouse gas (GHG) emission reductions resulting from WRC project estimated to total 29,482,837.57 tCO_2e, as shown annually by Table 44.

Table 44. ex-ante net greenhouse gas (GHG) emission reductions resulting from WRC project

Year	GHG_BSL-WRC	GHG_WPS-WRC	GHG_LK-WRC	Total Emission Reduction (tCO2e)
2023	299,308.15	94,138.49	-	205,169.66
2024	307,276.22	94,138.49	-	213,137.73
2025	394,049.30	94,138.49	-	299,910.81
2026	478,669.60	91,980.08	-	386,689.51

Year	GHG_BSL-WRC	GHG_WPS-WRC	GHG_LK-WRC	Total Emission Reduction (tCO2e)
2027	558,747.93	55,189.45	-	503,558.48
2028	623,617.42	26,534.32	-	597,083.11
2029	658,668.26	26,534.32	-	632,133.94
2030	751,941.33	26,534.32	-	725,407.02
2031	858,948.04	26,534.32	-	832,413.72
2032	832,853.72	26,534.32	-	806,319.40
2033	915,868.95	26,534.32	-	889,334.64
2034	957,482.06	26,534.32	-	930,947.74
2035	983,712.99	26,534.32	-	957,178.67
2036	1,049,554.52	26,534.32	-	1,023,020.21
2037	1,132,725.40	26,534.32	-	1,106,191.08
2038	1,174,511.41	26,534.32	-	1,147,977.09
2039	1,203,739.28	26,534.32	-	1,177,204.97
2040	1,287,873.12	26,534.32	-	1,261,338.81
2041	1,316,642.84	26,534.32	-	1,290,108.53
2042	1,387,496.92	26,534.32	-	1,360,962.60
2043	1,409,615.12	26,534.32	-	1,383,080.81
2044	1,420,207.58	26,534.32	-	1,393,673.26
2045	1,461,287.34	26,534.32	-	1,434,753.02
2046	1,537,403.04	26,534.32	-	1,510,868.72
2047	1,578,871.86	26,534.32	-	1,552,337.54
2048	1,556,890.23	26,534.32	-	1,530,355.91
2049	1,531,548.87	26,534.32	-	1,505,014.55
2050	1,565,693.02	26,534.32	-	1,539,158.70
2051	1,309,619.28	22,111.93	-	1,287,507.34

Year	GHG_BSL-WRC	GHG_WPS-WRC	GHG_LK-WRC	Total Emission Reduction (tCO2e)
Total	30,544,823.81	1,061,986.24	-	29,482,837.57

3.2.4.6 Calculation of the VCS Non-Permanence Risk Buffer Withholding

As detailed in Section 2.3.6, the total Project Non-Permanence Risk Buffer has been determined at 12%. In accordance with the guidance provided under the VM0007 REDD-MF methodology, this buffer withholding is applied exclusively to the net greenhouse gas (GHG) emission reductions and removals, and explicitly excludes any emissions attributable to leakage as presented in Table 45.

Table 45. VCUs for Non-Permanence risk buffer withholding

Vintage Period	Estimated Baseline Emission (tCO2e)	Estimated Project Emission (tCO2e)	Estimated Leakage Emission (tCO2e)	Estimated Net Emission Reduction (tCO2e)	Estimated buffer Pool Allocation emission (tCO2e)	Estimated reduction VCUs (tCO2e)	Estimated removal VCUs (tCO2e)	Estimated total VCU issuance (tCO2e)
01-January-2023 to 31-December-2023	617,413.42	135,487.11	49,739.94	432,186.37	51,862.36	380,324	-	380,324
01-January-2024 to 31-December-2024	569,568.78	135,487.11	51,669.45	382,412.22	45,889.47	336,522	-	336,522
01-January-2025 to 31-December-2025	662,022.27	120,939.71	56,695.88	484,386.67	58,126.40	426,260	-	426,260
01-January-2026 to 31-December-2026	839,064.41	118,231.61	57,308.88	663,523.92	79,622.87	583,901	-	583,901
01-January-2027 to 31-December-2027	958,142.46	66,893.58	56,529.57	834,719.31	100,166.32	734,552	-	734,552
01-January-2028 to 31-December-2028	1,058,411.17	38,238.45	52,796.10	967,376.63	116,085.20	851,291	-	851,291
01-January-2029 to 31-December-2029	1,084,327.64	34,225.96	58,007.86	992,093.81	119,051.26	873,042	-	873,042
01-January-2030 to 31-December-2030	1,233,765.02	33,225.96	57,818.83	1,142,720.23	137,126.43	1,005,593	-	1,005,593
01-January-2031 to 31-December-2031	1,381,920.84	30,546.81	61,090.71	1,290,283.32	154,834.00	1,135,449	-	1,135,449
01-January-2032 to 31-December-2032	1,286,026.94	27,534.32	58,909.44	1,199,583.18	143,949.98	1,055,633	-	1,055,633

Vintage Period	Estimated Baseline Emission (tCO2e)	Estimated Project Emission (tCO2e)	Estimated Leakage Emission (tCO2e)	Estimated Net Emission Reduction (tCO2e)	Estimated buffer Pool Allocation emission (tCO2e)	Estimated reduction VCUs (tCO2e)	Estimated removal VCUs (tCO2e)	Estimated total VCU issuance (tCO2e)
01-January-2033 to 31-December-2033	1,244,145.63	27,200.98	53,659.44	1,163,285.21	139,594.22	1,023,690	-	1,023,690
01-January-2034 to 31-December-2034	1,250,083.03	26,867.65	47,904.56	1,175,310.82	141,037.30	1,034,273	-	1,034,273
01-January-2035 to 31-December-2035	1,303,584.88	26,534.32	54,229.64	1,222,820.93	146,738.51	1,076,082	-	1,076,082
01-January-2036 to 31-December-2036	1,340,335.09	26,534.32	52,526.32	1,261,274.46	151,352.94	1,109,921	-	1,109,921
01-January-2037 to 31-December-2037	1,447,227.44	26,534.32	50,760.48	1,369,932.65	164,391.92	1,205,540	-	1,205,540
01-January-2038 to 31-December-2038	1,504,190.76	26,534.32	53,148.89	1,424,507.55	170,940.91	1,253,566	-	1,253,566
01-January-2039 to 31-December-2039	1,522,570.89	26,534.32	53,911.36	1,442,125.22	173,055.03	1,269,070	-	1,269,070
01-January-2040 to 31-December-2040	1,594,683.19	26,534.32	53,259.63	1,514,889.24	181,786.71	1,333,102	-	1,333,102
01-January-2041 to 31-December-2041	1,635,610.81	26,534.32	59,019.04	1,550,057.45	186,006.89	1,364,050	-	1,364,050
01-January-2042 to 31-December-2042	1,708,556.85	26,534.32	58,756.08	1,623,266.46	194,791.97	1,428,474	-	1,428,474
01-January-2043 to 31-December-2043	1,737,152.56	26,534.32	60,583.34	1,650,034.90	198,004.19	1,452,030	-	1,452,030

Vintage Period	Estimated Baseline Emission (tCO2e)	Estimated Project Emission (tCO2e)	Estimated Leakage Emission (tCO2e)	Estimated Net Emission Reduction (tCO2e)	Estimated buffer Pool Allocation emission (tCO2e)	Estimated reduction VCUs (tCO2e)	Estimated removal VCUs (tCO2e)	Estimated total VCU issuance (tCO2e)
01-January-2044 to 31-December-2044	1,725,088.92	26,534.32	56,634.79	1,641,919.82	197,030.38	1,444,889	-	1,444,889
01-January-2045 to 31-December-2045	1,794,011.97	26,534.32	56,729.18	1,710,748.47	205,289.82	1,505,458	-	1,505,458
01-January-2046 to 31-December-2046	1,919,093.63	26,534.32	67,148.91	1,825,410.40	219,049.25	1,606,361	-	1,606,361
01-January-2047 to 31-December-2047	1,925,560.01	26,534.32	63,808.63	1,835,217.07	220,226.05	1,614,991	-	1,614,991
01-January-2048 to 31-December-2048	1,861,975.64	26,534.32	46,536.59	1,788,904.74	214,668.57	1,574,236	-	1,574,236
01-January-2049 to 31-December-2049	1,850,851.81	26,534.32	42,467.17	1,781,850.32	213,822.04	1,568,028	-	1,568,028
01-January-2050 to 31-December-2050	1,911,793.34	26,534.32	42,099.76	1,843,159.26	221,179.11	1,621,980	-	1,621,980
01-January-2051 to 25-October-2051	1,702,287.39	22,111.93	64,237.36	1,615,938.10	193,912.57	1,422,025	-	1,422,025
Total	**40,669,466.79**	**1,241,540.27**	**1,597,987.81**	**37,829,938.71**	**4,539,592.65**	**33,290,333**	**-**	**33,290,333**

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation (VCS, 3.16)

The Data and Parameters available at Validation for REDD are presented in Appendix 12: Data and Parameters Available at Validation for REDD (APDeg and APD).

The Data and Parameters available at Validation for WRC are presented in Appendix 14: Data and Parameters Available at Validation for WRC.

3.3.2 Data and Parameters Monitored (VCS, 3.16)

The Data and Parameters Monitored for REDD are presented in appendix 13: Data and parameters monitored for redd.

The Data and Parameters Monitored for WRC are presented in APPENDIX 15: Data and parameters monitored for WRC.

3.3.3 Monitoring Plan (VCS, 3.16, 3.20)

3.3.3.1 REDD Monitoring Plan

Monitoring Forest Degradation

As required by VMD0015, the SPCP will conduct a Participatory Rural Appraisal (PRA) to assess the potential for illegal logging within and around the project area. If the PRA indicates a risk of forest degradation, a preliminary field sampling will be undertaken.

The area that is potentially subject to degradation firstly needs to be delineated (ADeg,i). An output of the PRA will be a distance of degradation penetration from all access points (access buffer), such as roads, pathway, and rivers or previously cleared areas, to the project area. The area subject to degradation shall be delineated (ADegW,i) based on an access buffer from all access points to the project area, with a width equal to the distance of degradation penetration. ADegW,i shall be sampled by surveying several transects of known length and width across the access-buffer area (equal in area to at least 1% of ADegW,i) to check whether new tree stumps are evident or not.

If the limited sampling finds trees being removed in the buffer area, then a more systematic sampling will be implemented. The sampling plan will be designed using plots systematically placed over the buffer zone so that they sample at least 3% of the area of the buffer zone (ADegW,i). The diameter of all tree stumps will be measured and conservatively assumed to be the same as the DBH.

The mean above ground carbon stock of the harvested trees will be conservatively estimated to be the total emissions and to all enter the atmosphere. This sampling procedure will be repeated every five years and the results annualized by dividing the total emissions by five.

The Net carbon stock changes as result of degradation is calculated by applying the equation (8) of VMD0015 below.

$$\Delta C_{P,DegW,i,t} = A_{DegW,i} \times \frac{C_{DegW,i,t}}{AP_i}$$

Where:

$\Delta C_{P,DegW,i,t}$	Net carbon stock changes as a result of degradation in stratum *i* in the project area in year *t*; tCO_2e
$A_{DegW,i}$	Area potentially impacted by degradation processes in stratum i; ha
$C_{DegW,i,t}$	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum *i* in year *t*; tCO_2e
AP_i	Total area of degradation sample plots in stratum i; ha
i	1, 2, 3, …M strata
t	1, 2, 3, … t* time elapsed since the start of the project activity (years)

Monitoring Deforestation

Deforestation monitoring will be carried out through the interpretation and analysis of satellite images to identify areas showing signs of forest loss. For this purpose, SPCP will regularly collect satellite imagery throughout the monitoring period and collect additional data to track deforestation within the project area. This process will adhere to the guidelines set out in the GOFC-GOLD Sourcebook for REDD (2016), ensuring consistency and accuracy in mapping and calculating deforestation. Additional data sources (including Synthetic Aperture RADAR, drone imagery, LiDAR data) will also be utilized to enhance the analysis. Once deforestation is detected, the project will conduct field verification to confirm the findings and assess on-the-ground conditions. When applicable, drone surveys will be used to support precise delineation of deforested areas.

The Net carbon stock changes as result of deforestation is calculated by applying the equation (3) of VMD0015 below.

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

Where:

$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project case in the project area in stratum *i* in year *t*; tCO_2e)
$A_{DefPA,u,i,t}$	Area of recorded deforestation in the project area stratum i converted to land use u in year t; ha
$\Delta C_{pools,P,Def,u,i,t}$	Net carbon stock changes in all pools in the project case in land use *u* in stratum *i* in year *t*; tCO_2e ha^{-1}
u	1, 2, 3, …U post-deforestation land uses
i	1, 2, 3, …M strata
t	1, 2, 3, … t* time elapsed since the start of the project activity (years)

Monitoring Burnt Areas

The project collects satellite hotspot data on a daily basis (from NASA FIRMS). For every fire incident within the project area, SPCP will map the affected areas and delineate burn scars. Initial mapping will be conducted through spatial analysis using satellite imagery and hotspot data, primarily from MODIS and NOAA. This will be followed by field verification to confirm the extent of the burnt area and assess the impact of fire on biomass. When applicable, drone will be utilized to support accurate delineation of burn scars. To guide this process, the project has developed a Standard Operating Procedure (SOP) for monitoring and assessing fire-affected areas.

Emission due to biomass burning is calculated by applying the equation (1) of VMD0013 below.

$$E_{biomassburn,i,t} = \sum_{g=1}^{G} \left[\left[\left[A_{burn,i,t} \times B_{i,t} \times COMF_i \times G_{g,i} \right] \times 10^{-3} \right] \times GWP_g \right]$$

Where:

$E_{biomassburn,i,t}$	Greenhouse gas emissions due to biomass burning in stratum i in year t of each GHG (CO_2, CH_4, N_2O) (tCO_2e)
$A_{burn,i,t}$	Area burnt for stratum *i* in year *t* (ha)
$B_{i,t}$	Average aboveground biomass stock before burning stratum *i*, year (t d.m. ha^{-1})
$COMF_i$	Combustion factor for stratum i (unitless)
$G_{g,i}$	Emission factor for stratum *i* for gas *g* (kg t^{-1} d.m. burnt)
GWP_g	Global warming potential for gas *g* (tCO_2/t gas g)
g	1, 2, 3 … *G* greenhouse gases including carbon dioxide1, methane and nitrousoxide (unitless)
i	1, 2, 3, …M strata
t	1, 2, 3, … t* time elapsed since the start of the project activity (years)

3.3.3.2 WRC Monitoring Plan

Water table depths are used as proxy for calculating GHG emissions in the project area and will be monitored by using a hydrological modelling approach. The project will use a network of automatic and manual dipwells to log water table depth at regular intervals throughout the project lifetime, and detailed procedures of water table monitoring can be found in Annex 7. Model outputs include daily water table depth raster. Model validity and accuracy will be assured in the parameter calibration process by using directly measured water table depth data. For this purpose, several dipwells will be

installed in the project area and will be measured by combining manual (weekly or two-weekly interval) and automatic methods (30-minutes interval) throughout the year. Daily rainfall will be measured using two automatic rainfall stations. A map of monitoring devices is shown in Figure 47. Physical parameters required for this modeling, which are hydraulic conductivity and storage coefficient, will be measured at random locations, and will be determined later.

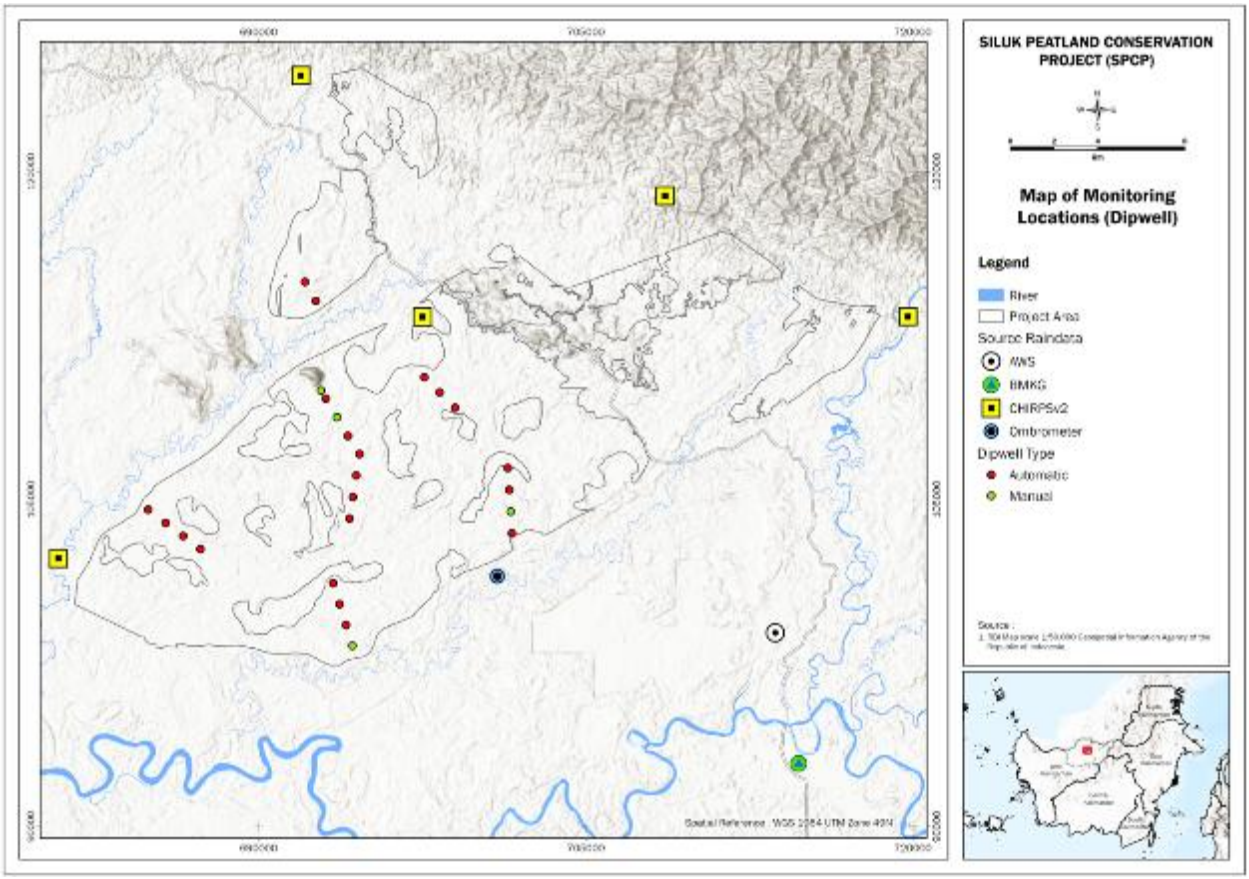


Figure 47. Location of Dipwells in the project area for WRC Monitoring

This hydrological model will be set-up in a spatially distributed dynamic schematization and will include water balance components: rainfall, evapotranspiration, groundwater flow, overland flow and open-channel flow. Peat thickness, DTM and rivers and canal networks will act as setup parameters. Canal water levels will be used as boundary conditions and will be measured using water level measurement devices (such as a staff gauge or AWLR) by combined manual (weekly/two-weekly interval) and automatic methods (30-minute interval).

Drainage network conditions in the Project Area will be monitored throughout the year. The presence or absence of new illegal canals will be mapped (using ground surveys, as well as LiDAR surveys) and remedied by constructing canal blocking as soon as possible. Canal water levels of new illegal canals will also be monitored by installing appropriate water level measurement device.

Daily water table depth rasters resulting from this modelling will be averaged into yearly water table depths. From this result, yearly CO_2 emissions from peat decomposition can be calculated by using the equation given in section 3.2.1.6.

Up to 10 monitoring wells will be installed in select adjacent peatland areas at 20 – 100 meters distance from project boundary that would be affected by project's rewetting measure. These wells served as supporting evidence for the presence or absence of ecological leakage. Exact locations for these monitoring wells will be determined later after completing the project rewetting design.

3.3.4 Dissemination of Monitoring Plan and Results (VCS, 3.18; CCB, CL4.2)

SPCP is committed to transparency and inclusive participation. The monitoring plan will be disseminated directly to communities and other relevant stakeholders in formats and languages suited to their needs. Printed and simplified summaries of the monitoring plan (in Bahasa Indonesia) will be shared during meetings with communities and through distribution at village offices. When appropriate, the project will also develop visual materials, such as infographics and posters, to clearly explain key components of the monitoring plan.

In addition, the monitoring plan will be disseminated to relevant government agencies and adapted to meet the specific data and reporting requirements mandated for PT ASK, in accordance with its regular compliance obligations to the government.

A summary of the monitoring plan will also be uploaded to the PT ASK website to ensure wider public accessibility and transparency. By making this information publicly available on the PT ASK website, the project ensures that stakeholders, including civil society, researchers, and interested members of the public, can easily access and understand how the project implementation are monitored.

3.4 Optional Criterion: Climate Change Adaptation Benefits

3.4.1 Regional Climate Change Scenarios (CCB, GL1.1)

Without the project, forest and peatland degradation will accelerate, leading to severe climate change impacts in the region. As these ecosystems deteriorate, vast amounts of stored carbon will be released into the atmosphere, significantly intensifying global warming. This will drive rising temperatures, prolonged droughts, and increasingly erratic rainfall patterns, disrupting the region's ecological balance. Without the protective function of healthy forests and peatlands as carbon sinks, West Kalimantan will face more extreme weather events, including heatwaves, extended dry seasons, and a heightened risk of wildfires.

The absence of the project will also weaken the region's natural ability to regulate water cycles. The loss of forest cover will result in more frequent and severe flooding during the wet season, while prolonged dry periods will lead to critical water shortages. Rising temperatures and shifting precipitation patterns will further increase the risk of drought, drying out degraded peatlands and making them more prone to uncontrolled fires.

For local communities, these climate disruptions will severely threaten traditional livelihoods, particularly for farmers and fishers who depend on stable environmental conditions. Unpredictable rainfall and water shortages will reduce agricultural productivity, leading to crop failures and declining food security.

3.4.2 Climate Change Impacts (CCB, GL1.2)

Current and projected climate changes are already affecting and will continue to impact community well-being in the project zone and surrounding areas. Rising temperatures, prolonged dry seasons, and unpredictable rainfall patterns are leading to increased food and water insecurity. Agriculture, which is a primary livelihood for many local communities, is particularly vulnerable to climate variability. More frequent droughts and irregular rainfall disrupt planting and harvesting cycles, reducing crop yields and threatening food availability.

Economic hardship is another major consequence of climate change, as declining agricultural productivity and resource degradation force communities to seek alternative livelihoods. However, without proper adaptation measures, many may turn into unsustainable activities such as illegal logging, poaching, or slash-and-burn farming, further accelerating environmental degradation.

The project zone and surrounding regions are home to diverse ecosystems, including peatlands, tropical forests, and freshwater habitats that support numerous endangered and endemic species. However, climate change is increasingly threatening biodiversity by altering habitat conditions and exacerbating existing threats such as deforestation and land degradation.

Rising temperatures and prolonged dry seasons are drying out peatlands, increasing their susceptibility to fires, which destroy critical habitats and release vast amounts of carbon into the atmosphere. These fires, along with more frequent droughts, directly threaten species that depend on intact forest ecosystems, including critically endangered orangutans (Pongo pygmaeus). Many of these species rely on dense forests for food and shelter, and habitat loss caused by climate change forces them into smaller, fragmented areas, increasing competition for resources and reducing genetic diversity. Flooding and changing water dynamics also affect freshwater biodiversity. Increased sedimentation and pollution from runoff reduce water quality, impacting fish populations and other aquatic species.

Climate change also exacerbates human-wildlife conflicts as species are forced to move beyond their traditional habitats in search of food and water. This increases the likelihood of interactions with human settlements, leading to increased poaching, retaliatory killings, and habitat destruction

3.4.3 Measures Needed and Designed for Adaptation (CCB, GL1.3)

SPCP recognizes that climate change poses significant risks to both local communities and biodiversity within the project area. These risks include increased temperature variability, prolonged dry seasons, heightened fire risks in peatlands, reduced water availability, shifts in species distribution, and greater vulnerability of forest ecosystems. To address these challenges, SPCP has designed and implemented a range of targeted adaptation measures.

Given the increasing intensity and frequency of droughts due to climate change, peatland fires pose a major threat to both ecosystems and human health. In response, SPCP is implementing community-based fire management strategies and establishing early warning systems and fire monitoring through remote sensing, drones, and community-based patrols. Additionally, SPCP is rewetting and hydrologically restoring degraded peatlands to reduce fire susceptibility and enhance ecosystem resilience.

Climate change is expected to reduce the productivity of traditional land-based livelihoods, such as farming and fishing. To reduce dependency on forest resources and increase economic resilience, SPCP supports the community through Community Enterprise Program Development (CEPD) initiatives and provides employment opportunities by engaging local communities in forest protection, restoration, and conservation activities. The project also offers technical assistance and capacity-building to enhance livelihood productivity, particularly for those vulnerable to climate change impacts.

Furthermore, SPCP enhances community-level adaptation by delivering climate change education and awareness programs designed for local contexts. These programs emphasize the link between ecosystem protection and long-term community resilience. SPCP also trains local communities on zero-burning agricultural practices and sustainable forest management to reduce climate risks and improve adaptive capacities.

4 COMMUNITY

4.1 If theyWithout-Project Community Scenario

4.1.1 Descriptions of Communities at Project Start (CCB, CM1.1)

At the start of the project, a socio-economic baseline assessment was conducted between 2022 and 2023 in 14 villages within the project area. This baseline aimed to provide a comprehensive profile of the communities, capturing social, economic, cultural, and environmental dimensions for project planning and implementation.

The assessment employed a mixed-methods approach, combining qualitative and quantitative data collection techniques. These included focus group discussions (FGDs), structured questionnaires, and in-depth interviews. FGDs were conducted with a cross-section of community representatives, including village heads, customary leaders, women, marginalized groups, and other community members, to capture diverse community perspectives. Structured questionnaires were administered to a sample of 30 individuals per village, collecting data on household income, types of livelihoods, age, number of dependents, and education level. At least 30% of respondents were women, ensuring gender-inclusive representation. In-depth interviews with key informants—such as customary leaders and local decision-makers—helped validate and enrich the information gathered. Each village assessment was completed over a 5–7-day period, during which both primary data (sourced from local governments and communities) and secondary data (collected from existing reports and field validation) were compiled.

As of 2022, the total population across the 14 villages was 9,688 people, composed of 4,894 males and 4,794 females. Most residents are of productive working age (15–64), providing a strong labour base. However, education levels remain low: 41.57% have completed only elementary school, 11.65% junior high, and 16.15% high school or higher. Limited school infrastructure, long travel distances, and teacher shortages hinder learning outcomes.

Health conditions are also concerning. Diarrhoea, skin infections, respiratory ailments, and tetanus are common due to the humid terrain and lack of sanitation. Village health posts are largely non-operational, with residents depending on sub-district centres that are often remote and costly to access.

The table below summarizes key demographic, economic, and service-related indicators at project start.

Table 46. Summary of key demographic, economic, and service-related indicators at project start

Category	Details
Location	14 villages in two sub-districts: Putussibau Utara (9) and Embaloh Hilir (5)
Ethnic Groups	Dayak Kantuk, Taman, Tamambaloh, Iban, Ngaju; Malay, Javanese, Flores
Total Population (2022)	9,688 (4,894 males; 4,794 females)
Age Distribution	Majority in 15–39 and 40–64 age groups
Education Levels	41.57% elementary; 11.65% junior high; 16.15% high school or higher
Education Challenges	Poor facilities, teacher shortages, long distances to schools
Health Issues	Diarrhoea, skin disease, respiratory infections, tetanus
Health Access	Village clinics mostly non-operational; sub-district centres distant
Main Livelihoods	Kratom, fishing, vegetable farming, honey, rattan, resin, rubber
Economic Vulnerabilities	Declining kratom demand; limited market access; regulatory uncertainty

The baseline findings indicate that the 14 villages are located within two ecologically distinct areas. Putussibau Utara is predominantly forested, with communities whose livelihood are closely tied to forest-resources. In contrast, Embaloh Hilir is defined by a network of rivers and lakes that support aquatic-based subsistence systems. Across both areas, communities rely heavily on natural resources for daily life and economic activities.

The villages are inhabited by diverse ethnic groups, including *Dayak Kantuk*, *Dayak Iban*, *Dayak Taman*, *Dayak Tamambaloh*, *Dayak Ngaju*, Malay, Javanese, Flores and others. These groups maintain strong historical, cultural and spiritual ties to the surrounding natural environment.

Governance in the villages operates under a dual system that blends formal administrative structure with strong customary institutions. The head of village (*Kepala Desa*), formally elected and recognized by the government, leads village administration, public services and development coordination in partnership with the Village Consultative Body (*Badan Permusyawaratan Desa*, BPD), a representative council ensuring community participation, oversight, and transparency. In parallel to this, the traditional system remains influential, led by *Ketua Adat* (customary leader) at the village level, supported by the *Temenggung* (subdistrict customary leader), and the *Dewan Adat Dayak* (DAD-district level council). These traditional leaders oversee matters of customary laws, uphold indigenous knowledge, safeguard collective rights, cultural preservation, land management, conflict resolution and ensure the enforcement of customary law through culturally appropriate sanctions.

The baseline also highlights the following defining cultural and social characteristics of the communities that shape their identity and governance:

- Language**:** predominantly Dayak languages, with distinct local dialects.
- Mythology and History: deep spriritual ties to ancestral spirits and the supernatural traditions.
- Culture practices: rich expression of Dayak music, dance, traditional clothing, weaving and carving craft.
- Livelihood Systems: reliance on agriculture, plantations, hunting, fishing, gathering, and handicrafts.
- Practices and Values: Social cohesion fostered through unity, mutual cooperation (*gotong royong*), and respect, reflected in communal ceremonies for weddings, harvests, and religious events.
- Historical, Cultural, and Spiritual Sites: Sacred places such as Gale Buya in Nanga Awin hold profound cultural and spiritual importance.
- Natural Resources relationship: a deep connection to forests, rivers, lakes, and land, which remain vital to daily life and cultural identity.

The tribal composition of each village, as gathered during the assessment, is summarized in the following table:

Table 47. Tribal distribution in the Project Area

Villages	Tribe							Total
	Malay	Dayak Kantuk	Dayak Taman	Dayak Tamambaloh	Javanese	Flores	Others	
Nanga Palin	100%	0%	0%	0%	0%	0%	0%	100%
Keliling Semulung	0%	100%	0%	0%	0%	0%	0%	100%

Kirin Nangka	0%	80%	0%	0%	20%	0%	0%	100%
Pala Pintas	0%	100%	0%	0%	0%	0%	0%	100%
Nanga Lauk	95%	0%	0%	0%	0%	0%	5%	100%
Sibau Hulu	45%	0%	45%	0%	8%	2%	0%	100%
Jangkang	0%	80%	10%	10%	0%	0%	0%	100%
Tanjung Beruang	0%	80%	10%	10%	0%	0%	0%	100%
Seluan	0%	80%	10%	10%	0%	0%	0%	100%
Nanga Nyabau	0%	0%	0%	100%	0%	0%	0%	100%
Nanga Awin	0%	95%	0%	0%	0%	0%	5%	100%
Benua Tengah	0%	0%	0%	95%	0%	0%	0%	95%
Sungai Uluk Palin	0%	0%	0%	100%	0%	0%	0%	100%
Tanjung Lasa	10%	0%	80%	0%	5%	5%	0%	100%

Baseline assessment confirmed the Dayak groups demonstrate deep reliance on natural resources. Three primary forms of dependence on the forest have been identified:

- Economic Dependence: The forests supply timber, building materials, fuelwood, and non-timber products such as mushrooms, honey, resin, rattan, and medicinal plants, all essential for both subsistence and income generation.
- Cultural and Spiritual Dependence: Forests are integral to traditional ceremonies and spiritual practices. Rituals like the Nyengkelan Buaya in Nanga Awin and Timang Lalu in Nanga Lauk reflects these deep connections.
- Ecosystem Dependence**:** Forests contribute to biodiversity preservation, water cycle regulation, climate stability, and protection from natural hazards.

The local economy is primarily based on agriculture, with kratom, field rice, corn, and vegetables as key crops. Rubber plantations once played a significant economic role, but declining market prices have led the community to diversify. Fishing is a major livelihood, with species such as *Toman*, *Belida*, *Jelawat*, and Catfish commonly caught for consumption and sale. High-value species like Arwana present opportunities for aquaculture, though this requires substantial investment. Rattan handicrafts,

including mats, hats, baskets, and bags are also economically promising, particularly with improved design and marketing support.

Women play essential roles in sustaining the local economic and socio-cultural. They are actively involved in farming, fishing, food processing and handicrafts, contributing directly to household welfare. However, the degree of women's participation varies between villages due to differing social norms and access to resources.

Despite these strengths, the baseline assessment identified several critical challenges:

- Heavy reliance on natural resources has leads to unsustainable practices and environmental degradation.
- Poverty remains widespread, with limited access to education, healthcare, and infrastructure such as roads.
- Illegal activities, including illegal logging and hunting, threating conservation efforts and create tensions between traditional use and environmental policies.
- Shifting cultivation practices contribute to forest and peatland degradation, exacerbating ecological risks.

This baseline findings offer critical insights into the social, cultural, economic, and ecological conditions of the target communities, providing a strong foundation for designing inclusive, contect-responsive and sustainable project interventions.

4.1.2 Interactions between Communities and Community Groups (VCS, 3.19; CCB, CM1.1)

As identified in the stakeholder analysis, at least six distinct community groups operate within the project area. These include farmers, fishermen, Non-Timber Forest Product (NTFP) collectors, loggers, hunters, and marginalized groups.

The interactions among these groups are characterized by close, mutually beneficial relationships. For instance, fishermen supply a key source of protein to both local households and neighboring communities. NTFP collectors contribute valuable forest-based resources such as honey, resin, medicinal plants, and rattan which support local livelihoods and feed into broader community markets. In turn, these groups rely on local services and trading systems that are sustained by other members of the community.

4.1.3 High Conservation Values (CCB, CM1.2)

The project has identified HCVs related to community well-being through a combination of desktop study as well as consultations with community members. As part of the desktop study, the team analyzed available data prior to the Project start date to identify relevant HCVs related to community

well-being. The team then engaged with communities and stakeholders to verify information analyzed and to gather additional insights to identify HCV 4,5 and 6, as described in the table and figure below.

High Conservation Value	Area critical for ecosystem services (HCV4): Peat swamp forest (carbon storage), river and buffer areas
Qualifying Attribute	Essential ecosystem services that are vital for both environmental integrity and community well-being. In the Project Zone, local communities rely heavily on these services for access to clean water, food security, and the protection of settlements and infrastructure. Peat swamp forests, covering approximately 42.260,88 hectares within the Project Zone, play a particularly critical role. Beyond supporting water regulation and reducing environmental risks, they act as major carbon sinks. Their deep organic soils store substantial amounts of carbon, making them essential for climate change mitigation and the prevention of emissions caused by land degradation and fire.
Focal Area	Project Zone Water & climate regulation: peat-swamp forest in Southern part of Project Zone Flood prevention: peatlands, swamp and all river networks within the Project Zone Water catchment areas: key water catchment areas are located upstream along the Seluan, Uluk Palin and Sibau (Tanjang Lasa) rivers
Potential Negative Impacts	No adverse impacts are anticipated. The core objective of the Project is to protect and restore peatlands, forest and other associate natural resources.

High Conservation Value	Areas fundamental to meeting basic needs of local communities (HCV5): Water & protein sources (rivers, lakes), forest (medicinal plants and NTFPs)

Qualifying Attribute	The areas that are fundamental to meeting the basic needs of local communities. In the Project Zone, forests and rivers are vital for the livelihoods and well-being of surrounding communities. Forests provide essential resources such as fruits, honey, resin, and medicinal plants, which are integral to subsistence, traditional medicine, and local economies. Rivers supply clean water for drinking, irrigation, fish for protein source, and daily household use. These natural resources not only meet immediate needs for food, water, and health but also support long-term self-sufficiency, cultural continuity, and economic resilience.
Focal Area	Forest within the Project Zone that provide NTFPs including herbs/medicinal plants Nangapalin River (in Banua Tengah and Nanga Nyabau), Batang Awin river and Suai river (in Nanga Awin), and Uluk River (in Uluk Palin and Embaloh Hilir) are used by communities for fish catchment as their source of protein.
Potential Negative Impacts	No negative impacts are anticipated. The primary objective of SPCP is to protect forests and other ecosystems, promoting their sustainable use and ensuring the continued provision of essential service to communities within the Project Zone.

High Conservation Value	Areas critical for traditional entity of communities (HCV 6): sites of cultural & religious importance
Qualifying Attribute	The areas that are critical for cultural, religious, or historical significance. Within the Project Zone, certain areas hold deep environmental, social, and cultural value for local communities. These areas are used to preserve cultural identity, sustain traditional practices, and uphold religious customs. They also embody the rights, values, and traditional knowledge of local communities, forming an integral part of their heritage and way of life.
Focal Area	Betang longhouses in 9 villages in the North part of Project Zone,

	Sacred trees in Tanjung Lasa, Sungai Uluk Palin, and Banua Tengah, A sacred cave in Seluan Village, Stone hill for religious ritual in Tanjung Lasa and Tanjung Beruang, Traditional Grave Sites in Keliling Semulung
Potential Negative Impacts	No negative impacts are anticipated. Within the Project Zone, where the Project holds a legal mandate, areas that contribute to the cultural identity of local communities will be fully protected

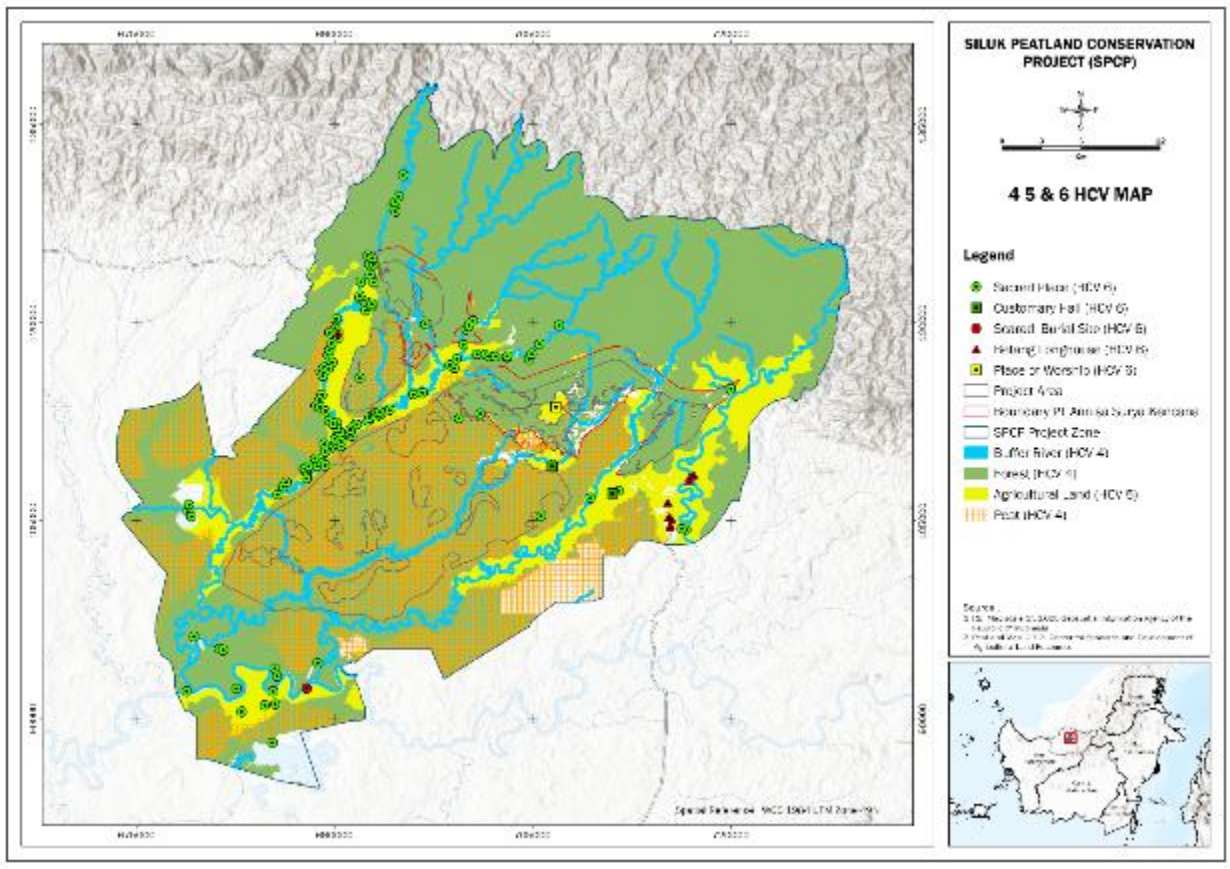


Figure 48. HCV 4, 5 and 6 within the Project Zone

4.1.4 Without-Project Scenario: Community (CCB, CM1.3)

As described in Section 2.2.1, the project area was designated for selective logging and conversion to an industrial timber plantation. The likely without-project scenario for local communities would be as follows:

Economic and livelihood impacts

- Loss of traditional livelihoods: in the without-project scenario, many residents of the 14 villages, who rely on forest products such as honey, resin, rattan, medicinal plants and fish, would face a declining availability of these resources. This would directly impact their income and food security.
- Reduced agricultural productivity: Tree removal can lead to erosion and soil degradation. In the long run, this lowers agricultural productivity, leading to food shortages and increased poverty among communities.
- Dependence on unsustainable practices: In the without-project scenario, the logging company is likely to neglect community livelihood programs. This may drive communities to rely more on unsustainable practices such as illegal logging, land burning, shifting cultivation, unsustainable oil palm planting - particularly in the northern areas-wildlife hunting, and overfishing- as they seek to sustain their livelihoods.

Social and cultural impacts

- Erosion of cultural practices: In the without-project scenario, exploitation of forests and natural resources would undermine traditional knowledge and practices, such as the use of medicinal plants and construction of traditional houses (*Betang*), leading to gradual loss of cultural identity.
- Conflict over resources: increased competition for dwindling natural resources may lead to conflicts between the company and communities, particularly over access to land, water and forest products.
- Decline in health conditions: As access to clean water diminishes and reliance on unsafe and less nutritious food sources increases, overall community health may decline. Additionally, increased exposure to environmental hazards, such as smoke from forest fires could lead to respiratory or other health problems.
- Increase vulnerability and poverty: In the without-project scenario, with declining natural resources and traditional income sources, communities may face rising poverty levels, making them vulnerable to external shocks such as economic downturns or natural disasters.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CCB, CM2.1)

The with-project scenario is designed to improve social and economic conditions by promoting inclusivity, active participation, and community's empowerment. The expected outcomes are significantly positive (detailed in Table 48 Section 4.2.3), enhancing community well-being by enabling people to address the challenges they face. The project engages communities from the outset through the following methods:

- Problem Identification – Identifying core issues such as poverty, limited education, gender inequality, inadequate healthcare access, and environmental changes
- Program Planning – Developing a structured workplan with clear objectives, strategies, and steps tailored to community-specific needs
- Community Participation – Actively involving community members in the planning, implementation, and monitoring processes to ensure solutions are locally relevant
- Community Empowerment – Strengthening local capacity by providing knowledge, skills, and access to resources that enable communities to lead their own development.

The following table outlines the specific community groups targeted through the community development programs. These groups were identified based on their impact to the project areas, vulnerability, socio-economic conditions, and potential to benefit directly from the project's interventions. They include farmers, fishermen, hunters, loggers and other marginalized or economically disadvantaged groups. The program designs activities to match the specific needs, roles, and conditions of each group, helping to ensure that everyone can participate meaningfully and benefit fairly. This targeted approach increases the impact of the program and supports broader goals of social inclusion and sustainable development.

Community group	Farmers, fishermen, NTFP collectors
Impact(s)	Improved productivity of livelihood activities through targeted capacity building and support for alternative enterprises
Type of benefit/cost/risk	**Benefit:** New and enhanced income opportunities via upskilling. **Cost:** Time and effort required for training and participation. **Risk:** Possible failure of new enterprises; social tension due to limited project capacity to support all households.
Change in well-being	Economic improvement through increased income, savings, and reinvestment. Enhanced autonomy in household financial decisions.

Community group	Loggers, hunters
Impact(s)	Sustainable livelihood activities, employment opportunities, and increased awareness on sustainable forest management
Type of benefit/cost/risk	**Benefit:** New income opportunities and upskilling in sustainable livelihood practices. Reduced exposure to unsafe conditions in illegal logging. **Cost:** Time and effort required for awareness raising, training and participation . Opportunity cost from logging and hunting.

	Risk: Income from alternative ivelihood may be lower then earnings from illegal activities..
Change in well-being	Sustainable economic activities and increased awareness on sustainable forest management

Community group	Marginalized groups (e.g., elderly, widows, persons with disabilities) typically excluded from mainstream livelihood programs
Impact(s)	Increased access to inclusive economic opportunities through tailored support and skills training
Type of benefit/cost/risk	**Benefit:** Improved livelihood access and skills enhancement. **Cost:** No financial burden, but requires time and participation. **Risk:** Potential failure of livelihood activities.
Change in well-being	Greater economic independence and empowerment. Increased participation in decision-making at household and community levels.

To support sustainable development and safeguard community well-being, the project will implement the following strategies:

- Promote inclusive and gender-sensitive approaches by ensuring at least 30% of women representation in project-formed groups and decision making roles. Schedule meetings and activities at times and places that are accessible and covenient for women, considering childcare responsibilities and household obligation.
- Actively engage marginalized groups (e.g., person with disabilities, elderly, poor and people with limited acccess to livelihood programs) to ensure their meaningful participation and inclusion in project activities. This approach fosters a safe, equitable environment and promotes leadership and participation from underrepresented community members.
- Protection of High Conservation Value (HCV) areas such as sites of cultural, spiritual, and subsistence importance, especially peatland forests providing clean water, fish, and NTFPs.
- Sustainable use: Promote responsible harvesting of local resources such as honey, rattan, and medicinal plants.
- Community participation: ensure transparent and inclusive decision-making throughout project implementation.
- Adaptive management: apply a flexible approach that integrates ongoing monitoring, community feedback, and continuous improvement.

4.2.2 Negative Community Impact Mitigation (VCS, 3.19; CCB, CM2.2)

Some identified community groups within the Project Area are currently practicing logging and hunting activities that are considered illegal and ecologically unsustainable. Under the with-project scenario, these activities will be gradually phased out through close collaboration with the communities themselves. The project will prioritize awareness raising and engaged these groups in various project components such as alternative livelihood initiatives, forest restoration and conservation efforts tailored to their interests and capacities.

The project also recognizes the potential risk of conflict arising from perceived inequalities in the distribution of livelihood support, particularly during the initial implementation phase when interventions are carried out in a limited scale. To mitigate this, the project will adopt a phased expansion strategy, ensuring more community members are engaged throughout the project period.

Additionally, to extend its impact across a wider population, the project will enhance outreach through education support, health awareness campaigns, and initiatives to improve access to clean water.

4.2.3 Net Positive Community Well-Being (VCS, 3.19; CCB, CM2.3, GL1.4)

This project has conducted an analysis of the anticipated well-being impacts on all identified community groups within the project area. The assessment compares projected conditions under a "without-project" baseline scenario with those anticipated under full project implementation.

In the without project scenario, without project intervention, as outlined in Section 4.1.4, the Siluk Project's initial focus on selective logging and forest conversion is expected to negatively affect community well-being across economic, social, cultural, and health dimensions. Traditional livelihoods dependent on forest products would likely decline, and agricultural productivity would decrease due to land degradation. As a result, communities may increasingly rely on unsustainable practices such as illegal logging, shifting cultivation, wildlife hunting, and overfishing.

These pressures are expected to lead to economic decline, erosion of cultural practices, growing conflicts over dwindling resources, and deteriorating health due to poor nutrition and environmental hazards. Vulnerable groups may experience deepening poverty and reduced resilience to external shocks such as climate change and economic instability.

Under the with-project scenario, targeted interventions are introduced to promote sustainable livelihoods, strengthen community capacity, restore ecosystems, and generate employment opportunities. Key activities include the development of community enterprises, technical assistance, livelihood diversification, capacity building for women and youth, and job creation in restoration and rehabilitation programs.

The table below summarizes the project activities, baseline conditions under without project scenario, planned interventions, expected net well-being outcomes for targeted community groups, and alignment with CCB Gold Level climate change adaptation criteria:

Targeted groups include farmers, loggers, hunters, NTFP collectors and marginalized groups, as per Section 4.2.1 above. Numbers in parentheses refer to the monitoring methodology (see Section 4.4.1).

Table 48. Summary of the project activities, baseline conditions, planned interventions, expected net well-being outcomes for targeted community groups

Programs	Without-project scenario	With-project scenario	Expected Positive Impact (Net Well-being Impact)	Gold Level Climate Change Adaptation Benefit
Sustainable livelihood support (1)	Communities rely on unsustainable practices (e.g., illegal logging, slash and burn farming, overfishing, wildlife hunting); limited income diversification	Development of community enterprises, support for sustainable NTFP use (e.g., rattan, resin, honey), promotion of traditional forest-based practices, sustainable agriculture and aquaculture	Improved and diversified livelihoods, reduced reliance on environmentally damaging practices See detailed monitoring measure and targets in Appendix 2: Project Activities and Theory of Change Table.	Promotes resilient livelihoods through sustainable resource use, reducing environmental pressure and improving long-term adaptation options
Access to market/ market linkage (2)	Communities face poor market connectivity and lack of bargaining power	Establishment of supply chains, support for local enterprises, training in value-added production and market linkage	Increased market linkage to better product pricing, improved market inclusion, economic empowerment	Enhances community resilience by strengthening market-based income sources adaptable to environmental and economic shift
Capacity building for environmental	Limited knowledge and skills in conservation,	Training programs for farmers, women, youth, loggers,	Enhanced skills in sustainable resource use,	Strengthens local adaptive capacity through

Programs	Without-project scenario	With-project scenario	Expected Positive Impact (Net Well-being Impact)	Gold Level Climate Change Adaptation Benefit
protection and ecosystem restoration (3)	climate adaptation, and sustainable land use	hunters, and NTFP collectors in sustainable practices and ecosystem management	increased environmental stewardship, intergenerational knowledge transfer	embedded practices sustain healthy, resilient ecosystem
Employment in forest protection and peatland restoration (4)	Unemployment or reliance on destructive land-use practices (e.g., land clearing, poaching)	Jobs in restoration programs, reforestation, fire prevention, and conservation initiatives. This program will prioritize loggers and hunters	Income generation from conservation employment, reduced environmental degradation, social inclusion	Provides climate-resilient employment that restores ecosystem functions, supports biodiversity, and increases community adaptive capacity
Improved health, education and access to clean water (5)	Limited support in health services, basic education and access to clean and safer water. Due to poverty, low income families face significant barriers in accessing these essential services	Implementation of targeted health programs (e.g., community health campaigns, nutritious food for children, malaria prevention), distribution of learning materials and ecosystem awareness for students, and provision of clean water through deep wells	Improved health and hygiene, reduced disease risks, increased school participation, and enhanced well-being of vulnerable groups	Builds community resilience by addressing health vulnerabilities, supporting informed and healthy future generations, and reducing water-related climate risks

4.2.4 High Conservation Values Protected (CCB, CM2.4)

The project is not expected to have any negative impacts on High Conservation Values (HCVs), as detailed in Section 4.1.3. All project activities will be carefully designed with appropriate safeguards to mitigate any potential risks. The table below summarizes the key activities aimed at protecting HCV areas within the Project Zone.

Identified High Conservation Value	Focal area	Activities to protect HCV Areas
HCV4: Peat swamp forest, river and buffer areas	Project Zone Water & climate regulation: peat-swamp forest in Southern part of Project Zone Flood prevention: peatlands, swamp and all river networks within the Project Zone Water catchment areas: key water catchment areas are located upstream along the Seluan, Uluk Palin and Sibau (Tanjang Lasa) rivers	The project will contribute to the protection HCV 4 by safeguarding and restoring peatlands, forest and associate natural resources. Particular emphasis will be placed on maintaining optimal water levels in peatlands areas to mitigate fire risks and preserve their ecological integrity over the long term.
HCV5: rivers, lakes, forest	Forest within the Project Zone that provide NTFPs including herbs/medicinal plants Nangapalin River (in Banua Tengah and Nanga Nyabau), Batang Awin river and Suai river (in Nanga Awin), and Uluk River (in Uluk Palin and Embaloh Hilir) are used by communities for fish catchment as their source of protein.	The project will protect forests and other ecosystems by promoting their sustainable use and ensuring the continued provision of essential service to communities within the Project Zone. One key activity is the promotion of Zero Burning Agriculture (ZBA) as sustainable alternative to traditional slash-and-burn practices. ZBA helps maintain soil fertility, reduces land degradation, and significantly decreases the risk of forest fires, thereby safeguarding forest resources that are essential for community livelihoods.
HCV 6: sites of cultural & religious importance	Betang longhouses in 9 villages in the North part of Project Zone, Sacred trees in Tanjung Lasa, Sungai Uluk Palin, and Banua Tengah, A sacred cave in Seluan Village,	The project, operating under a legal mandate, will ensure the full protection of areas that hold cultural identity and spiritual values for local communities. These culturally significant sites will be safeguarded through close collaboration

	Stone hill for religious ritual in Tanjung Lasa and Tanjung Beruang, Traditional grave in Keliling Semulung	with community leaders and the integration of traditional knowledge into project planning and implementation, while facilitating the sustainable use of resources.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (VCS, 3.18, 3.19; CCB, CM3.1)

The SPCP is designed to promote constructive collaboration and complement the initiative of other stakeholders operating within the project zone, as detailed in Appendix 4: Stakeholder Description Table. Local NGOs working on environmental conservation and community development have been supporting the establishment of Village Forests (*Hutan Desa/HD*) and Customary Forests (*Hutan Adat/HA*) in areas adjacent to the Project Area. However, in accordance with national regulations, HD/HA designations cannot be established within areas covered by forest utilization licenses, including SPCP's concession. This legal framework effectively prevents any spatial overlap.

To ensure alignment and avoid potential conflicts, the SPCP has actively engaged with NGOs and relevant stakeholders. A key aspect of this coordination is the exchange of spatial data and clarification of land boundaries, which helps to ensure that current and future HD/HA applications do not interfere with project implementation. This ongoing collaboration demonstrates the project's commitment to transparency, mutual understanding, and responsible land governance within the project zone.

In addition to alignment with stakeholders, the SPCP is expected to generate several positive and sustainable outcomes. Through initiatives such as Zero Burning Agriculture (ZBA) and forest fire management, the project will support district and provincial governments in reducing fire risks and associated environmental impacts. The CEPD program is aligned with poverty alleviation efforts in the region, directly addressing local socio-economic challenges. Furthermore, the project will stimulate the local economy by enhancing supply chain-market linkages and diversifying products. Collaborative community empowerment programs will build strong partnerships with NGOs and align with private actors and other organizations that share sustainability objectives. Collectively, these actions will deliver lasting benefits for local communities and enhance environmental resilience across the region.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (VCS, 3.18, 3.19; CCB, CM3.2)

As described in Section 4.3.1, the project promotes collaborative partnerships especially on complementary efforts that contribute to improving overall well-being of communities in the project zone. Through such partnerships, impacts on other stakeholders are positive and no negative impacts have been identified requiring mitigation. The project proponents will continue to maintain regular engagement with other stakeholders, fostering open dialogue to build understanding, trust, and alignment with the project's objectives and implementation.

4.3.3 Net Impacts on Other Stakeholders (VCS, 3.18, 3.19; CCB, CM3.3)

The "without-project scenario" would involve the continuation of logging, canal construction, unsustainable agricultural practices, and forest degradation practices that provide short term financial gains at significant environmental costs. If the project is successful, non-community stakeholders stand to benefit from long term positive outcomes, as outlined in Section 4.3.1. These outcomes would represent substantial net-positive impacts for these stakeholders.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CCB, CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

To ensure effective implementation and adaptive management, the SPCP has developed a participatory community monitoring plan align with project's objectives. This plan systematically tracks project outputs, outcomes, and impacts on community well-being across the 14 target villages, with particular attention to differentiated effects on key targeted groups- including farmers, fishers, NTFP collectors, loggers, hunters and marginalized groups.

Monitoring criteria are outlined in Table 49 and include both qualitative and quantitative methods. Data collection combines direct tracking of project activities with secondary sources such as village census records and government databases to ensure robust, triangulated analysis.

A key focus is the evaluation of measures aimed at maintaining or enhancing High Conservation Value (HCV) attributes linked to community well-being. These include the protection of ecosystem services, cultural heritage sites, traditional knowledge systems, and equitable access to natural resources. Ground-truthing and spatial data verification will be conducted regularly, with community participation in identifying key HCV areas to prevent ecological or cultural degradation.

To support Gold Level validation under the CCB Standards, the monitoring plan incorporates indicators that measure climate change adaptation and exceptional community benefits. For climate adaptation (GL1), the plan assesses household livelihood diversification through CEPD programs, sustainable practices such as zero burning agriculture, and the creation of green jobs through restoration and conservation activities.

For exceptional community benefits (GL2), the plan uses disaggregated indicators to monitor the inclusion and well-being of women and other marginalize groups. This includes tracking their participation in livelihood programs, value chains and governance processes, as well as their access to ecosystem services that contribute to food security and income stability.

Livelihood activities are monitored monthly, while all other aspects-including group governance, administration, financial reporting and overall progress are reviewed quarterly using standardized tools such as community groups surveys, focus group discussions, and key informant interviews. The results are shared transparently with communities to promote shared learning, strengthen accountability, and support evidence-based project adjustments.

4.4.2 Monitoring Plan Dissemination (CCB, CM4.3)

Monitoring results will be shared with communities through an Indonesian-language summary, using community group meetings and other participatory forums to ensure transparency and encourage local feedback. The following table outlines the matrix of the community monitoring plan, detailing key variables and overall targets, methods and frequency.

Table 49. Matrix of Community Monitoring Plan

Ref	Monitoring Element	Target Group	Key Variable and Overall Target	Means of Verification/Data Source	Data collection Tool	Frequency
#1	Sustainable livelihood support	Farmers, fishermen, NTFP collectors, loggers, hunters, marginalized groups	Number of CEPD groups established	Project records, group registration	Group registration form, interview	quarterly
			Number of individuals receiving funding support (detailed number in Section 0 and Appendix 2: Project Activities and Theory of Change Table)	Grant reports, disbursement log	Funding disbursement log	quarterly
			Number of women/marginalized receiving funding support	Group records, gender-disaggregated data	Funding disbursement	quarterly
#2	Access to market/market linkage	Farmers, fishermen, NTFP collectors, loggers, hunters, marginalized groups	Number of business models linked to market	Project records, sales agreements	Market linkage report	Biannually
			number of individuals benefiting from community business models	Business records, surveys	Business progress survey	Biannually

Ref	Monitoring Element	Target Group	Key Variable and Overall Target	Means of Verification/Data Source	Data collection Tool	Frequency
#3	Capacity building for environmental protection and ecosystem restoration	Farmers, fishermen, NTFP collectors, loggers, hunters, marginalized groups	Number of trainings conducted	Training reports	Training event log	Monthly
			Number of individuals trained	Attendance records	Training attendance sheet	After each training
#4	Employment in forest protection and peatland restoration	Loggers, hunters, marginalized groups	Number of individuals employed in peatland restoration	Employment contracts, field reports	Employment registry	Quarterly
			Number of individuals engaged in peatland restoration	Short-term contracts, field reports	Non-permanent employment registry	Quarterly
#5	Health, education, and access to clean water support	Children, elderly, low-income and marginalized families	Number of individuals receiving health services (e.g., campaigns, nutritious food, malaria fogging) Number of students receiving eduaction materials and participating in	Field monitoring report, beneficiary records Distribution reports, school coordination records	Monitoring sheet	Biannualy

Ref	Monitoring Element	Target Group	Key Variable and Overall Target	Means of Verification/Data Source	Data collection Tool	Frequency
			awareness campaigns Number of deep wells contructe	Infrastructure completion reports, site verification		

4.5 Criterion: Exceptional Community Benefits

4.5.1 Exceptional Community Criteria (CCB, GL2.1)

According to the Human Development Index (HDI), Indonesia is classified as a country with Medium Human Development, ranking 108th out of 169 countries globally. The Indonesian Bureau of Statistics (*Badan Pusat Statistik*) defines the national poverty line for West Kalimantan Province as the minimum purchasing power required per capita to afford both staple food and non-food items, equivalent to IDR 454,652 per month. A social baseline assessment conducted by the SPCP Project found that over 50% of village households earn an average monthly income of approximately IDR 2,000,000. With an average household size of 4.6 persons in West Kalimantan, this equates to a per capita income of IDR 434,782, below the established national poverty line. Therefore, the SPCP Project Zone qualifies as a rural area where more than 50% of households live below the national poverty line, meeting the criteria for CCB Gold Level consideration under the Community Exceptional Criteria.

To support community resilience and meet the CCB Gold Level Climate Change Adaptation criteria, the project implements integrated actions that strengthen sustainable livelihoods, enhance market access, build local capacities, and create green employment opportunities. Communities are supported to transition from environmentally harmful practices toward zero burning agriculture thereby reducing pressure on ecosystems. Improved market linkages promote income stability and economic security, while targeted capacity-building programs empower farmers, fishers, hunters, loggers, women and marginalized groups with skills in conservation and climate adaptation. Furthermore, employment opportunities in ecosystem restoration provide inclusive and sustainable alternatives to environmentally degrading activities. Together, these interventions enhance the community's long-term adaptive capacity, strengthen socio-economic resilience, and improve well-being across all social groups (detailed in Section 4.2.3).

4.5.2 Short-term and Long-term Community Benefits (CCB, GL2.2)

The project is expected to generate both short-term and long-term net positive well-being benefits for communities. By aligning interventions with locally identified priorities and embedding sustainability principles into environmental and economic practices, the project will contribute to immediate improvements in livelihoods, capacity, and access to employment, while also strengthening long-term community resilience, resource security and intergenerational well-being. The anticipated well-being benefits are detailed in Section 4.2.3 and Appendix 4: Stakeholder Description Table. A summary of these short- and long-term benefits from project activities is presented in the table below.

Table 50. The summary of short- and long-term benefits from project activities

Project Activities	Outputs - (short term)	Impacts- (long term)
Provide funding focused on sustainable livelihoods.	At least 55 groups are established under the Community Enterprise Program Development (CEPD), with	The community within the project zone achieves greater economic stability through

Project Activities	Outputs - (short term)	Impacts- (long term)
	950 number of individuals receiving funding support At least 15 women and/or marginalized groups are established, with 150 number of individuals receiving funding support	sustainable livelihoods linked to forest and peatland protection. They also play an active role in conservation efforts, fostering a healthier ecosystem and a more resilient economy.
Empowering local businesses towards sustainable markets.	At least 20 business models are linked to the market	
Educating community members on the importance of environmental protection, which leads to engaging them in forest and peatland restoration programs, while enhancing local capacity for forest monitoring, peatland restoration, and overall ecosystem restoration	Forest protection and peatland restoration activities have started, with 90 of trainings conducted, and 310 of individuals trained (including women and youth)	
Creation of employment opportunities linked to environmental conservation.	40 individuals employed by the company, and 180 individuals engaged in forest and peatland restoration and rehabilitation programs	
Supporting health, education and access to clean water	880 individuals engaged in health campaigns and access to health support (i.e. medical check-ups) 600 students receiving educational materials (e.g., books, stationery) and attend awareness raising 2100 communities accessing clean water from deep wells constructed by project	Improve access to health, education, and clean water is expected to enhance overall well-being, reduce preventable diseases and strengthen human capital for long-term community resilience.

4.5.3 Community Participation Risks (CCB, GL2.3)

The SPCP Project is designed to deliver a broad range of socio-economic benefits to communities, with a strong emphasis on reaching the most vulnerable and marginalized groups. The project's approach, including outreach to the poor and socially excluded, is described in Appendix 4: Stakeholder Description Table. Positive outcomes are expected in the form of improved market access, increased employment, and strengthened community capacity. These impacts depend on inclusive participation, transparency, and effective implementation. Through the social baseline assessment, three key barriers were identified, each with planned mitigation strategies:

- Limited Participation: Marginalized groups often reside in remote areas and lack access to information or community decision-making processes. Meeting participants are frequently selected by local leaders, which can exclude poorer or less connected households. To ensure inclusive representation, the project will engage village-level facilitators, apply participatory planning methods, and hold meetings at times and locations accessible to all groups. Active validation of marginalized group participation will help ensure their voices are integrated into planning and implementation.

- Elite Capture: In the absence of transparency and balanced representation, there is a risk that decisions, such as allocation of project benefits could be influenced by individuals acting in their own interests. The project will address this by promoting diverse and equitable community representation, particularly from marginalized households. Public access to meeting records and decision-making processes will be ensured to create checks and balances, discourage favouritism, and foster trust across all stakeholder groups.

- Weak Project Management: Inadequate human and financial capacity, along with poor oversight, may limit the project's ability to deliver benefits effectively, especially to marginalized groups. To mitigate this, the project will provide training in financial and operational management, strengthen monitoring and evaluation frameworks, and implement adaptive, community-based management approaches. These steps aim to improve accountability, ensure resources are used efficiently, and build local capacity for long-term sustainability.

4.5.4 Marginalized and/or Vulnerable Community Groups (CCB, GL2.4)

SPCP, during the socio-economy baseline assessment, has included community members categorized as marginalized and vulnerable groups in the project area including women, persons with disabilities, people with limited access to information or decision making, and elders who often overlooked and excluded from development programs. The project specifically targets these groups to ensure their active participation in groups meetings, livelihood initiatives programs and decision-making processes. The approach for ensuring the inclusion of marginalized groups is detailed in Section 4.5.3, with an emphasis on promoting meaningful engagement and representation.

The following table outlines the targeted community groups, highlighting the anticipated net positive impacts, strategies to enhance benefit access, and measures to identify and mitigate any potential negative impacts.

Community Group	Women

Net positive impacts	Project activities such as inclusive livelihood training (e.g., chicken farming, maize farming, administration, and fish farming) are designed to increase women's economic participation and promote leadership roles.
Benefit access	Gender-sensitive approaches (e.g., separate FGD sessions, childcare provision during meetings) are used to reduce participation barriers. A minimum quota of 30% women's representation is applied in project activities and capacity-building initiatives.
Negative impacts	Gender impact assessments through interview and FGD will be conducted, and any gender-based risks identified (e.g., increased workload, exclusion) will be addressed through targeted support, awareness training, and adjustments in project design.
Community Group	People with limited access to information or decision-making (e.g., remote households).
Net positive impacts	The project supports awareness-building and encourages broader representation in project planning. It also promotes inclusive livelihood activities- such as chicken farming, maize farming, and fish farming)- that are designed to enhance the economic participation of people with limited access to information or decision-making and strengthen their involvement in village institutions.
Benefit access	Simplified communication tools such as leaflets and local language materials are used to ensure messages are accessible to communities.
Negative impacts	The project monitors participation rates and information access through village-level feedback. If groups are found to be excluded, additional outreach and dedicated facilitation will be deployed.

Community Group	Persons with Disabilities
Net positive impacts	The project supports persons with disabilities by providing inclusive livelihood activities – such as training in chicken farming, maize farming, administration, fish farming along with accessible training modules and improved facilities to ensure their meaningful participation and inclusion.
Benefit access	Persons with disabilities benefit from improved physical accessibility, the use of communication aids such as visual and audio materials, and dedicated facilitator support. Tailored needs assessment is conducted to ensure that interventions respond effectively to individual requirements. Additional

	support measures include providing comfortable seating, meal assistance and writing support, including personalized guidance for those who have difficulty writing by hands.
Negative impacts	Monitoring will track any exclusion from benefits due to physical or communication barriers. Corrective actions include individualized outreach and accessibility enhancements.

Community Group	Elders
Net positive impacts	The project supports elders by providing inclusive livelihood activities – such as training in chicken farming, maize farming, administration, fish farming along with accessible training modules to ensure their meaningful participation and inclusion.
Benefit access	Elderly participants benefit from enhanced visual and audio communication aids, as well as dedicated facilitator support. Activities are tailored through individual needs assessments to ensure they are relevant and comfortable. Engagement strategies, such as using local languages in discussion forums, help improve understanding and promote meaningful participation.
Negative impacts	Age-related barriers such as mobility limitations or exclusion from decision-making are monitored. Mitigation includes assigning local facilitators to support their involvement and ensuring age-sensitive formats for participation.

4.5.5 Net Impacts on Women (CCB, GL2.5)

Although women have historically been involved in the community level engagement, their roles remain limited. Decisions are predominantly made by men, whether in technical, administrative or financial matters. Women often serve only as institutional figures. To promote gender equality, amplify women's voices, and encourage female leadership, the project will focus on several key areas:

a. Economic empowerment

- Improved livelihoods and increase income opportunities: through the project, women will be engaged in sustainable and diversified livelihood practices, including broiler and egg-laying chicken farming, egg-laying duck farming, fish farming, maize farming, and zero-burning land management, supported through CEPD programs.

b. Social and Gender Equity

- Reduction in gender disparities: the project is designed with a gender sensitive approach to reduce inequalities, ensuring women have equitable access to resources, land and

training opportunities. Women's representation is prioritized, with a minimum quota of 30% women required in every group. This requirement is formally stated in Cooperation Agreement/PKS for the CEPD programs.

- Increased decision-making power: the project will promote women's involvement in leadership and decision-making processes, empowering them to take a more active role in community governance and resources management. In the 14 villages, women's role and presence are highly valued. The project has established CEPD groups, with women making up more than 50% of the members. One of these groups is led by a women. This structure promotes women's active involvement in leadership and decision making processes related to community governance and resource management. Women also hold key roles such as business coordinators, secretaries and treasures, and are actively engaged in all stages of the project- from planning and implementation to monitoring.

c. Capacity building

- Skill development: the project includes training and capacity building programs, enabling women within the project area gain skills in sustainable practices, resource management, leadership and entrepreneurship. Additionally, women empowerment is enhanced by strengthening group's capacity through training in administration and financial management, as well as technical training in chicken farming, maize farming and fisheries. Women's groups are also encouraged to hold regular meetings for planning and evaluating activities.

4.5.6 Benefit Sharing Mechanisms (CCB, GL2.6)

While the project does not impact property rights, it does fully acknowledge and respect that local communities have historically dependent on the project area for their livelihoods. The project also recognizes the strong cultural and socio-economic ties between the forest and the surrounding communities. In this context, SPCP is committed to ensuring that these communities continue to benefit from the project's presence and activities. To support this commitment, the project prioritizes in-kind support as a primary mechanism for delivering these benefits, aligning with local contexts and community-defined priorities.

This commitment is operationalized through a range of benefit sharing initiatives including community enterprise development programs, improved access to market, training in sustainable agriculture practices and capacity building support. These initiatives were designed through participatory approaches that incorporate community input gathered during consultations, with an emphasis on addressing immediate needs while fostering long term impacts on community well-being.

Benefit allocation and eligibility criteria are communicated transparently through consultation processes to ensure community understanding and trust. The project also adopts adaptive management to continuously strengthen its benefit-sharing approach, ensuring they remain relevant to the evolving needs and priorities of the community throughout its implementation.

4.5.7 Benefits, Costs, and Risks Communication (VCS, 3.18; CCB, GL2.7)

Effectively communicating relevant and adequate information about project activities to community members is a critical component of the implementation strategy. Community members are engaged through various participatory methods such as community meetings, focus group discussions (FGDs), and workshops. These forums serve not only to inform but also to facilitate two-way communication, enabling community members to ask questions, seek clarification, and provide input on the information presented.

As part of this process, written materials in Bahasa Indonesia, such as brochures outlining the overall project, including the Community Development Program, have been developed and distributed. These brochures are shared during initial socialization sessions and ongoing Free, Prior, and Informed Consent (FPIC) processes. They include essential information such as the company profile and a description of activities planned and those already undertaken. This approach ensures that community members fully understand the project's objectives and methods, which is essential for informed participation, successful adoption of project activities, and improved long-term outcomes.

4.5.8 Governance and Implementation Structures (CCB, GL2.8)

To ensure inclusive and accountable community engagement, the project has established a community engagement governance framework. This includes the formation of a Community Engagement (CE) Department and a Social Performance (SP) Unit, which work together to promote transparency, participation, and responsiveness throughout project implementation.

At the village level, the project has deployed facilitators across all 14 participating villages. These facilitators serve as direct liaisons between the project and local stakeholders, ensuring that community perspectives, needs, and priorities are consistently integrated into planning and implementation. Their presence helps build trust, fosters mutual understanding, and reinforce local ownership of project activities.

To promote accountability and enhance responsiveness, the project is in the process of establishing a formal grievance mechanism, which is expected to be operational in 2025. This system will enable community members to submit complaints or concerns, which will be documented, tracked, and addressed in a timely and transparently manner. This mechanism is intended to play a key role in maintaining trust and ensuring the project remains aligned with community expectations.

The governance framework is designed to support full and effective participation through regular village-level consultations, participatory decision-making processes, and ongoing capacity-building initiatives. The project also facilitates the formation of community groups — particularly in livelihood enterprise development and conservation-restoration activities — as platforms for aggregating local stakeholders. These groups serve as representative structures that enable collective decision-making, implementation, and monitoring, reinforcing self-governance and long-term sustainability.

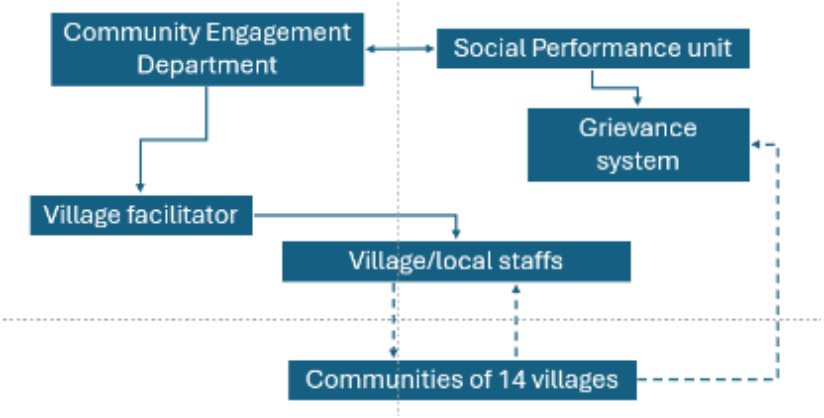


Figure 49. SPCP's community Engagement governance framework

To deepen community engagement and empower local decision-making, the project supports the following initiatives:

- Participatory mapping and village land-use planning, enabling communities to articulate their territorial and resource rights;
- Ongoing Free, Prior, and Informed Consent (FPIC) processes, ensuring that community members have consistent opportunities to express their views and aspirations;
- Co-development of partnership terms, including collaborative design, review, and revision of Cooperation Agreement between the project and community groups;
- Community Enterprise Program Development, where communities actively shape and implement livelihood initiatives;
- Regular feedback sessions and community meetings, providing a platform for dialogue on project implementation and addressing operational challenges;
- Operational grievance redress channels, allowing concerns to be raised and resolved in a structured and timely manner.

4.5.9 Smallholders/Community Members Capacity Development (CCB, GL2.9)

The project foresees several interventions aimed at improving the capacity of community members, such as:

- Training and capacity building through the CEPD program, which includes training on broiler chicken farming, egg-laying chicken farming, maize farming, freshwater fish farming, and egg-laying duck farming. Training in improved agriculture technique, with a particular focus on Zero Burning Agriculture (ZBA). This technique is expected to be implemented beyond the project area and adopted by other community members in surrounding regions.

- Training on forest fires prevention and response involving community members to enhance their capacity in managing and mitigating fire risks.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (VCS, 3.19; CCB, B1.1)

SPCP is located within the Borneo Lowland Rainforests Ecoregion. This ecoregion encompasses an area with complex ecological characteristics, ranging from peat swamp forests to lowland tropical rainforests and mountains. The project zone and project area lie within the transition zone primarily consists of lowland tropical rainforests and peat swamp forests, serving as habitats for various endemic, Critical and Endangered species, such as Bornean Orangutan (*Pongo pygmeaus pygmaeus*), Proboscis Monkey (*Nasalis larvatus*), Bornean Banded Langur (*Presbytis chrysomelas*), Rhinoceros Hornbill (*Buceros rhinoceros*), Hairy-Nosed Otters (*Lutra sumatrana*), Wreathed Hornbill (*Rhyticeros undulatus*), Bornean Crestless Fireback (*Lophura pyronota*) and other RTE species (Baseline Study 2023).

In the absence of the project, the forests of the project area were threatened by commercial logging and conversion of peatlands into timber plantations. Peatland will be drained leading to changes in the natural balance of the hydrological regime of the area and increase threat to fires during prolonged drought sessions. Logging and forest conversion will remove the habitat for many of the protected biodiversity forcing the wildlife moving out to other areas, and if not possible the population will be lost.

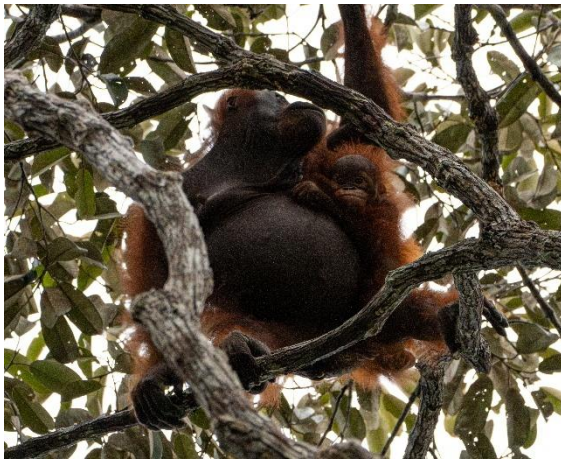
In order to assess the biodiversity baseline of the project area, a range of survey activities were conducted within 2022-2023. These included transect line survey, camera trapping monitoring, orangutan population estimate using nest counting, herpetofauna survey, fish species and avifauna. The collected data was used as the baseline to determine the condition of the species diversity and determine strategy to conserve and monitor the biodiversity, most surveys were conducted using the simple line transect methods following tracks, road and rivers. For orangutan population estimation, nest counts were employed, and their distribution was then analysed using the Maxent application to assess habitat suitability.

The camera trapping survey began in 2022 and, as of December 2024, has accumulated over 2,700 trap days across a three-year period. A total of 40 camera units—comprising Bushnell Trophy Cam E3 Essential Trail Cameras and Browning Dark Ops Extreme Cameras—were deployed using a grid-based cluster sampling approach. Each camera was placed within 40 distinct 1x1 km grid clusters, ensuring broad spatial coverage.

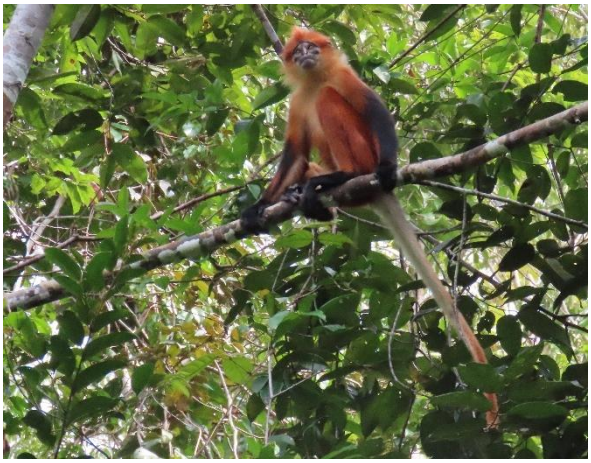
Due to limitations in the number of available camera traps, a rotational sampling method was implemented. Each camera remained in a given cluster for 105 days before being re-evaluated and re-located to a new cluster, repeating the cycle to maximize data collection across different habitats. This rotation will continue until a sufficient number of camera traps are acquired, allowing for permanent placement within all clusters.

Project staff also collect data on any possible threats found during the survey including sign of wildlife hunting, live-trapping, habitat disturbance, encroachment, and wildlife trade. All data collected is used to determine conservation action and monitoring.

The outcome of these surveys is shown in Appendix 6-9. This included at least 39 mammals, 120 birds, 19 amphibians, 21 reptiles, 78 freshwater fish, and 353 flora species. Based on the IUCN Red List (2024), there are 19 species classified as Critically Endangered (CR), 14 species as Endangered (EN), 49 species as Vulnerable (VU), and 58 species as Near Threatened (NT). According to the Minister of Environment and Forestry Regulation No.106 of 2018 regarding the Second Amendment to Minister of Environment and Forestry Regulation No. P.20 of 2018 concerning Protected Plant and Animal Species, there are at least 51 species in the area protected by the Indonesian government. Meanwhile, in terms of trade status referring to CITES Appendix, at least 12 species are listed under App.I, 32 species under App.II, and 2 species under App.III. The species categorized as rare, endangered, and protected are presented in Appendix 6-10. Additionally, from an assessment of the Bornean orangutan population (*Pongo pygmaeus pygmaeus*), the current estimated population size is approximately 180 individuals (range: 98-329) with a density estimate of about 0.5 individuals per km2 (range: 0.27-0.93).



(a)



(b)



(c)



(d)

Figure 50. (a) Bornean Orangutan (Pongo pygmeaus pygmaeus), (b) Bornean Banded Langur (Presbytis chrysomelas), (c) Horsfiled's Tarsier (Cephalopachus bancanus), and (d) False Gharial (Tomistoma schlegelii)

SPCP is committed to ensuring that project activities do not adversely impact these sensitive areas as explained below.

Species and habitat	SPCP is inhabited by rare, threatened, and endangered species, including the Bornean orangutan (*Pongo pygmaeus pygmaeus*), Proboscis monkey (*Nasalis larvatus*), Bornean banded langur (*Presbytis chrysomelas*), Rhinoceros hornbill (*Buceros rhinoceros*), Hairy-nosed otter (*Lutra sumatrana*), False gharial (*Tomistoma schlegellii*), Wreathed hornbill (*Rhyticeros undulatus*), and Bornean crestless fireback (*Lophura pyronota*). The full list of species is presented in Appendices Appendix 6: list of mid-large mammals in the project area to Appendix 9: . These species inhabit forested areas, peat swamps, and rivers within the project area, and their existence depends on the condition of these habitats. External threats include poaching and hunting, which pose significant risks to their survival. SPCP aims to protect and restore rare, threatened or endangered species and habitats within the project area, SPCP ensures that project activities will not adversely impact habitats for rare, threatened, or endangered species. Critical habitats identified through biodiversity assessments and mapping are protected under a strict no-deforestation policy. Under the Project scenario, the project will implement measures such as community patrols and monitoring to prevent habitat fragmentation, disturbance, or degradation, thereby safeguarding the integrity of species habitats throughout the project period. Degraded area will be restored using native species and/or natural regeneration. The activities of the project will positively impact the adjacent landscape within the project zone, particularly conservation areas, remaining forests, and peat swamp forests. As species inhabit these ecosystems, they will benefit from expanded habitat, which supports their survival, increases potential population sizes, and reduces the risk of loss due to unsustainable use. Therefore, the project anticipates that both the project area and the surrounding project zone will experience significant benefits.
Areas needed for habitat connectivity	SPCP is situated in a transition area between mountainous tropical rainforest and lowland peat swamp forest, providing a unique opportunity to maintain habitat connectivity by protecting these ecosystems. No activities will be undertaken that adversely impact these habitats, as no forest or peat swamp

will be removed. Additionally, previously degraded habitats can be restored through reforestation and peat rewetting programs.

The project takes serious measures to protect the area from disturbances, ensuring the long-term conservation of these critical habitats.

Situated in a transition area between mountainous tropical rainforest and lowland peat swamp forest create unique opportunity for SPCP to maintain areas need for habitat connectivity by protecting those habitats. No activity will be taken to adversely impact these habitats as no forest and peat swamp will be remove and other habitat that already loss and can be restored by reforestation and peat rewetting program. In addition, the project takes serious measures to protect the area from disturbances.

5.1.2 High Conservation Values (CCB, B1.2)

An HCV assessment was conducted within the project zone in 2023. This identified the entire Project Area as HCV 1 (area with notable biodiversity concentration), HCV 2 (large landscape-level areas) and HCV 3 (rare and threatened habitats). Additionally, several areas located outside the Project Area, but still within the broader Project Zone, were also identified as containing HCV 1, HCV 2, and HCV 3 values. Figure 51 shows the HCV 1, 2 and 3 areas within the Project Zone.

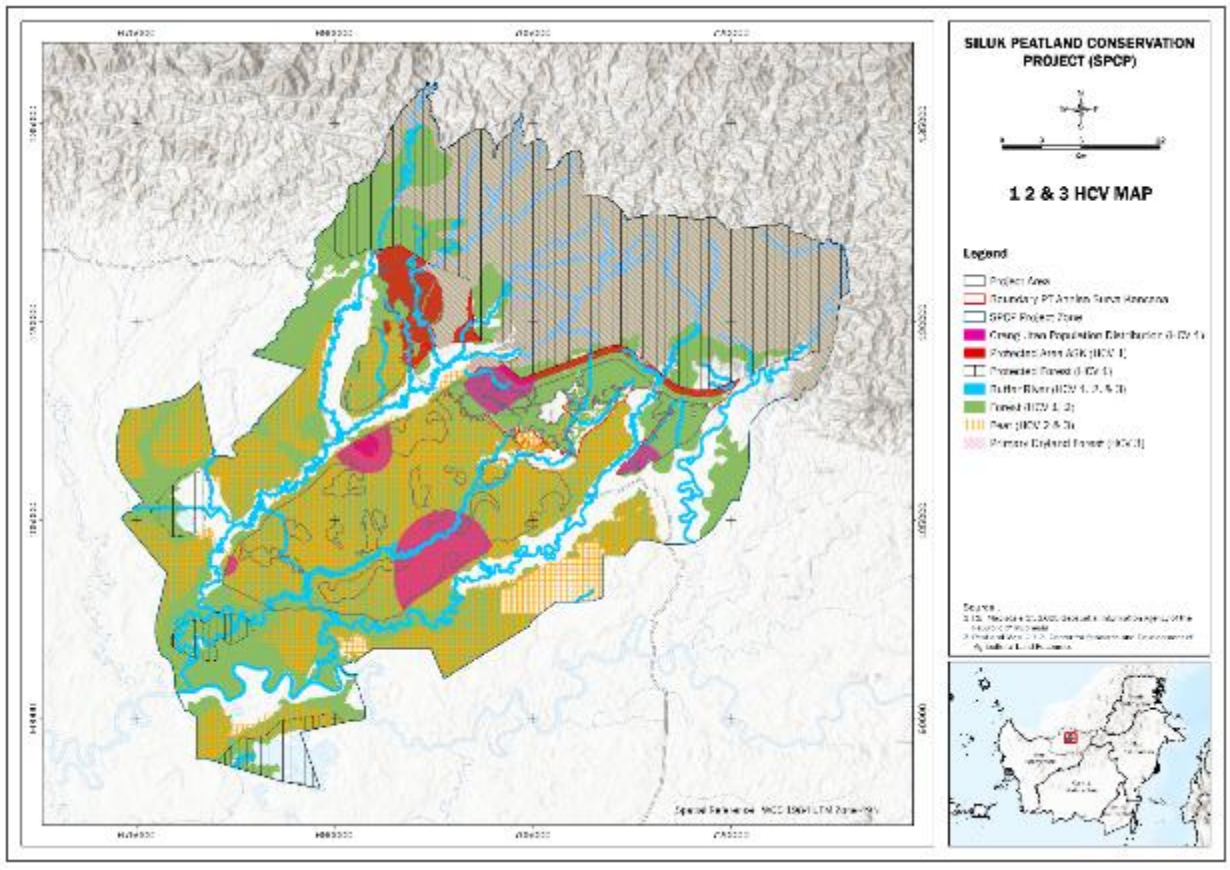


Figure 51. The areas of HCV 1, 2 and 3 within the Project Zone

Each HCV value, its qualifying attribute/focal area, current condition, the baseline scenario, the project activity to maintain/enhance and the monitoring method and initial values are shown the tables below.

High conservation value	HCV 1: Globally, regionally, or nationally significant concentrations of biodiversity values, protected areas, threatened species, endemic species and/or areas that support significant concentrations of a species during any time in their lifecycle.
Qualifying attribute	The project area meets the HCV 1 criteria. Specifically, there are 4 mammal species listed in the IUCN Red List (2024) as Critically Endangered (CE), 6 species as Endangered (EN), 6 species as Vulnerable (VU), and 7 mammal species are Near Threatened (NT). Additionally, 2 bird species are Endangered, 13 Vulnerable, and 23 species are Near Threatened. Two reptile species are classified as Vulnerable, 2 as Critically Endangered, and 1 as Endangered, with 1 species being Near Threatened. Moreover, 3 species of freshwater fish are classified as Endangered, and 1 as Vulnerable. In the plant kingdom, there are 6 floral species known as Critically Endangered, 2 as Endangered, 16 as Vulnerable, and 7 species are Near Threatened.
Focal area	All forest and natural water body (river, swamp) within Project Zone. (*See* Figure 51)

High conservation value	HCV 2: Globally, regionally, or nationally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.
Qualifying attribute	The project area meets the HCV 2 criteria. Based on HCV assessment done by SPCP The area represents few of the remaining lowland peat swamp forest to lowland forest outside designated conservation area in the province. Since the 1990's. the area is subject to logging and conversion. While peatland areas began receiving increase legal protection status in 2012, a lack of effective law enforcement has hindered conservation efforts Notably, this regain remain one of the few significant areas of peat-swamp forest within the Kapuas Hulu District, functioning

	as a vital buffer zone to Betung Kerihun and Danau Sentarum National Park.
Focal area	All peatlands and forest within the Project Zone

High conservation value	HCV 3: Ecosystems and habitats Rare, threatened, or endangered ecosystems, habitats or refugia.
Qualifying attribute	The project area meets the HCV 3 criteria. The area represents the largest expanse of lowland peat swamp forest to lowland forest outside the conservation area (TNBKDS). It is notably one of the few remaining significant areas of peat-swamp forest within the Kapuas Hulu District, functioning as a vital buffer zone to Betung Kerihun and Danau Sentarum National Park.
Focal area	Peat swamp and low land forest within the Project Zone

5.1.3 Without-project Scenario: Biodiversity (CCB, B1.3)

The baseline scenario for the project, including commercial drainage, logging and land clearance for mono-culture plantation is described in detail in Sections 3.1.4 and 3.1.5 above. The impact of this baseline scenario on HCV values is described in Section 5.2.1, and on key trigger species in Section 5.5.2 below.

Apart from the baseline agent, areas in the project zone have potential increasing threats from increased development activity including expansion of settlement. Most of this area does not have protection status or even active management. Collaborative effort will be coordinated with other stakeholders to ensure that development can be controlled, activities conducted in a sustainable manner and habitat connectivity is preserved.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (VCS, 3.19; CCB, B2.1)

Activities designed to enhance biodiversity are outlined below in relation to HCV values, and in Section 5.5.2 for key trigger species. Each includes the known baseline status, expected changes, and the monitoring approach. Section 5.4 provides further details.

Prior to the project's initiation, parts of the area had been drained by previous concession owners to lower the water table, facilitating logging operations. This activity ceased when the concession license was ended. However, if the project does not proceed, drainage is expected to continue under the baseline scenario agents pursuing similar operations to the prior of project initiation. The dominant

land cover in the project area remains natural forest, rather than invasive species. (see Section 2.1.14 for a description of vegetation in the project area).

In the envisioned with-project scenario, protection and conservation to maintain and improve the condition of existing populations and habitats both in terms of size or extent, distribution and quality will have a positive impact on biodiversity in the project area/zone. Concrete measures to reduce habitat degradation and fragmentation by reducing several external and internal threats/pressure factors such as encroachment, illegal logging, and forest and land fires are expected to ensure the viability of species populations. In the long term, degraded areas that are successfully restored will form connectivity (corridors) between previously fragmented habitat patches, will also enable/enabling colonization and provide space for the movement of species that require a wide home range such as the Bornean orangutan (*P. Pygmaeus pygmaeus*) and other primate species (e.g. Hylobates muelleri, *Nasalis larvatus*, *Presbytis chrysomelas*) and carnivorous groups (e.g. *Neofelis diardi*, *Helarctos malayanus*).

Campaigns, education and awareness of target groups such as poachers, encroachers and fish catchers are expected to increase knowledge and awareness as well as positive behavioral changes. This positive change will encourage the practice of utilizing NTFPs and sustainable agricultural cultivation of local communities. Ultimately, sustainable practices by local communities are expected to have a significant positive impact on biodiversity conservation in the project area.

Implementation of the proposed project scenario is poised to foster the survival and eventual recovery of populations belonging to various species of conservation concern. In the absence of this scenario, these species would face severe depletion or complete elimination from the landscape, as outlined in the baseline scenario.

Biodiversity element	HCV 1: Species diversity
Estimated change	The project will protect all remaining forests and peatlands within the project area, with potential positive impacts extending to the broader Project Zone. Degraded areas, including damaged forest and drained peatland, will be restored. Activities that threaten species diversity and their habitats—such as unsustainable hunting, natural resource extraction, and land fires—will be halted. The project will promote sustainable land use practices among all stakeholders within the Project Zone, contributing to landscape-level ecosystem management. Protection and restoration efforts will ensure the long-term viability of species and their habitats within the same ecosystem landscape. Over time, successfully restored degraded areas will form ecological corridors between previously fragmented habitat patches, enabling

	colonization and the movement of species that require wide home ranges. The project will implement a baseline biodiversity survey, complemented by follow-up assessments for trigger species and key taxonomic groups. Regular biodiversity monitoring will be established to update species records and detect any disturbances to existing populations. Campaigns, education, and awareness-building for target groups—such as poachers, encroachers, and fishers—are expected to increase knowledge, promote positive behavioral change, and reduce pressure on biodiversity. Implementing the proposed project scenario is expected to support the survival and recovery of species of conservation concern. Without this intervention, these species could face severe decline or complete local extinction, as projected in the baseline scenario Section 5.5.2 presents specific change estimates for key trigger species. For all other recorded species (see Appendices Appendix 9:), forest extent—relative to the baseline scenario of forest loss—is used as a proxy indicator. Targets for habitat protection under initial, baseline, and with-project scenarios are outlined below for HCV 2 and 3.
Justification of change	In the absence of the project, the area is likely to be commercially logged and drained, with parts cleared for timber plantations. The removal of forest cover will impact forest-dwelling wildlife, as well as species that rely on forest resources for food and shelter. Some species may face local extinction, as very few will be able to relocate to nearby habitats due to the limited remaining intact peat swamp forest. This destruction will result in habitat fragmentation, preventing species from using the project area as a natural corridor to adjacent habitats. As the forest is opened, encroachment for settlement and cultivation is expected to increase. Areas that were once difficult to access will become more exposed. These pressures, combined with continued demand for the exotic pet and traditional medicine markets, will further threaten biodiversity. Local extinctions could disrupt food chains—if a species has no substitute, its loss may have cascading effects on other species. Under the Baseline Scenario, species conservation programs are unlikely to be implemented regularly or according to rigorous

	scientific standards. Most monitoring efforts may exist only on paper, lacking field surveys or consultation with experts. This could lead to biased and inaccurate data on species diversity and identification. Justifications of anticipated change for key trigger species are described in Section 5.5.2 while the measures used to monitor changes are described in Section 5.4.1. Methods and metrics used for forest and peat monitoring are covered by the project's climate monitoring and described in detail in Section 3.1 and summarised below in Section 5.4.1.

Biodiversity element	HCV 2: Landscape-level ecosystems and mosaics
Estimated change	Without the implementation of this project, the forested areas within the project boundary would have faced extensive degradation through drainage, logging, and partial conversion to monoculture plantations. Such land-use changes would have led to the fragmentation of the contiguous landscape mosaic, undermining the very attributes that qualify the region under HCV 2. The integrity of this vast ecosystem complex—ranging from montane to lowland habitats—relies on the maintenance of ecological connectivity and uninterrupted natural processes across large spatial scales. The absence of protection would have compromised key ecosystem functions, including habitat continuity for wide-ranging species, natural hydrological cycles, and carbon storage. Fragmentation and simplification of the landscape through monoculture development would have disrupted species movement, reduced genetic exchange, and increased vulnerability to external stressors such as fires and invasive species. Over time, this would erode the landscape-level resilience and biodiversity that HCV 2 seeks to safeguard. In contrast, the project's strategy to protect and restore the entire area directly contributes to preserving these critical ecosystem linkages—ensuring that the mosaic remains functional, biodiverse, and ecologically robust. For further details on the baseline scenario and its contributing factors, refer to Section 3.1.4. Information on the actions and activities the project will implement to ensure habitat protection and restoration is provided in Section 2.1.17.

Justification of change	As a production forest, without carbon project, the baseline scenario will continue throughout project lifetime as it is legal based on the licensing given by the government. For more details on the baseline scenario and its contributing factors, see Section 3.1.4. For more details of the actions and activities the project will take to ensure habitat protection and restoration, see Section 2.1.17. Methods and metrics used for forest and peat monitoring are covered by the project's climate monitoring and described in detail in Section 3.1 and summarised below in Section 5.4.1.
Biodiversity element	HCV 3: Ecosystems and habitats
Estimated change	To uphold the values of HCV 3, the project will implement targeted measures to protect and restore rare and threatened ecosystems within the project area, particularly tropical peatlands and seasonally inundated forests. These ecosystems are prioritized due to their ecological sensitivity, limited regional extent, and importance for biodiversity and climate stability. The project will prevent further degradation through the strict protection of intact habitats and the enforcement of no-drainage and no-conversion policies across peat-dominated zones. Restoration efforts will focus on rewetting drained peatlands to recover their hydrological functions, reestablishing native vegetation cover, and mitigating fire risks through community-based fire prevention and monitoring. Where degradation has occurred, the project will undertake ecological rehabilitation using site-appropriate methods that aim to reintroduce native species and reestablish the structure and function of these ecosystems. These interventions will be integrated with long-term monitoring to track recovery, ensure effectiveness, and guide adaptive management. By aligning these actions with its commitments under HCV 2, the project ensures that the protection of threatened ecosystems is not isolated but forms part of a comprehensive, landscape-level conservation strategy. At the start of the project, the area encompassed approximately 28,291.33 ha of forest, 214.77 ha of non-forest, 16,196.34 ha of undrained peat, and 826.65 ha of drained peat. Under the baseline scenario for the first crediting

	period (through 2051), these land cover types are expected to change as outlined in Section 3.
Justification of change	Without the implementation of the project, the ecosystems qualifying as HCV 3—particularly the tropical peatlands and seasonally inundated forests—would face significant and likely irreversible degradation. These rare habitats are already under pressure from regional land-use trends, and without protective measures, they would be highly vulnerable to drainage, logging, and conversion to monoculture plantations. Peatland ecosystems, which are central to this HCV 3 designation, would be at immediate risk of further drainage. This would trigger rapid oxidation of peat layers, releasing substantial amounts of greenhouse gases and greatly diminishing the area's capacity for carbon storage. Loss of hydrological integrity would also reduce water retention and increase the likelihood of peat fires—events that are notoriously difficult to control and devastating in both ecological and social terms. In parallel, biodiversity supported by these rare ecosystems would be severely impacted. Many endemic species rely on intact peat swamp forests and flooded forest systems; once these habitats are altered or fragmented, they are unlikely to support the same diversity or ecological interactions. Species with narrow ecological niches, low dispersal ability, or already-declining populations would be at especially high risk of local extinction. Moreover, the breakdown of these ecosystems would compromise ecosystem services that extend well beyond biodiversity: water regulation, climate moderation, and cultural values tied to natural landscapes. Without intervention, what remains of these endangered ecosystems could cross ecological thresholds beyond recovery, undermining both conservation goals and local community well-being. For further details on the baseline scenario and its contributing factors, refer to Sections 3.1.4 and 3.1.5. Information on the actions and activities the project will implement to ensure habitat protection and restoration is provided in Section 2.1.17. The methods and metrics used for monitoring forest and peat conditions are addressed through the project's climate monitoring framework, detailed in Section 3.1. Biodiversity monitoring approaches are summarized below in Section 5.4.1.

5.2.2 Mitigation Measures (VCS, 3.19; CCB, B2.3)

Within the project area, there are no known or anticipated negative impacts on biodiversity resulting from project activities. However, mitigation efforts will be focused on identifying threats, pressures, risks, and implementing preventive measures. Continuous monitoring will be conducted to detect any potential impact as early as possible.

Mitigation efforts will include, but are not limited to protection patrols, forest and land fire control, and restoration and enrichment of habitat with native species. Additional measures will aim to prevent habitat destruction, such as the use of fire to land clearing, and habitat pollution, particularly in aquatic ecosystems, caused by hazardous chemicals such as pesticides and chemical fertilizers.

Unsustainable practices, including poison fishing and overfishing by local communities, will also be addressed. All of these actions are intended to maintain and enhance biodiversity within the project area and will be guided with the precautionary principle to uphold ecosystem balance and reduce risks to biodiversity.

Project measures to maintain and enhance High Conservation Values (HCVs) are outlined in Sections 5.1.2 and 5.2.1. Specifically, regarding designated HCV areas, the project's primary objective is to preserve natural ecosystems in their original state. This objective aligns fully with the precautionary principle, which is commonly applied to anticipate and prevent potential negative impacts from activities that may exploit, modify, or inadvertently alter naturally occurring ecosystems.

Accordingly, all community-based activities carried out within the project zone—such as shifts in agricultural or fisheries practices—will be subject to feasibility assessments including its environmental impact that reflect this precautionary approach. Additional details on these assessments are provided in Section 4.

5.2.3 Net Positive Biodiversity Impacts (CCB, B2.2, GL1.4)

Assessing the project's impact on biodiversity within the area, it is anticipated to result in a net positive effect. A key strategy in achieving this outcome is the preservation and expansion of forest cover, ensuring adequate habitat and biodiversity representation. When looking at the importance of this area from the perspective of its function as a wildlife corridor, especially for species such as the Bornean orangutan, the project zone shows significant potential. This zone has the ability to connect populations in meta-populations, creating a critical path between the Danau Sentarum and Betung Kerihun areas and the surrounding area. This connection is important for the survival and development of the species, forming a system that supports vital genetic movement and exchange.

In addition, the project zone is also identified as a potential refugium area. This means that this area can function as a refuge for relict populations in surrounding habitat patches that may be remote or vulnerable. Thus, this project not only plays a role in maintaining current biodiversity, but also in supporting biodiversity and adaptation to possible impacts of climate change in the future.

The anticipated impacts of the project in relation to each criterion are presented in Sections 5.2.1 and 5.5.2, respectively.

5.2.4 High Conservation Values Protected (CCB, B2.4)

As outlined in Section 5.5.2, none of the activities undertaken during the project will have a negative impact on High Conservation Values (HCVs) within the project area. On the contrary, all project interventions are specifically designed to enhance HCV attributes and safeguard populations of key and trigger species during the project implementation phase. Several strategic actions were taken to ensure conservation and enhancement of biodiversity. Protection patrols were increased to maintain the integrity of the area, and rehabilitation measures such as enrichment and planting of native species as well as peat rewetting were carried out in degraded areas.

Furthermore, agroforestry conservation initiatives in degraded areas provide a sustainable approach to managing natural resources. Canal blocking was integrated to support aquatic ecosystems and increase their resilience to climate change. Biodiversity survey activities were used to monitor and identify impacts of project initiatives on local flora and fauna.

All these measures were designed to support the enhancement of values and positive impacts on biodiversity and local communities. A bioresource-based approach in livelihood development for local communities was prioritized to create a sustainable balance and provide mutual benefits between the community and the project. Thus, this project ensures sustainability and well-being for the biodiversity and local communities involved.

5.2.5 Species Used (VCS, 3.19; CCB, B2.5, B2.6)

The project is committed to using only native species in the revegetation program and will not introduce any known invasive or non-native species (Giesen 2004; Randi *et al.* 2014). To safeguard the local ecosystem, the project will implement regular monitoring to ensure that all species incorporated align with the natural biodiversity of the area.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
Shorea stenoptera	Dipterocarpaceae, Native species	This species, categorized as Meranti Tengkawang, holds significant biodiversity value and is well-suited for planting in degraded forests or non-forest areas on dryland	No adverse effect is identified
Shorea macrophylla	Dipterocarpaceae, Native species	This species, categorized as Meranti Tengkawang, holds significant biodiversity value	No adverse effect is identified

Species introduced	Classification	Justification for use	Adverse effects and mitigation
		and is well-suited for planting in degraded forests or non-forest areas on dryland	
Shorea belangeran	Dipterocarpaceae, Native species	This species, known as swamp meranti, holds significant biodiversity value and is well-suited for planting in degraded forests or non-forest areas on peatswamp area	No adverse effect is identified
Comretocarpus rotundatus	Combretaceae	This species, known as perepat darat or Tumih. This species holds significant biodiversity value and is well-suited for planting in degraded forests or non-forest areas on peatswamp area	No adverse effect is identified
Koompasia malacensis	Fabaceae, Native species	This species, known as swamp meranti, holds significant biodiversity value and is well-suited for planting in degraded forests or non-forest areas on peatswamp area	No adverse effect is identified
Dyera polyphylla	Apocynaceae, Native species	This species, known as swamp jelutung and natural latex producer, holds significant biodiversity value and is well-suited for planting in degraded forests or non-forest areas on peatswamp area	No adverse effect is identified
Artocarpus odoratissimus	Moraceae, Native species	This species, known as terap and producing fruit for	No adverse effect is identified

Species introduced	Classification	Justification for use	Adverse effects and mitigation
		orangutan, holds significant biodiversity value and is well-suited for planting in degraded forests or non-forest areas on dryland area	
Ficus sp.	Moraceae, Native species	This species, known as terap and producing fruit for orangutan, holds significant biodiversity value and is well-suited for planting in degraded forests or non-forest areas on dryland area	No adverse effect is identified

5.2.6 Invasive Species (VCS, 3.19; CCB, B2.5)

No invasive species have been identified in the project area. However, the project will conduct regular monitoring to ensure early detection. If any invasive species are found in the future, the project will record this and take appropriate measures to control their spread and mitigate potential impacts on the ecosystem.

5.2.7 GMO Exclusion (CCB, B2.7)

No GMOs are used in this project.

5.2.8 Inputs Justification (VCS, 3.19; CCB, B2.8)

SPCP does not use fertilizers, chemical pesticides, biological control agents, or other chemical inputs in its project activities. However, it recognizes that some communities have long relied on these substances. To address this, the project will implement awareness-raising initiatives to inform communities about the risks associated with chemical use, promote the reduction or elimination of such practices, and encourage the adoption of organic and environmentally friendly alternatives.

5.2.9 Waste Products (VCS, 3.19; CCB, B2.9)

The project will identify waste generated from its activities, which includes office waste (e.g., paper, plastics, electronics), transportation waste (e.g., oil cans, fuel containers), food waste from field surveys (e.g., packaging, leftovers), and medical waste (e.g., infusion-related items like syringes and IV bags). Proper management of each waste type is essential.

The project will classify waste into categories: hazardous (e.g., oil cans, batteries, medical waste), non-hazardous (e.g., office waste, food waste), biodegradable (e.g., food scraps, organic materials),

recyclable (e.g., plastics, metals), and non-recyclable waste. For hazardous waste, the project will establish partnerships with certified disposal companies.

The project will develop a waste management plan and is fully committed to its implementation. This would include waste segregation and disposal management in an environmentally responsible manner as well as exploring opportunity for recycle-re-use.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (CCB, B3.1) and Mitigation Measures (CCB, B3.2)

The project was designed to protect and restore the biodiversity population within the project area while extending conservation efforts to its wider Project Zone. Potential risk of Leakage effects, where hunters, loggers and encroachers targeted by the project program might relocate the same activity elsewhere. By providing viable opportunities within the project framework, the likelihood of them continuing their illegal activity elsewhere is significantly reduced.

Negative offsite impact	Mitigation measure(s)
The main negative impact outside the project location (offsite) is the potential for leakage effects, where individuals involved in (illegal activities such as illegal logging and hunting within the project area move to other areas and carry out similar activities, especially targeting valuable tree and protected species in the alternative location.	The off-site forest area, as crucial part of the peat swamp forest and secondary dryland lowland forest in Kapuas Hulu Regency, providing ecological significance such as carbon storage, water regulation and biodiversity conservation. These forests are formally protected as the Kapuas Hulu Highlands Area-Based National Park (TNBKDS) which aims to preserve their ecological integrity. While the formal protection status reduces the risk of leakage, certain threats, such as illegal logging, encroachment and habitat degradation, persist due to enforcement challenges. Studies on forest conversion patterns in the region indicate that protected areas still experience resource extraction pressure, particularly from activities driven by weak regulatory oversight or economic demand. Additionally, local reports have documented instances of unauthorized land clearing and selective logging, signalling that protection alone may not fully prevent leakage effects. Implementation of risk mitigation measures needs to be carried out although providing an accurate picture of the impacts at the project location (on site) compared to the impacts at other locations (off site) may be a challenge.

Negative offsite impact	Mitigation measure(s)
	To address these concerns, strengthened enforcement, community engagement, and sustainable livelihood programs will be critical in ensuring that forest conservation efforts remain effective in mitigating biodiversity loss and habitat destruction In anticipation, the Project will develop sustainable alternative livelihood program including agriculture, livestock farming, entrepreneurship and employment opportunities, aimed at transitioning individuals awa from harmful practices such as wildlife hunting, illegal logging and forest conversion. By providing viable economic alternatives, the initiative seeks to reduce environmental degradation while promoting long-term community resilience.

5.3.2 Net Offsite Biodiversity Benefits (VCS, 3.19; CCB, B3.3)

As outlined in Section 5.3.1, offsite negative impacts on biodiversity are expected to be minimal or absent. In contrast, the project is anticipated to deliver substantial positive biodiversity outcomes within both the Project Area and the broader Project Zone—benefits that represent one of the project's core overarching objectives. Nonetheless, the project recognizes the possibility of unforeseen or unmitigated negative impacts on biodiversity, particularly in areas adjacent to the project boundary, where indirect pressures such as displacement of land use or increased access may emerge.

To evaluate these potential offsite impacts, the project will apply a combination of spatial analysis (e.g., land cover change detection using remote sensing), stakeholder consultations, and ecological monitoring to detect shifts in species distribution, habitat integrity, or resource use beyond project boundaries. These observations will be compared with biodiversity gains measured within the Project Zone, including improved habitat quality, increased connectivity, and population recovery of trigger species. The project will use established biodiversity indicators and baseline comparisons (see Sections 5.4.1 and 5.5.2) to quantify changes.

The findings from this comparative assessment will be integrated into the project's adaptive management framework. Where needed, mitigation measures will be extended to buffer zones or addressed through local partnerships. Given the extensive conservation actions within the Project Area—including habitat restoration, peatland rewetting, and community-based protection efforts—the project expects the net effect on biodiversity to be strongly positive. This conclusion is supported by the scale and intensity of in-zone interventions relative to the limited and closely monitored risks beyond the zone.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (CCB, B4.1, B4.2, GL1.4, GL3.4)

SPCP project will implement monitoring plans to monitor species population and stability of key species. This will be measured using several indices and metrics such as population size, density, species richness index, diversity, abundance, and occupancy. Along with these parameters, we plan to monitor threats to biodiversity that usually come from outside the project area, such as illegal hunting/fishing/hunting (unsustainable use of wildlife species), fire, and encroachment. The area to be monitored includes 22 permanent plots, 22 km monitoring transects within the project area/zone grid (see Figure 52).

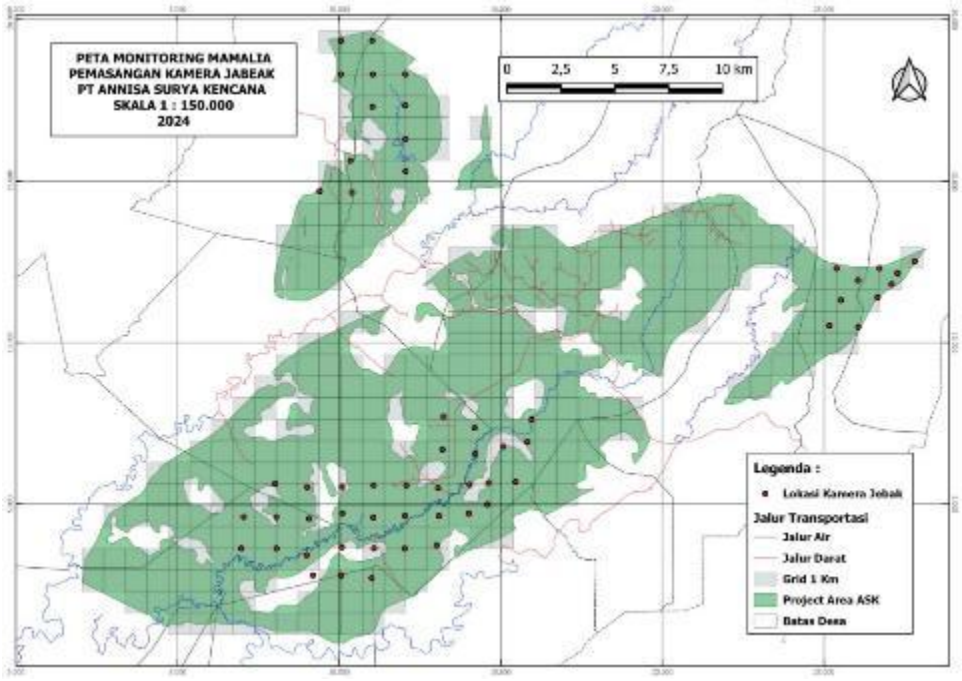


Figure 52. Biodiversity monitoring map

The sampling method is distance survey of orangutan nests, line transects, camera-trapping, visual encounter survey, point counts/point transects. Threat measurement will be measured using household surveys and interviews with local communities (Threat Reduction Assessment). In addition, the level of threat is also assessed from the results of forest protection patrol data analysis (Siluk Patrol System, hereinafter abbreviated SPS). For a detailed Biodiversity Monitoring Plan, see Appendix 11: Biodiversity Monitoring Plan.

The development of alternative livelihoods within the community, particularly for fishermen in Embaloh hilir District is expected to positively impact biodiversity, especially fresh-water fish populations. Additionally, increasing community awareness will help enhance knowledge and encourage a shift away from unsustainable fishing towards more sustainable methods. For instance, destructive fishing techniques and tools such as *rotenone* and electric fishing will be phased out, and protected species such as *belida* will be no longer harvested.

Enhanced protection efforts will target/focus primarily on Bornean orangutan populations, alongside proboscis monkeys and Bornean Banded Langurs. These populations are the primary targets of bushmeat hunting after the decline of ungulate/wild boar populations due to the peak of the African

Swine Fever (ASF) pandemic in 2021. By reducing hunting pressure/threats, these populations will recover.

The project has designed a monitoring plan to assess the status of biodiversity and the condition of its associated habitats throughout the project area. The methods, target, approach and frequency of biodiversity monitoring are detailed in Table 51.

Table 51. Biodiversity monitoring plan

Ref	Method	Target Metric	Approach	Frequency
#1	Transect Line Survey: Birds	Transect line survey will be implemented to inventory monitor species richness, population abundance and distribution	A transect line survey is a systematic way to study and monitor species presence, abundance, and distribution by walking along a straight line (called a transect) and recording all the organisms (or signs) observed within a set area or distance. Various approach will be implemented for Bird species (avifauna) including Variable Circular Plot / VCP (Bibby et. al. 1992), Point Count (Bibby et. al. 1992 and Ralph et.al. 1993) and Passive Acousting Monitoring (PAM) (Abraham, 2018)	At least once for every 12 months, or every 6 months to cover seasonal weather
#2	Transect Line Survey: Mammals	This method was applied with specific approach for mid-large size mammals to inventory monitor species richness, population abundance and distribution	A transect line survey is a systematic way to study and monitor species presence, abundance, and distribution by walking along a straight line (called a transect) and recording all the organisms (or signs) observed within a set area or distance.	Every 12 months

Ref	Method	Target Metric	Approach	Frequency
#3	Transect Line Survey: Herpetofauna	This method of line transect using specific approach will be implemented to inventory monitor herpetofauna species richness, population abundance and distribution	For herpetofauna, SPCP will apply a modified line transect methods define as Strip Transect (Heyer et.al 1994)	Every 12 months
#4	Transect Line Survey: Fish	Transect line survey in rivers and water will be implemented to inventory monitor fish species in the SPCP project area for species richness, potential population abundance and distribution	Survey for fish will also use Transect Lien along rivers and waterbodies, samples are taken in specific place as sampling location, either using fish nets and interviewing available fisherman	Every 12 months
#5	Camera Trapping	The camera trapping method is a powerful, non-invasive tool for studying wildlife in their natural habitat — especially useful for secretive, rare, or nocturnal animals. A camera trap is an automatic, motion- or heat-sensitive camera placed in the wild that takes photos or videos when an animal passes by. It lets researchers observe wildlife without human presence, 24/7, over weeks or month Camera traps is beneficial to monitor	Camera trap placement methodology was designed using a grid-based approach, ensuring comprehensive coverage of the forest ecosystem. The grid system consists of 1x1 km cells, strategically selected to maximize ecological representativeness. This spacing allows for an effective balance between survey coverage and data resolution, ensuring sufficient wildlife detection across different habitats. Each grid cell contains one camera trap, positioned at key locations such as animal trails, water sources, rivers/streams, or nesting	Daily measurement, with 3 months photo data collection Rotation every 3 month to represent the wider project area

Ref	Method	Target Metric	Approach	Frequency
		large to small mammals, primate and ground dwelling birds	sites. These placement decisions are based on species movement patterns, habitat suitability, and terrain considerations to optimize data collection. To enhance ecological coverage, cameras position will be re-evaluated within the same grid or potentially moved every 3 months (105 days) to a new grid cluster. This rotation strategy accounts for seasonal variations in species activity, habitat changes, and movement patterns, ensuring a broader representation of wildlife interactions within the study area. After each rotation, collected data undergoes systematic analysis before cameras are repositioned. Images and metadata are reviewed to identify species presence, behavior, and habitat use, informing future placement strategies. This adaptive monitoring approach strengthens the accuracy and effectiveness of the camera trapping survey.	
#3	Hunting offtake survey	A hunting offtake survey is a method used to quantify the number and types of wild animals harvested (hunted, trapped, or collected) by	The project uses questionnaire approach to conduct hunting offtake survey using structured questionnaires, Household Interviews will be conducted	Every 2 years

Ref	Method	Target Metric	Approach	Frequency
		people in a given area over a specific time period. It helps the project to understand: • Sustainability of wildlife use (animal trading to support pet market) • Impacts of hunting on wildlife populations • Community dependence on wild meat ("bushmeat")	to local hunters/families will be asked for species hunted, numbers, frequency, methods of hunting and usage include species name, numbers, date, location, methods and its use Project may occasionally done Market or Carcass Monitoring in the village nearby, this could provide further data on market value	
#4	Forest Monitoring	Implemented to detect changes in forest stratum which affecting biodiversity habitat	Methods, variables monitored and frequency for forest monitoring (including fire, deforestation, degradation and restoration) are covered by the project's climate monitoring and described in detail in Section 3.2 (in particular Section 3.3.2 Data and Parameters Monitored and Section 3.3.3 Monitoring Plan). These monitoring processes provide all the variables needed to assess the project's progress in protecting and restoring critical biodiversity habitat without the need for separate measurement. See section 3.2.3.1.	Once a year

Ref	Method	Target Metric	Approach	Frequency
#5	Peat Monitoring	Implemented to detect peat degradation and restoration which affecting biodiversity habitat	Methods, variables monitored and frequency for forest and peat monitoring (including fire, deforestation, degradation and restoration) are covered by the project's climate monitoring and described in detail in Section 3.2 (in particular Section 3.3.2 Data and Parameters Monitored and Section 3.3.3 Monitoring Plan). These monitoring processes provide all the variables needed to assess the project's progress in protecting and restoring critical biodiversity habitat without the need for separate measurement. See section 3.2.3.2.	Every 5 years
#6	Orangutan survey	Nest decay method – Since orangutans are elusive and hard to count directly, **nests act as proxies** for the animals. This is the most known and efficient method to determine population of orangutan in forested area. Widely used and scientifically acceptable.	An orangutan nest decay survey is a scientific method used to estimate orangutan population density in the wild by observing their sleeping nests and how long they take to decay.	Baseline survey in 2023 Periodically repeated every 5 years
#7	SPS Patroling	SPS Patrolling (SPS = Siluk Patrol System) is a modern and tech-enabled approach to improve wildlife protection and law enforcement in protected areas like national parks,	Rangers use Smartphones or GPS units with the SPS mobile app to log: • Wildlife sightings • Illegal activities (poaching, logging)	Every 3 months

Ref	Method	Target Metric	Approach	Frequency
		wildlife reserves, and forests. SPS Patrolling system used to plan, record, analyse, and report on ranger patrols and wildlife monitoring activities along with its GPS coordinates in a specialized Smartphone or GPS unit app. The data is later combined in a GIS system for further analysis. It helps track threats, species, and enforcement actions in real time or near real time.	• Patrol routes • Human-wildlife conflict signs • Environmental observations	

5.4.2 Biodiversity Monitoring Plan Dissemination (CCB, B4.3)

Biodiversity monitoring plans will be incorporated in the Project Document and its subsequent Monitoring Report alongside other relevant project information, as outlined in Sections 2.3.1 to 2.3.5, and will be disseminated throughout the validation and verification process during project lifetime.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (CCB, GL3.1)

This project seeks to be validated to the Gold Level/Standard for exceptional biodiversity benefit because it meets the criteria of vulnerability and irreplaceability.

The project area meets the criteria of vulnerability with the presence of at least 12 species included in the Critical (CR) category, 14 species with endangered status (EN), 38 Vulnerable species, 38 Near Threatened (NT) species. Meanwhile, based on the Regulation of the Minister of Environment and Forestry No. 106 of 2018 concerning the Second Amendment to the Regulation of the Minister of Environment and Forestry No. P.20 2018 concerning Protected Plant and Animal Species, there are at least 47 species protected by the Indonesian government. Meanwhile, the trade status refers to the CITES Appendix, at least 11 species are included in the App.I list, 31 species in App.II, and 2 species are included in App.III.

The Bornean orangutan subspecies *Pongo pygmaeus pygmaeus*—which has the smallest population size and the most restricted distribution among the Bornean orangutan subspecies—is considered resident within the project area. Due to its limited range and critically endangered status, this population may meet the irreplaceability criterion under HCV 1. The peat swamp forest within the project zone serves as a key habitat for this subspecies, further emphasizing the urgency of its protection.

In addition to the orangutan, it is suspected that the 1% irreplaceability threshold may also be met by several other endemic and conservation-dependent species, including the Proboscis Monkey (*Nasalis larvatus*), Bornean Banded Langur (*Presbytis chrysomelas*), Bornean Gibbon (*Hylobates muelleri*), and various hornbill species. These species are closely associated with intact peat swamp and lowland forest ecosystems. However, at present, sufficient population data to confirm their irreplaceability status is lacking. Further field surveys and species-specific assessments will be required to substantiate these assumptions and inform conservation prioritization.

5.5.2 Trigger Species Population Trends (CCB, GL3.2, GL3.3)

Trigger species (those listed as Critically Endangered, or Endangered) are shown in Appendix 6: list of mid-large mammals in the project area–Appendix 10: List Flora found within project area and in the table below, which includes population trends (where known) and anticipated with- and without-project scenarios. As more trigger species are identified at the site, they will be incorporated to this list.

Trigger species	Orangutan (Pongo pygmaeus pygmaeus) The Bornean orangutan (P. pygmaeus pygmaeus) is the least studied sub-species in Kalimantan and also has the most restricted population and distribution characterized by fragmented and patchy population compared to other Kalimantan orangutan sub-species. This makes its population the most critical among Kalimantan Orangutan subspecies (Utami-Atmoko et al., 2017).
Population trend at start of project	According to the 2016 Population and Habitat Viability Analysis (PHVA), the total wild population of P. pygmaeus pygmaeus is estimated at 4,490 individuals, primarlyconcentrated in TNBKDS and the Batang Ai-Lanjak-Entimau Landscape (Sarawak). About 680 individuals of these population, dispersed in Danau Sentarum and the Labian-Leboyan corridor, which connects Danau Sentarum with Betung Kerihun through the Embaloh Watershed (Utami-Atmoko et al., 2017). A 2023 population study of orangutans and habitat conducted in the project area (PT ASK) estimated 180 individuals with a density of 0.5 ind km^{-2} (0.27-0.93). This figure remains above the Minimum Viable Population (MVP) threshold for Kalimantan, ensuring population sustainability for the next 100 years (Utami-Atmoko et al., 2017).

	However, the development of trans-border roads since 2014 poses significant threat, potentially impeding the movement of orangutans between the lower forest blocks (Nanga Lauk, Nanga Nyabau, and Nanga Palin) and the upper blocks (Seluan and Nanga Awin).
Without-project scenario	Population monitoring in and around TNBKDS reveals a significant decline over time. Data from 1996 (Russon et al., 2001) estimated a population of 1,578 individuals, with a density of 2.86 individuals per km^2. However, population assessments conducted between 2010 and 2014 (Yuliani et al., 2023) show a drastic reduction, with only 72 individuals recorded, and a density dropping to 0.15 individuals per km^2.The continuation of the baseline scenario will worsen existing, further adcelrating the already declining population trend that begin before the baseline scenario was in effect. Habitat disturbance will significantly impact species survival. Our 2023 population assessment confirms this trend, aligning with indicators of a shrinking population size. Without the project, the population faces isolation or complete loss, as habitat fragmentation intensifies. While some individuals from the southern side may attempt to cross the trans-national road to the northern side, the likelihood is extremely low. The already small population, which is below the carrying capacity, remains increasingly isolated on the southern side due to settlements, roads, and expanding community activities, such as farming and land use changes.
With-project scenario	The project will implement targeted conservation activities to maintain and enhance the current orangutan population. Conservation efforts will focus on supporting a relatively small population to maintain the value still on the above of the minimum viable population (MVP) or carrying capacity, ensuring long-term survival. Habitat fragmentation has led to population isolation, restricting gene flow within the metapopulation. To address this, the project will develop ecological corridors, facilitating individual movement across fragmented habitats. These corridors will restore connectivity, ultimately ensuring genetic exchange and promoting population growth. Additionally, the project will explore the introduction of rehabilitated same sub-species individuals from centers such as the Sintang Orangutan Center (SOC). Establishing a new founder population

	through carefully managed reintroductions will further support population recovery and stability in the region.
Initial Value	Compared to previous study by Yanuar et al. (2019), estimated a population density of 1.29 individuals/km² (0.51–3.25), while Saleh (1991) predicted a density of 2.62 individuals/km² (1.02–6.72) Currently, the population is fragmented, with 133 estimated individuals in the lower project blocks and 47 individuals in the upper blocks.

Trigger species	Proboscis monkey (*Nasalis larvatus*) Proboscis monkeys are endemic to Borneo with adistribution spannig Sarawak, Sabah and Brunei. In Indonesia they could be found on South, Central and West Kalimantan Province, mostly inhabiting forest area near to water. As adept swimmers, they thrive in coastal areas, mangrove and riverine habitats, but largely avoid non-lowland areas that arefar from tidal influence (Sebastian A. C. (2000). "Proboscis monkeys in Danau Sentarum National Park". Borneo Research Bulletin. 31: 359–371.) Today, most of their habitat lies outside conservation areas due to habitat degradation and conversion, which has contributed to a decline in the monkey's population.
Population trend at start of project	Proboscis monkeys are classified as Endangered primarly due to habitat loss, fragmentation, and degradation, driven from agricultural expansion and infrastructure development. In Kapuas Hulu, these threats are further intensified by logging activities and the conversion of forested areas into plantations. The lack of comprehensive population data in this region highlights the urgent need for targeted conservation efforts, including habitat protection and species monitoring programs. The presence of Proboscis Monkey on the lowland project area underscroes the critical ecological role of lowland peatlands within the region. Local populations are estimated extremely small, with direct encounters becoming increasingly rare in locations such as Desa Nanga Lauk and Desa Nanga Palin over the past five years, primarily due to ongoing prevalence of hunting.

Without-project scenario	The continuation of the baseline scenario will exacerbate existing threats, further acclerating the declining population trend as habitat disturbance and conversion intensify. Species that rely on riverine forests and water sources will be significantly affected, as vegetation and forested areas surrounding rivers and water bodies are removed, disrupting vital ecological dependencies.
With-project scenario	The project proponent's intervention, through protective patrol activities, aims to reduce pressure and mitigate threats from hunting and bush-meat activities. These efforts will halt existing threats, ensuring the stability of the current population. Over time, these conservation measures are expected to support the growth and recovery of a healthy, sustainable population.
Initial Value	The local population of the species is currently unknown.

Trigger species	Tricolour Langur (Presbytis chrysomelas cruciger) The Tricolour Langur, also known as the Sarawak Surili, is a critically endangered primate endemic to Borneo. This subspecies is primarily distributed across northern Borneo, including parts of Sarawak and Sabah in Malaysia, as well as West Kalimantan in Indonesia.
Population trend at start of project	Historically, the Tricolour Langur inhabited a broader range, but today, its distribution is restricted to a few fragmented areas, including Sarawak and Danau Sentarum National Park, West Kalimantan, Indonesia These habitats consist mainly of peat swamp forests, lowland rainforests, and mangroves, which are the preferred habitats of the Tricolour Langur The International Union for Conservation of Nature (IUCN) has classified the Tricolour Langur as Critically Endangered. Over the past 30 years, its population has declined by approximately 80%, largely due to habitat loss from expanding oil palm plantations. Currently, the species occupies less than 5% of its historical range. Although, the Tricolour Langur is legally protected under the Wild Life Protection Ordinance. it lacks formal protection at the national level, partly due to limited ecological data which complicate conservation efforts.

Without-project scenario	Continuing the baseline scenario will further intensify threats to the already declining population trend, as habitat disturbance and conversion accelerate.
With-project scenario	The project proponent's intervention, through protective patrol activities, aims to reduce the high threat of hunting, necessitating serious protective measures to ensure that the current population remain stable, and does not decline or disappear. Over time, these efforts may also contribute to population growth and long-term recovery
Initial value	The local population of the species is currently unknown.

Trigger species	Hairy-Nosed Otter (*Lutra sumatrana*) The Hairy-Nosed Otter (*Lutra sumatrana*) is one of the rarest and least studied otter species in the world, native to Southeast Asia. It is classified as Endangered due to habitat loss, poaching, and human disturbances.
Population trend at start of project	The Hairy-nosed Otter (*Lutra sumatrana*) is native to Southeast Asia. Once believe to be extinct in its natural range, Confirmed sightings in recent years,have been reported in several countries including Indonesia, though populations remains fragmented and scarce. In 2015, sightings on 2015 from Sumatra confirm its existence, followed by camera trap records in the Project Area. Hairy Nosed Otters thrive in peat swamp forests, mangroves, and lowland flooded forests, particularly in areas with dense vegetation, which provide essential cover and abundant prey. It is classified as Endangered on the IUCN Red List, with a declining population trend. Additionaly, the species is listed in CITES Appendix II, meaning that international trade is regulated to prevent exploitation. It is legally protected in Indonesia, though conservation measures remain limite Major threats to survival: • Habitat loss due to deforestation, wetlands drinage, and agariculture expansion, particularly oil palm plantations. • Hunting and poaching for fur, meat, and the illegal pet trade.

	• Accidental capture in fishing gear, leading to population decline • Reduction in prey availability due to overfishing and habitat degradation.
Without-project scenario	Hairy Nosed Otters are highly dependent on the existence of thriving peatswamp ecosystem that provide abundant food resources. However, the continuation of baseline scenario activitie will lead to forest cover degradation and peat drainageincreasing succeptibilty to fire. Without adequate habitat, the otter will be forced to move into adjacent, unmaganged, and unprotected peat swamp, where survival conditions are far less favorable. Additionally, peat drainagealters aquatic ecosystems, reducing prey availability and changing the composition of potential food sources, further exacerbating their struggle for survival. In the long term, the continued habita destruction under the baseline scenario will inevitablycontribute to local extinction of the species unless urgent conservation interventions are implemented.
With-project scenario	The project will conduct a baseline survey to assess the distribution and population size of the species within the project area. This survey will provide critical ecological data needed for effective conservation planning. Key focus areas include mapping species presence, estimating population size, evaluating habitat suitability, identifying threats, and developing long-term monitoring frameworks. Based on the findings, targeted conservation strategies will be implemented, including habitat restoration, legal protections, sustainable land-use management, community engagement, and possible captive breeding and reintroduction efforts. The project follows a structured, data-driven approach, ensuring a scientifically sound and ecologically responsible recovery plan.
Initial Value	The local population of the species is currently unknown

REFERENCE

Abraham C. 2018. Bird bioacoustics surveys-developing a standard protocol. Inpractice. (102): 20-23.

Al-Shammary, A.B.G., Kouzani, A., Kaynak, A., Khoo, S.Y., Norton, M., Gates, W. (2018). Soil bulk density estimation methods: A review. Pedosphere. 28(4): 581–596.

Aldrian, Edvin, and Raden Dwi Susanto. "Identification of three dominant rainfall regions within Indonesia and their relationship to sea surface temperature." International Journal of Climatology: A Journal of the Royal Meteorological Society 23.12 (2003): 1435-1452.

Bear, J., & Cheng, A. H.-D. (2010). *Theory and Applications of Transport in Porous Media : Modeling Groundwater Flow and Contaminant Transport* (Vol. 23). Springer Dordrecht Heidelberg London New York. http://www.springer.com/series/6612

Belitz, K., Phillips, S. P., & Gronberg, J. A. M. (1993). *Numerical simulation of ground-water flow in the central part of the western San Joaquin Valley, California*. https://pubs.usgs.gov/publication/wsp2396

Budiaman, A., & Rahayu, N. (2023). Kerusakan Tegakan Tinggal Pada Teknik Reduced Impact Logging Di Indonesia: Tinjauan Sistematis. *Jurnal Belantara*, *6*(2), 221–233. https://doi.org/10.29303/jbl.v6i2.959

Carlson, K. M., Goodman, L. K., & May-Tobin, C. C. (2015). Modeling relationships between water table depth and peat soil carbon loss in Southeast Asian plantations. *Environmental Research Letters*, *10*(7). https://doi.org/10.1088/1748-9326/10/7/074006

Christian, T. J., Kleiss, B., Yokelson, R. J., Holzinger, R., Crutzen, P. J., Hao, W. M., Saharjo, B. H., & Ward, D. E. (2003). Comprehensive laboratory measurements of biomass-burning emissions: 1. Emissions from Indonesian, African, and other fuels. *Journal of Geophysical Research: Atmospheres*, *108*(23). https://doi.org/10.1029/2003jd003704

Circular Letter of Director General of Sustainable Production Forest Management Number SE.7/PHL/PUPH/HPL.1/10/2022 on Protection of Protected Wildlife in the Working Area of Forest Utilization Permits (PBPH), Pub. L. No. SE.7/PHL/PUPH/HPL.1/10/2022 (2022).

Circular Letter of the Minister of Environment and Forestry Number SE.6/MENLHK/SETJEN/KUM.1/12/2022 on Approval of Work Plans for Multi-Enterprise Forest Utilization Businesses, Pub. L. No. SE.6/MENLHK/SETJEN/KUM.1/12/2022 (2022).

Couwenberg, J., & Hooijer, A. (2013). *Towards robust subsidence-based soil carbon emission factors for peat soils in south-east Asia, with special reference to oil palm plantations* (Vol. 12). http://www.mires-and-peat.net/,

Darcy, H. (1856). *Les fontaines publiques de la ville de Dijon*. Dalmont.

Decree of the Minister of Environment and Forestry Number: SK.1295/MENLHK/SETJEN/PLA.2/12/2022 Concerning the Indicative Map and Social Forestry Areas (PIAPS), Pub. L. No. SK.1295/MENLHK/SETJEN/PLA.2/12/2022 (2022).

Funk, Chris, et al. "The climate hazards infrared precipitation with stations—a new environmental record for monitoring extremes." Scientific data 2.1 (2015): 1-21.

Giesen, W. (2004). *Causes of Peat Swamp Forest Degradation in Berbak Np, Indonesia, and Recommendations for Restoration*.

Goode, D. J., & Appel, C. A. (1992). *Finite-Difference Interblock Transmissivity for Unconfined Aquifers and for Aquifers having Smoothly Varying Transmissivity*.

Government Regulation in Lieu of Law Number 2 of 2022 on Job Creation, Pub. L. No. 2 (2022).

Government Regulation Number 21 of 2021 on the Implementation of Spatial Planning, Pub. L. No. 71 (2021).

Government Regulation Number 23 of 2021 on Forestry Administration, Pub. L. No. 23 (2021).

Government Regulation Number 23 of 2021 on the Implementation of Forestry, Pub. L. No. 23 (2021).

Government Regulation Number 24 of 2021 Procedure for Imposing Administrative Sanctions and Procedures for Non-Tax State Revenues Derived from Administrative Fines in the Forestry Sector, Pub. L. No. 24 (2021).

Government Regulation Number 36 of 2024 on Types and Tariffs for Non-Tax State Revenues Applicable to the Ministry of Environment and Forestry, Pub. L. No. 36 (2024).

Government Regulation Number 37 of 2021 Concerning the Implementation of the Job Loss Guarantee Program., Pub. L. No. 37 (2021).

Government Regulation Number 50 of 2012 on Occupational Health and Safety Management System, Pub. L. No. 50 (2012).

Government Regulation Number 57 of 2016 Concerning Amendments to Government Regulation Number 71 of 2014 Concerning Protection and Management of Peat Ecosystems, Pub. L. No. 57 (2016).

Government Regulation Number 71 of 2014 Concerning Protection and Management of Peat Ecosystems, Pub. L. No. 71 (2014).

Governor Regulation No. 103 of 2020, Pub. L. No. 103 (2020).

Gunawan, H., Setyawati, T., Atmoko, T., Subarudi, Kwatrina, R. T., Yeny, I., Yuwati, T. W., Effendy, R., Abdullah, L., Mukhlisi, Lastini, T., Arini, D. I. D., Sari, U. K., Sitepu, B. S., Pattiselanno, F., & Kuswanda, W. (2024). A review of forest fragmentation in Indonesia under the DPSIR framework for biodiversity conservation strategies. *Global Ecology and Conservation*, *51*. https://doi.org/10.1016/j.gecco.2024.e02918

Hatano, R., Toma, Y., Hamada, Y., Arai, H., Susilawati, H. L., & Inubushi, K. (2015). Methane and nitrous oxide emissions from tropical peat soil. In *Tropical Peatland Ecosystems* (pp. 339–351). Springer Japan. https://doi.org/10.1007/978-4-431-55681-7_22

Hawker, L., Uhe, P., Paulo, L., Sosa, J., Savage, J., Sampson, C., & Neal, J. (2022). A 30 m global map of elevation with forests and buildings removed. *Environmental Research Letters*, *17*(2). https://doi.org/10.1088/1748-9326/ac4d4f

Heyer. 1994. Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. Washington (USA): Smithsonian Institution Press

Hirano, K. K. Kusin, S. Limin, M. Osaki. 2015. Evapotranspiration of tropical peat swamp forests. Glob. Chang. Biol. 2015 May;21(5):1914-27. doi: 10.1111/gcb.12653. Epub 2014 Jun 27.

Hooijer, A., Page, S., Canadell, J. G., Silvius, M., Kwadijk, J., Wösten, H., & Jauhiainen, J. (2010). Current and future CO 2 emissions from drained peatlands in Southeast Asia. *Biogeosciences*, *7*(5), 1505–1514. https://doi.org/10.5194/bg-7-1505-2010

IPCC. (2014). *Climate Change 2014 Mitigation of Climate Change : Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

Iskandar, D. T., Setyanto, D. Y., & Liswanto, W. (1998). Keanekaragaman Herpetofauna Di Taman Nasional Bentuang Karimun, Kalimantan Barat. *Prosiding : RPTN Bentuang Karimun 2000-2024*, 358–363.

Jauhiainen, J., Hooijer, A., & Page, S. E. (2012). Carbon dioxide emissions from an Acacia plantation on peatland in Sumatra, Indonesia. *Biogeosciences*, *9*(2), 617–630. https://doi.org/10.5194/bg-9-617-2012

Kurniadi, Ari, et al. "Independent ENSO and IOD impacts on rainfall extremes over Indonesia." International Journal of Climatology 41.6 (2021): 3640-3656.

Lang, N., Jetz, W., Schindler, K., & Wegner, J. D. (2022). *A high-resolution canopy height model of the Earth*. http://arxiv.org/abs/2204.08322

Law Number 1 of 1970 on Worker Safety Rules, Pub. L. No. 1 (1970).

Law Number 5 of 1990 on Conservation of Living Resources and Their Ecosystem, Pub. L. No. 5 (1990).

Law Number 13 of 2003 on Concering Manpower, Pub. L. No. 13 (2003).

Law Number 16 of 2016 on Ratification of the Paris Agreement on the United Nations Framework Convention on Climate Change, Pub. L. No. 16 (2016).

Law Number 18 of 2013 on The Prevention and Eradication of Forest Destruction, Pub. L. No. 18 (2013).

Law Number 32 of 2009 on Environmental Protection and Management, Pub. L. No. 32 (2009).

Law Number 40 of 2004 on the National Social Security System (SJSN), Pub. L. No. 40 (2004).

Law Number 41 of 1999 in Forestry, Pub. L. No. 41 (1999).

Manning, R. (1981). On the flow of water in open channels and pipes. *Transactions of the Institution of Civil Engineers of Ireland*, *XX*, 161–207.

Manuri, S., Brack, C., Nugroho, N. P., Hergoualc'h, K., Novita, N., Dotzauer, H., Verchot, L., Putra, C. A. S., & Widyasari, E. (2014). Tree biomass equations for tropical peat swamp forest ecosystems in Indonesia. *Forest Ecology and Management*, *334*, 241–253. https://doi.org/10.1016/j.foreco.2014.08.031

Manuri, S., Kumara, I., Kusharyono, D., & Somala, E. (2013). *Pengembangan Persamaan Alometrik Lokal di Kabupaten Kapuas Hulu*.

Minister of Environment and Forestry Circular Letter Number: SE.494 / MENLHK-PHPL / 2015 Concerning Prohibition of Clearing Peatlands Dated November 3, 2015; 3 November 2015 (2015).

Minister of Environment and Forestry Letter Number S.661/Menlhk-Setjen/Rokum/2015 Regarding Instruction for Peatland Management, Pub. L. No. S.661/Menlhk-Setjen/Rokum/2015 (2015).

Minister of Environment and Forestry Regulation Number 7 of 2021 Concerning Forestry Planning, Changes in the Designation of Forest Areas and Changes in the Functions of Forest Areas, as Well as the Use of Forest Areas, Pub. L. No. 7 (2021). www.peraturan.go.id

Minister of Environment and Forestry Regulation Number 8 of 2021 on the Forestry Management and the Preparation of Forestry Management Plan, as Well as Forestry Utilization in Protected Forest and Production Forest, Pub. L. No. 8 (2021).

Minister of Environment and Forestry Regulation Number 9 of 2021 on Management of Social Forestry, Pub. L. No. 9 (2021). www.peraturan.go.id

Minister of Environment and Forestry Regulation Number 11 of 2022 on the Profession and Competence of Forest Management Technical Staff (2022).

Minister of Environment and Forestry Regulation Number 21 of 2022 on the Guidelines of Carbon Economic Value Implementation, Pub. L. No. 21 (2022).

Minister of Environment and Forestry Regulation Number 106 of 2018, Pub. L. No. 106 (2018).

Minister of Environment and Forestry Regulation Number P.8/MENLHK/SETJEN/KUM.1/3/2018 Concerning Fixed Procedures for Field Checking Information on Hotspots and or Information on Forest and Land Fires (2018).

Minister of Environment and Forestry Regulation Number P.14 MENLHK SETJEN KUM.1 22017 Concerning Procedures for Inventory and Determination of Peat Ecosystem Functions (2017).

Minister of Environment and Forestry Regulation Number: P.15/MENLHK/SETJEN/KUM.1/2022 Concerning Procedures for Land-Based Comprehensive Forest Inventory (IHMB), Which Requires Holders of IUPHHK-HA, IUPHHK-HTI, and IUPHHK-RE to Conduct IHMB Every 10 Years, Pub. L. No. P.15/MENLHK/SETJEN/KUM.1/2022 (2022).

Minister of Environment and Forestry Regulation Number P.20 of 2018, Pub. L. No. P20 (2018).

Minister of Environment and Forestry Regulation Number P.21/MENLHK/SETJEN/KUM.1/2019 Concerning Forest Boundary Arrangement, Which Regulates the Mapping of State Forest Physical Boundaries (2019).

Minister of Environment and Forestry Regulation Number P.32/MenLHK/Setjen/Kum.1/3/2016 concerning Forest and Land Fire Control, Pub. L. No. 32, 1 (2016). www.peraturan.go.id

Minister of Environment and Forestry Regulation Number: P.38/MENLHK/SETJEN/KUM.1/2023 Concerning Procedures for Inventory and Mapping of Forest Areas, Pub. L. No. P.38/MENLHK/SETJEN/KUM.1/2023 (2023).

Minister of Environment and Forestry Regulation Number P.70/MENLHK/SETJEN/KUM.1/12/2017 Concerning Procedures for Measurement, Reporting, and Verification (MRV) of Climate Change Mitigation Actions in the Forestry Sector (2017).

Minister of Environment and Forestry Regulation Number: P.73 / Menhut-II / 2014: Business Plan for Utilization of Carbon Absorption and / or Storage in Production Forests; 22 September 2014, Pub. L. No. P. 73/Menhut-II/2014 (2014).

Minister of Environment and Forestry Regulation Number P.74 Menhut-II 2014 Application of Silvicultural Techniques in Business Utilization and or Storage of Carbon in Production Forests (2014).

Minister of Environment and Forestry Regulation Number P.9/MENLHK/SETJEN/KUM.1/3/2018 Concerning Technical Criteria for Forest and Land Fire Preparedness and Emergency Status, Pub. L. No. P.9/MENLHK/SETJEN/KUM.1/3/2018 (2018).

Minister of Environment and Forestry Regulation Number P.10/ MENLHK/SETJEN/Kum.1/3/2019 Concerning Determination, Determination and Management on Top of Peat Dome Based on Peat Hydrological Unit, Pub. L. No. P.10/ MENLHK/SETJEN/Kum.1/3/2019 (2019).

Minister of Forestry Regulation Number: P.43 / Menhut-II / 2013 Concerning Boundary Arrangement of Forest Utilization Permits Work Area, Principle Approval of Forest Area Use, Principle Approval of Release of Forest Areas and Management of Forest Areas in Forest Management Units and Forest Areas with Special Purpose, Pub. L. No. P.43/Menhut-II/2008 (2008).

Minister of Forestry Regulation Number: P.43 / Menhut-II / 2013 Concerning Boundary Arrangement of Forest Utilization Permits Work Area, Principle Approval of Forest Area Use, Principle Approval of Release of Forest Areas and Management of Forest Areas in Forest Management Units and Forest Areas with Special Purpose, Pub. L. No. P.43/Menhut-II/2013 (2013).

Minister of Manpower Regulation Number 5 of 2021 Concerning Procedures for the Implementation of the Work Accident Insurance, Death Insurance, and Old Age Security Programs, Pub. L. No. 5 (2021).

Mizuno, K., Fujita, M. S., Kozan, O., Itoh, M., Shiodera, S., Naito, D., Suzuki, H., & Gunawan, H. (2023). *Introduction: The Vulnerability and Transformation of Indonesian Peatlands* (pp. 1–13). https://doi.org/10.1007/978-981-99-0906-3_1

Monteith, J. L. (1965). Evaporation and environment. *Symposia of the Society for Experimental Biology*, *19*, 205–234.

Mozafari, B., Bruen, M., Donohue, S., Renou-Wilson, F., & O'Loughlin, F. (2023). Peatland dynamics: A review of process-based models and approaches. *Science of the Total Environment*, *877*. https://doi.org/10.1016/j.scitotenv.2023.162890

Page, S. E., Wust, R. A. J., Weiss, D., Rieley, J. O., Shotyk, W., & Limin, S. H. (2004). A record of Late Pleistocene and Holocene carbon accumulation and climate change from an equatorial peat bog (Kalimantan, Indonesia): Implications for past, present and future carbon dynamics. *Journal of Quaternary Science*, *19*(7), 625–635. https://doi.org/10.1002/jqs.884

Partomihardjo, T., Syahirsyah, albertus, & Soedjito, H. (1998). Flora Pohon Dan Tipe Hutan Taman Nasional Bentuang Karimun Kalimatan Barat. *Prosiding : RPTN Bentuang Karimun 2000-2024*, 261.

Peatland Restoration Agency. (2016). *Letter of the Head of the Peatland Restoration Agency Number: SE.02/ KB/11/2016 concerning Directions for Pre-Arrangement of Peatlands in the Area of Business Permits for Utilization of Forest Products in Production Forests*.

Philip, J. R. (1957). The Theory of Infiltration. *Soil Science*, *84*(3), 257–264. https://doi.org/10.1097/00010694-195709000-00010

Pinard, M. A., & Putz, F. E. (1996a). Retaining Forest Biomass by Reducing Logging Damage. *Biotropica*, *28*(3), 278. https://doi.org/10.2307/2389193

Pinard, M. A., & Putz, F. E. (1996b). Retaining Forest Biomass by Reducing Logging Damage. *Biotropica*, *28*(3), 278. https://doi.org/10.2307/2389193

Presidential Decree Number 32 of 1990 on Management of Protected Areas (1990).

Presidential Instruction Number 3 of 2020 on Forestry and Land Fire Management, Pub. L. No. 3 (2020).

Presidential Regulation No. 59 Year 2017 on the Implementation of the Achievement of SDGs, Pub. L. No. 59 (2017).

Presidential Regulation Number 59 of 2017 in the Achievement of SDGs, Pub. L. No. 59 (2017).

Rachmatika, I., & Haaryono. (1998). Ikhtiofauna Dan Pengembangan Perikanan Di Taman Nasional Bentuang Karimun, Kalimantan Barat. *Prosiding : RPTN Bentuang Karimun 2000-2024*, 282–06.

Rahajaningtrah, W., & Prayogo, H. (1998). Keanekaragaman, Distribusi, Ekologi Serta Aspek Konservasi Burung Di Taman Nasional Bentuang Karimun Kalimantan Barat. *Prosiding : RPTN Bentuang Karimun 2000-2024*, 339–357.

Randi, A., Manurung, F., & Siahaan, S. (n.d.). *Identification of Tree Species as the Compiler of Peat Swamp Vegetation in Danau Sentarum National Park Kapuas Hulu Regency)*.

Regulation of the Director General of Climate Change Monitoring Number P.3/PPI/SET/KUM.1/1/2018 on the Establishment and Development of a Fire Concerned Community, Pub. L. No. P.3/PPI/SET/KUM.1/1/2018 (2018).

Regulation of the Director General of Forestry Planning Number: P. 5/VII-KUH/2011 Concerning Technical Guidelines for Implementation of Boundary Arrangement of Forest Utilization Permits (2011).

Regulation of the Director General of Sustainable Production Forest Management Number: P. 3 / PHPL / SET / Kum.0 / 2/2017 Concerning Guidelines for Periodic Forest Carbon Inventory (IKHB) in Businesses to Utilize Carbon Absorption and / or Storage in Production Forests; , Pub. L. No. P. 3 / PHPL / SET / kum.0 / 2/2017 (2017).

Regulation of the Director General of Sustainable Production Forest Management Number P.14/PHPL SET 4/2016 Concerning Standards and Guidelines for Implementation of Performance Assessment of Sustainable Production Forest Management (PHPL) and Verification of Timber Legality (VLK), Pub. L. No. P.14/PHPL SET 4/2016 (2016).

Regulation of the Director General PHPL Number SK.63/PHPL/SET.5/KUM.1/3/2016 Concerning Technical Guidelines for IHMB in Natural Production Forest., Pub. L. No. SK.63/PHPL/SET.5/KUM.1/3/2016 (2016).

Regulation of the President of The Republic of Indonesia Number 98 of 2021 on The Implementation of Carbon Pricing to Achieve the Nationally Determined Contribution Target and Control over Greenhouse Gas Emissions in the National Development, Pub. L. No. 98 (2021).

Remson, I., Hornberger, G. M., & Molz, F. J. (1971). *Numerical Methods in Subsurface Hydrology, with an Introduction to the Finite Element Method*. Wiley-Interscience.

Ritzema, H. and H. Jansen. 2008. Assessing the water balance of tropical peatlands by using the inverse groundwater modelling approach. Tropical Peatlands, Conference Paper.

Saint-Venant, A. J. C. (1871). *Théorie du mouvement non permanent des eaux avec applications aux crues des rivières et à l'introduction des marées dans leur lit*. Comptes Rendus des Séances de Académie des Sciences.

Sebastian, A. C. (2000). Proboscis Monkeys in Danau Sentarum National Park. *Borneo Research Bulletin*, *31*, 359–371.

Soil Survey Staff. 2022. Keys to Soil Taxonomy. 13th Edition. United States Department of Agriculture Natural Resources Conservation Service.

Terzaghi, K., Peck, R. B., & Mesri, G. (1996). *Soil Mechanics in Engineering Practice*. John Wiley & Sons, Inc.

Tolan, J., Yang, H.-I., Nosarzewski, B., Couairon, G., Vo, H., Brandt, J., Spore, J., Majumdar, S., Haziza, D., Vamaraju, J., Moutakanni, T., Bojanowski, P., Johns, T., White, B., Tiecke, T., & Couprie, C. (2023). *Very high resolution canopy height maps from RGB imagery using self-supervised vision transformer and convolutional decoder trained on Aerial Lidar*. https://doi.org/10.1016/j.rse.2023.113888

Treby, S., C. Jayasekara, N. Idrus, S.N.A. Ningsih, L.B. Graham, L. Hutley, J. Beringer, and S. Grover. 2024. Evapotranspiration from a drained tropical peatland undergoing restoration. https://essopenarchive.org/users/869842/articles/1251230-evapotranspiration-from-a-drained-tropical-peatland-undergoing-restoration

Verra. (2012). *VT0001 : Tool For the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities v3.0*. http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-01-v2.pdf

Verra. (2015). *VT0005 : Tool for Measuring Aboveground Live Forest Biomass Using Remote Sensing v1.0*.

Verra. (2020a). *VMD0017 : Estimation of Uncertainty for REDD+ Project Activities (X-UNC)*.

Verra. (2020b). *VMD0042 : Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities (BL-PEAT) v1.1*.

Verra. (2020c). *VMD0044 : Estimation of Emissions from Ecological Leakage (LK-ECO)*.

Verra. (2020d). *VMD0046 : Methods for monitoring of soil carbon stock changes and greenhouse gas emissions and removals in peatland rewetting and conservation project activities (M-PEAT)*.

Verra. (2023a). *VMD0001 : Estimation of Carbon Stocks in The Above-and Belowground Biomass in Live Tree and Non-Tree Pools (CP-AB)*.

Verra. (2023b). *VMD0006 : Estimation of Baseline Carbon Stock Changes and Greenhouse Gas Emissions From Planned Deforestation/Forest Degradation and Planned Wetland Degradation (BL-PL)*.

Verra. (2023c). *VMD0015 : Methods for Monitoring of GHG Emissions and Removals in REDD and CIW Projects (M-REDD)*.

Verra. (2024a). *A FOLU Non-Permanence Risk Tool v 4.2*.

Verra. (2024b). *VCS Standard v.4.7*.

Verra. (2024c). *VM0007 : REDD+ Methodology Framework*.

Verruijt, A. (2001). *Soil Mechanics*. Delft University of Technology. http://geo.citg.tudelft.nl/.

Winjun, J. K., Brown, S., & Schlamadiner, B. (1998). *Forest Harvests and Wood Products: Source and Sinks of Atmospheric Carbon Dioxide*.

Wösten, H., A. Hooijer, C. Siderius, D.S. Rais, A. Idris and J. Rieley. 2006. Tropical Peatland water management modelling of the Air Hitam Laut catchment in Indonesia. Intl. J. River Basin Management Vol. 4, No. 4 (2006), pp. 233–244.

Yanuar, A., Fehse, J., Chivers, D., & Sugardjito, J. (2019). New estimates of orangutan density in Sungai Palin watershed, Kapuas Hulu, West Kalimantan, Indonesia. *ORYX*, *54*(6), 763–766. https://doi.org/10.1017/S0030605319000875

Yuliani, E. L., Bakara, D. O., Ilyas, M., Russon, A. E., Salim, A., Sammy, J., Sunderland-Groves, J. L., & Sunderland, T. C. H. (2023). Bornean orangutan Pongo pygmaeus pygmaeus population estimate within and around Danau Sentarum National Park, Kapuas Hulu, West Kalimantan. *Conservation Science and Practice*, *5*(4). https://doi.org/10.1111/csp2.12916

APPENDIX 1 PROJECT RISKS TABLE

	Identified risk(s)	Potential impact of risk on stakeholders, ecosystem health, and biodiversity	Mitigation or preventative measure(s) taken
Natural and human induced risks to stakeholders' wellbeing	The main risks: • Feed availability and cost for livestock activity • Pests and diseases pose risks to both livestock and agriculture • Overuse of inorganic fertilizers harms soil health • Market competition See Sections 2.3.7 and 4.5.3 for detailed stakeholder risk considerations and mitigation related to SPCP participation	The potential impacts: • Feed availability and cost: Affects farmer income; may lead to unsustainable resource use and local biodiversity loss. • Pests and diseases: Cause yield losses; chemical control harms ecosystems and non-target species. • Inorganic fertilizer overuse: Degrades soil and water quality; threatens soil biodiversity. • Market competition: Risks farmer exclusion and	Mitigate or preventative measures: • For feed availability and cost: promoting local or alternative feed production and training farmers in independent feed-making techniques can reduce dependency on expensive factory-made feed. • For pests and diseases in livestock and agriculture: strengthening veterinary and extension services, along with adopting integrated pest and disease management (IPDM), can minimize losses while reducing environmental impact. • For overuse of inorganic fertilizers: promoting organic fertilizer use and providing training on sustainable soil management practices to preserve soil health and biodiversity. • For market competition: Developing both B2B and B2C marketing strategies, supporting value addition,

		promotes unsustainable practices, reducing ecological diversity.	and strengthening farmer cooperatives can enhance market access and improve income stability for smallholders.
Risks to stakeholder participation	As above	As above	As above
Working conditions	• Physical risks: Falling trees/branches, slips, getting lost • Environmental risks: Harsh weather, floods, landslides, wild animal encounters • Health risks: Vector-borne diseases, allergic reactions, fatigue, limited medical access • Social/security risks: Land/resource conflicts, illegal activity encounters, poor communication access	• Physical risks: Injuries can lead to lost workdays, reduced productivity, or long-term disability. • Environmental risks: Exposure to extreme conditions or wildlife can endanger lives and limit access to forest areas. • Health risks: Illness or fatigue can lower work efficiency, increase healthcare costs, and pose long-term health issues. • Social/security risks: Conflicts or encounters with illegal actors can	• Physical risks; provide proper safety training and PPE (helmets, boots, gloves), use safe/ well-maintained equipment, and provide navigation tools and clear protocols to prevent getting lost • Environmental risks: monitor weather forecasts and avoid work during extreme conditions, train teams in wildlife safety and emergency response, assess flood risks • Health risks: provide vaccinations and mosquito protection (nets, repellents), ensure access to clean water, rest, and first aid, schedule breaks and monitor for fatigue or heat stress • Social/security risks: actively engaged with community, provide livelihood program, coordinate with related stakeholders in he village, maintain coordination and communication The project is committed to meet standard as outlined in Section 2.5.2 “Relevant Laws and Regulations Related to Worker’s Rights” and

		create unsafe working conditions and disrupt project activities.	Section 2.3.19 “Occupational Safety Assessment” for further information.
Safety of women and girls	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	No specific impacts have been identified at this stage. Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. However, should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures. Section 2.3.14 “Anti-Discrimination Assurance” and Section 4.5.5 “Net Impacts on Women” will be used as reference.
Safety of minority and marginalized groups, including children	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. However, should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures Section 4.5.4 “Marginalized and/or Vulnerable Community Groups” will be used as reference
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. The project has established rigorous Health, Safety, Security, and Environment (HSSE) assessment and monitoring procedures. For

	risks that may occur within project period		further details, please refer to Sections 2.3.19, 5.2.8, and 5.2.9. Should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures
Discrimination	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. Should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures The project addresses this issue in the section 2.3.14 “Anti-Discrimination Assurance”, and Section 2.5.2 “Relevant Laws and Regulations Related to Worker’s Rights” for further information
Sexual harassment	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. Should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures The project addresses this issue in the section 2.3.14 “Anti-Discrimination Assurance”, Section 2.5.2 “Relevant Laws and Regulations Related to Worker’s Rights”

Equal pay for equal work	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. Should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures The project addresses this issue in the section 2.3.14 "Anti-Discrimination Assurance", Section 2.5.2 "Relevant Laws and Regulations Related to Worker's Rights"
Gender equity in labor and work	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. Should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures The project addresses this issue in the section 2.3.14 "Anti-Discrimination Assurance", Section 2.5.2 "Relevant Laws and Regulations Related to Worker's Rights"
Forced labor[17]	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. Should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures

[17] 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.

			The Project is committed to fully compliance with Indonesian Employment Law and laws regarding Forced Labour, Child Labour and Human Trafficking
Child labor	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. Should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures The Project is committed to fully compliance with Indonesian Employment Law and laws regarding Forced Labour, Child Labour and Human Trafficking
Human trafficking	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. Should any risk and impacts are identified, the project is committed to take proactive and adaptive mitigation and preventive measures The Project is committed to fully compliance with Indonesian Employment Law and laws regarding Forced Labour, Child Labour and Human Trafficking
Recognition of, respect of, and promotion of the rights to IPs, LCs and customary rights holders	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented.

	risks that may occur within project period		SPCP is committed to recognize and respect rights to IPs, LCs and customary rights holders if and when such cases arise.
Preserving and protecting cultural heritage	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any risks that may occur within project period	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. The project is committed to preserve and protect cultural heritage. See Section 2.5.4 "Indigenous Peoples and Cultural Heritage"
Protecting and preserving property rights, customary rights, or protecting legal or customary tenure/access rights to territories, property, and resources, including collective and/or conflicting rights	See further in the section 2.5.5 "Statutory and Customary Property Rights" for a full assessment of the associated risks and mitigations associated with access and property rights	See further in the section 2.5.5 "Statutory and Customary Property Rights"	See further in the section 2.5.5 "Statutory and Customary Property Rights"
Impacts on biodiversity and ecosystems	No specific risks have been identified at this stage. This is one of the principal risks identified under the baseline scenario (Section 5.1.3 "Without-project Scenario: Biodiversity")	See Section 5.1.3 "Without-project Scenario: Biodiversity" and Section 5.2.2 and 5.3.1 concerning negative Offsite biodiversity impacts and mitigation measures	At this stage, no specific mitigation or preventative measures have been implemented. This risk, under the baseline scenario, is one of key risks mitigated by SPCP. See further information in the Section 2.1.17 "Project Activities and Theory of Change" and Section 5.

Soil degradation and soil erosion	No specific risks have been identified at this stage. Preventing peat drainage , with corresponding changes in the water table, are a principal risk identified under the baseline scenario (See Sections 3.1.4 & 3.1.5 Baseline and Additionality). However this is not considered a risk under the project scenario	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts See Section 2.2 “Without-project Land Use Scenario and Additionality”	At this stage, no specific mitigation or preventative measures have been implemented. SPCP is committed to protect the integrity of the peatland ecosystem and associated hydrology (see Section 2.1.17 “Project Activities and Theory of Change”)
Water consumption and stress	No specific risks have been identified at this stage. Preventing peat drainage , with corresponding changes in the water table, are a principal risk identified under the baseline scenario (See Sections 3.1.4 & 3.1.5 Baseline and Additionality). However this is not considered a risk under the project scenario	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts See Section 2.2 “Without-project Land Use Scenario and Additionality”	At this stage, no specific mitigation or preventative measures have been implemented. SPCP is committed to protect the integrity of the peatland ecosystem and associated hydrology (see Section 2.1.17 “Project Activities and Theory of Change”)

Habitats (and areas needed for habitat connectivity) for rare, threatened, and endangered species	No specific risks have been identified at this stage. This is one of principal risks identified under the baseline scenario (See 3.1.5 Baseline and Additionality). However this is not considered a risk under the project scenario	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts See further in the section 5.1.3 “Without-project Scenario: Biodiversity” and Section 5.2.2 and 5.3.1 concerning negative Offsite biodiversity impacts and mitigation measures	At this stage, no specific mitigation or preventative measures have been implemented. Under the baseline scenario, this riskis one of key risks mitigated by the project. For more information see Section 2.1.17 “Project Activities and Theory of Change” and Section 5.
Areas needed for habitat connectivity	No specific risks have been identified at this stage. This is one of principal risks identified under the baseline scenario (See 3.1.5 Baseline and Additionality). This is not considered a risk under the project scenario	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts See further in the section 5.1.3 “Without-project Scenario: Biodiversity” and Section 5.2.2 and 5.3.1 concerning negative Offsite biodiversity impacts and mitigation measures	At this stage, no specific mitigation or preventative measures have been implemented. Under the baseline scenario, this riskis one of key risks mitigated by the project. For more information see Section 2.1.17 “Project Activities and Theory of Change” and Section 5.
Invasive species	No specific risks have been identified at this stage; however, the project will remain vigilant and responsive to any	Should any risks occurred, the project will conduct a thorough assessment to understand their potential impacts	At this stage, no specific mitigation or preventative measures have been implemented. The project is committed to avoid any risks from invasive species. All restoration will be done by using native species.

	risks that may occur within project period See further in the section 5.2.6 “Invasive Species		See further in the section 5.2.6 “Invasive Species
Ecosystem conversion	No specific risks have been identified; See further in the section 2.1.17 “Project Activities and Theory of Change”	N/A	No specific mitigation or preventative measures have been implemented. The project is committed to avoid forest conversion, can be found in the section 2.1.17 “Project Activities and Theory of Change”.

APPENDIX 2: PROJECT ACTIVITIES AND THEORY OF CHANGE TABLE

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Goal 1: Mitigate carbon emissions by preventing deforestation, peatland degradation, and wildfires while enhancing carbon sequestration through forest and peatland restoration and scientifically credible MRV system				
1. Awareness raising and capacity building on forest- peat conservation and restoration: Facilitating community to raise awareness about the impacts of forest disturbance and increase local capacity for forest and peat conservation.	640 community involved in meeting or approached on the impact of illegal logging, hunting, and slash-and-burn practices carried out. 140 training on conservation, forest protection, and peatland restoration organized. 560 individuals capable to perform forest protection and restoration.	Communities recognize the impacts of illegal logging, hunting, and slash-and-burn practices and become capable of conserving forests, protecting peatlands, and restoring ecosystems.	Forests and peatlands are restored effectively, greenhouse gas emissions decline as deforestation, degradation, and fire-related incidents decrease through sustainable land use and community-led conservation	Objective 1. Protecting Forests and Peatlands

2. Zero-Burning Agriculture and fires risk reduction: Improving community capacity on sustainable land use management, support the adoption of sustainable land-clearing techniques across targeted areas to reduce fire-related agricultural incidents.	710 farmers trained on the Zero-Burning Agriculture techniques. 360 hectares apply Implement Zero-Burning Agriculture. Fire related agriculture incidents reduced by 80%.	Farmers adopt zero-burning agriculture techniques, reducing fire-related agricultural incidents and improving sustainable land management practices.		Objective 1. Protecting Forests and Peatlands
3. Implementation of Forest Protection: Implementing an early detection and forest disturbance response system, while engaging stakeholders to reduce greenhouse gas emissions.	Early detection system established. Fire response system established. 210 patrol carried out, involving community. 120 engagement with Government and stakeholders to address forest disturbance. Emission from Deforestation and forest degradation decreased significantly at 90 %.	Forests and peatlands are effectively safeguarded as deforestation, degradation, and fire-related incidents decline, leading to reduced greenhouse gas emissions, driven by community participation, sustainable farming, and strong monitoring and response systems.		Objective 1. Protecting Forests and Peatlands

4. Restoring peat and forest ecosystem: Restoring ecosystems focuses on rehabilitating degraded peatlands and forests to enhance their ecological functions and improve carbon storage	290 community with prior illegal activities are engaged in forest rehabilitation and peat rewetting. 100 hectares of area rehabilitated with community participation. 15 dams constructed in drained peatland. Emission from peatland drainage reduced at 80%.	Forest and peatland ecosystems recover through rehabilitation and hydrological restoration, leading to peat emissions reduction and biomass sequestration enhancement.		Objective 3. Strengthening Climate Action
5. Establishment of MRV system and its application: Applying a credible MRV framework with standardized methodologies to increase the accuracy of baseline assessment and project impact monitoring	MRV framework developed with standardized methodologies. Advanced technology applied (including remote sensing, satellite imagery, drones, LiDAR) for accurate assessment and monitoring. Project baseline assessment and monitoring carried out. 27 Monitoring-verification reports	The MRV system is fully implemented with standardized methodologies and advanced technology, ensuring accurate monitoring of carbon stocks, emissions, and land-use changes while enhancing transparency and data reliability.	The project achieves high credibility and quality standards through a robust MRV system that ensures accurate emissions monitoring, enhances transparency, and strengthens compliance with international standard	Objective 3. Strengthening Climate Action

	produced to measure project impact.			
Goal 2: Improved community livelihoods through sustainable forest management, peatland restoration, and income-generating community-based enterprises linked to environmental conservation.				
1. Funding for livelihood programs: Provide funding focused on sustainable livelihoods.	At least 55 groups are established under the Community Enterprise Program Development (CEPD), with 950 number of individuals receiving funding support At least 15 women and/or marginalized groups are established, with 150 number of individuals receiving funding support	• Community businesses begin generating consistent income and achieve a level of financial stability. • The targeted group will show significant progress as result of this financial support.	The community within the project zone achieves greater economic stability through sustainable livelihoods linked to forest and peatland protection. They also play an active role in conservation efforts, fostering a healthier ecosystem and a more resilient economy.	Objective 2. Supporting Sustainable Livelihoods
2. Facilitation of Market Linkages: Empowering local businesses towards sustainable markets.	At least 20 business models are linked to the market	Early-stage market linkages are established for local businesses, providing better access to market and enhancing profitability and economic stability		Objective 2. Supporting Sustainable Livelihoods
3. Capacity Building for Environmental Protection and Ecosystem	Forest protection and peatland restoration activities have started,	Local communities' knowledge and skills in forest monitoring and ecosystem restoration are		Objective 1. Protecting Forests and Peatlands

Restoration: Educating community members on the importance of environmental protection, which leads to engaging them in forest and peatland restoration programs, while enhancing local capacity for forest monitoring, peatland restoration, and overall ecosystem restoration	with 90 of trainings conducted, and 310 of individuals trained (including women)	enhanced, promoting sustainable management practices and improving their capacity to protect and restore natural resources for long-term environmental sustainability and resilience		
4. Employment in Forest Protection and Peatland Restoration: Creation of employment opportunities linked to environmental conservation.	40 individuals employed by the company, and 180 individuals engaged in forest and peatland restoration and rehabilitation programs	Individuals actively participating in forest and peatland restoration and rehabilitation programs, contributing to both economic development and environmental sustainability.		Objective 2. Supporting Sustainable Livelihoods Objective 1. Protecting Forests and Peatlands
5. Supporting health, education and access to clean water	880 individuals engaged in helath campaigns and access to health services	Increased community awareness and practices related to hygiene and health	Improve access to health, education, and clean water is expected to enhance overall well-being, reduce preventable diseases and	Objective 2. Supporting Sustainable Livelihoods

	600 students receiving educational materials (e.g., books, stationery) and attend awareness raising 2100 communities accessing clean water from dip wells constructed by project	Increased student participation and learning motivation Increased access to clean and safe water for households	strenghten human capital for long-term community resilience.	
Goal 3: Protect and restore critical habitats to support thriving ecosystems, halting hunting and poaching to conserve wildli fe.				
1. Raise Awareness and behavioural change on Biodiversity: Enhancing awareness and driving behavioural change to support biodiversity conservation through education, community engagement, and advocacy initiatives --	210 outreach campaigns on the ecological and legal consequences of illegal hunting conducted. 110 events to promote wildlife conservation values.	Communities become more aware of the ecological and legal consequences of illegal hunting, leading to greater support for wildlife conservation and a shift towards sustainable practices.	Communities gain awareness of the ecological and legal consequences of illegal hunting, leading to increased support for wildlife conservation. Improved monitoring and joint patrol efforts enhance enforcement, resulting in a measurable reduction in poaching incidents.	Objective 4. Safeguarding Biodiversity
2. Biodiversity Monitoring and law Enforcement: Strengthening biodiversity monitoring and law enforcement through systematic monitoring collection and community-based	Poaching monitoring system established 210 joint patrol on poaching Illegal hunting-poaching reduced at 80%	Enhanced poaching monitoring and joint patrol efforts lead to a significant reduction in illegal hunting, contributing to the stabilization or growth of wildlife populations.		Objective 4. Safeguarding Biodiversity

patrols to prevent conserve biodiversity	Wildlife population stable or increase			

APPENDIX 3: LIST OF LAWS AND REGULATION RELEVANT TO THE PROJECT

Regulation Name	Relevance and Compliancy of the Project
Indonesian Law	
Law Number 1 of 1970 on Worker Safety Rules	This law is relevant to SPCP as it ensures occupational safety for workers engaged in the whole operations. The law further mandates risk assessments, safety training, and protective measures to prevent accidents and health hazards in field operations. To comply with this law, the SPCP will implement workplace safety protocols, provide protective equipment, conduct regular safety training, and ensure safe working conditions for all personnel, including former illegal loggers, hunters, and land encroachers involved in project activities.
Law Number 5 of 1990 on the Conservation of Biological Natural Resources and Their Ecosystems	This law is highly relevant to SPCP as it provides the legal foundation for biodiversity conservation, habitat protection, and sustainable ecosystem management—key objectives of the carbon project. To ensure compliance, SPCP will integrate biodiversity safeguards into peatland restoration, protect ecosystems and wildlife, and adhere to legal conservation guidelines, while actively engaging local communities in its initiatives.
Law Number 41 of 1999 on Forestry	This law is relevant to SPCP as it provides the legal foundation for forest protection, restoration, and sustainable management within the program. To ensure compliance, the project will fully adhere to its provisions, reinforcing the project's legal legitimacy and ensuring its successful implementation throughout the project period.

Regulation Name	Relevance and Compliancy of the Project
Law Number 13 of 2003 on Manpower	This is relevant to SPCP as it regulates employment relations, worker rights, and labor protections, ensuring fair treatment, proper wages, and safe working conditions. To comply with this law, the SPCP will ensure fair wages, social security benefits, workplace safety, and non-discriminatory employment practices for all workers. The project also will follow labor regulations on contracts, working hours, and dispute resolution, ensuring that employment within the project aligns with national labor laws and international labor standards.
Law Number 40 of 2004 on the National Social Security System (SJSN)	This law is highly relevant to SPCP as it establishes the National Social Security System (SJSN), ensuring social protection for all workers. It mandates health and employment benefits, aligning with labour welfare standards. To comply with this law, the SPCP will commit to enrolling all employees in the national social security programs, covering health, work accidents, and pensions. This safeguards worker rights, fulfils legal obligations, and prevents potential sanctions.
Law Number 32 Year 2009 on Environmental Protection and Management	This law supports SPCP by providing a legal framework for sustainable environmental management. It aligns with carbon projects through its focus on conservation, pollution control, and ecosystem protection, while also regulating environmental impact assessments (AMDAL) and permitting processes. To comply with this law, the SPCP will ensure all activities follow environmental protection principles, secure necessary permits, and conduct AMDAL when required.
Law Number 24 of 2011 on the Social Security Organizing Agency (BPJS)	This law mandates social security coverage for workers, making it relevant to SPCP which employ staff and field workers. SPCP will commit to registering all employees with BPJS for health and employment benefits. This ensures worker protection, meets legal requirements, and avoids potential penalties.

Regulation Name	Relevance and Compliancy of the Project
Law Number 16 of 2016 on Ratification of the Paris Agreement on the United Nations Framework Convention on Climate Change	This law is relevant to SPCP as it reinforces Indonesia's commitment to the Paris Agreement, which aims to reduce greenhouse gas emissions and combat climate change. To comply with this law, SPCP will contribute to Indonesia's emission reduction targets by implementing verified carbon projects and following national regulations on climate action. This includes adhering to monitoring, reporting, and verification (MRV) standards to ensure transparency and effectiveness.
Law Number 18 of 2013 on The Prevention and Eradication of Forest Destruction	This law is relevant to SPCP as it regulates forest destruction, ensuring the protection of carbon stocks and ecosystem stability. Its provisions align with SPCP's efforts in sustainable forest management, conservation, and restoration. To comply with this law, SPCP will implement strict measures to prevent illegal logging and land conversion within project areas. This includes monitoring forest conditions, engaging local communities in conservation efforts, and adhering to government regulations on land use.
Law Number 6 of 2023 on the Stipulation of Government Regulation in Lieu of Law Number 2 of 2022 on Job Creation into Law	This law is relevant to SPCP as it introduces regulatory reforms affecting business licensing, environmental management, and labor policies, which are essential for carbon project implementation. To comply with this law, SPCP will adhere to the updated licensing procedures, environmental impact assessments, and labor regulations outlined in the Job Creation Law. This includes securing necessary permits, ensuring sustainable land use, and maintaining worker protections.
Government Regulation	
Government Regulation Number 50 of 2012 on Occupational Health and Safety Management System	This regulation is relevant to SPCP as it mandates the implementation of an Occupational Health and Safety Management System (SMK3) to ensure worker safety in forestry and land-use projects.

Regulation Name	Relevance and Compliancy of the Project
	To comply with this regulation, SPCP will implement SMK3 by identifying hazards, providing safety training, and enforcing protective measures. This includes conducting regular safety audits, carrying out emergency drills, and ensuring the use of personal protective equipment (PPE).
Government Regulation Number 71 of 2014 concerning Protection and Management of Peat Ecosystems	This regulation is relevant to SPCP as it ensures the conservation of peat ecosystems, which are key to carbon storage and emission reduction. To adhere to this regulation, SPCP will adopt sustainable peatland management practices, prevent land degradation, and follow government guidelines for peat restoration. This includes monitoring water table levels, preventing drainage activities that could cause peat decomposition, and engaging local communities in sustainable land-use practices.
Government Regulation Number 57 of 2016 concerning Amendments to Government Regulation number 71 of 2014 concerning Protection and Management of Peat Ecosystems	This regulation is relevant to SPCP as it emphasizes the protection of Peat Hydrological Units (KHG) by restricting land use that disrupts their hydrological function. To comply, SPCP will ensure that project activities do not interfere with the hydrological integrity of peatlands and will implement restoration measures where necessary.
Government Regulation Number 21 of 2021 on the Implementation of Spatial Planning	This regulation is relevant to SPCP as it provides a framework for sustainable land use planning to prevent environmental degradation and land-use conflicts. To comply, SPCP must ensure its activities align with spatial planning policies, secure appropriate land-use permits, and integrate project development within designated zoning regulations.
Government Regulation Number 22 of 2021 on Environemental Protection, Organisation and Management-	This regulation supports SPCP as it sets standards for environmental approvals, pollution control, and waste management while ensuring compliance through monitoring and sanctions.

Regulation Name	Relevance and Compliancy of the Project
	To adhere to this regulation, SPCP will obtain environmental approvals, manage pollution and waste responsibly, and conduct regular monitoring to preventing environmental violations and potential administrative sanctions.
Government Regulation Number 23 of 2021 on the Implementation of Forestry	This regulation is relevant to SPCP as it governs the management, utilization, and protection of forest areas, including licensing and conservation efforts. To comply with this regulation, SPCP will fulfil all licensing obligations, implement sustainable forest management practices, and contribute to conservation initiatives.
Government Regulation Number 24 of 2021 Procedure for Imposing Administrative Sanctions and Procedures for Non-Tax State Revenues Derived from Administrative Fines in the Forestry Sector	This regulation is relevant to SPCP as it regulates administrative sanctions and non-tax state revenue (PNBP) from fines in the forestry sector. To adhere to this regulation, SPCP will secure necessary permits, prevent unauthorized land use, follow administrative procedures, and fulfill financial obligations if sanctioned.
Government Regulation Number 35 of 2021 on Fixed-Term Employment Agreements, Outsourcing, Working Hours and Breaks, and Termination of Employment.	This regulation is highly relevant to SPCP as it establishes legal provisions for fixed-term employment agreements, outsourcing, working conditions, and termination of employment, ensuring compliance with labor rights and protections. To adhere to this regulation, SPCP will formalize employment contracts, uphold fair labor standards, and implement lawful termination procedures, ensuring legal certainty and workforce welfare in accordance with national labor laws.
Government Regulation Number 36 of 2021 on Wages.	This regulation supports SPCP as it sets legal guidelines for wages, including minimum wage requirements, payment systems, and wage protection, to promote fair worker compensation. To comply with this regulation, SPCP will implement wage policies that adhere to legal standards, ensure fair and timely payments, and uphold labor rights in accordance with national regulations.

Regulation Name	Relevance and Compliancy of the Project
Government Regulation Number 37 of 2021 concerning the Implementation of the Job Loss Guarantee Program.	This regulation is relevant to SPCP as it establishes the Job Loss Guarantee Program, which provides financial support, access to job training, and job placement services for terminated workers. In adherence to this regulation, SPCP will enroll eligible employees in the program, fulfill employer contribution requirements, and assist workers in obtaining benefits as stipulated by national labor laws.
Government Regulation in Lieu of Law Number 2 of 2022 on Job Creation.	This regulation supports SPCP by improving the investment ecosystem, business activities, and environmental governance, which are essential for sustainable project development. In adherence to this regulation, SPCP will comply with business licensing, labor provisions, and environmental management requirements to ensure regulatory alignment and effective project implementation.
Government Regulation in Lieu of Law Number 2 of 2022 on Job Creation	This regulation facilitates SPCP by improving the business climate, investment framework, and labor policies, which are essential for sustainable project execution. In alignment with this regulation, SPCP will fulfill requirements for business licensing, environmental management, and labor compliance to ensure regulatory adherence and efficient project operations.
Government Regulation Number 36 of 2024 on Types and Tariffs for Non-Tax State Revenues Applicable to the Ministry of Environment and Forestry	This regulation is relevant to SPCP as it defines the types and tariffs of Non-Tax State Revenues (PNBP) within the Ministry of Environment and Forestry, including fees for forest utilization, environmental compensation, and administrative fines. In adherence to this regulation, SPCP will fulfill financial obligations related to forest area use, permits, and environmental impact management to ensure compliance with applicable fiscal and environmental policies.
Presidential decree - regulation	

Regulation Name	Relevance and Compliancy of the Project
Regulation of the President of The Republic of Indonesia Number 98 of 2021 on The Implementation of Carbon Pricing to Achieve the Nationally Determined Contribution Target and Control over Greenhouse Gas Emissions in the National Development	This regulation is relevant to SPCP as it establishes carbon pricing mechanisms to support Indonesia's NDC targets and GHG reduction efforts. It promotes accountability in carbon trading and climate mitigation. In compliance, SPCP will align with national policies, ensure transparency, and participate in monitoring and evaluation.
Presidential Decree Number 32 of 1990 on Management of Protected Areas; July 25, 1990	This regulation is relevant to SPCP as it establishes guidelines for the management of protected areas. To comply with this regulation, SPCP will adhere to land-use restrictions, implement conservation measures, and support sustainable management practices within protected areas. This includes preventing illegal activities, restoring degraded ecosystems, and aligning project activities with national conservation objectives.
Presidential Instruction Number 3 of 2020 on Forestry and Land Fire Management	This regulation aligns with SPCP's objectives by mandating comprehensive forest and land fire management, including prevention, suppression, and post-fire recovery. To comply with this regulation, SPCP will implement fire prevention measures, conduct regular monitoring, and collaborate with authorities for fire suppression and post-fire restoration efforts.
Ministerial Decree	
Minister of Environment and Forestry Regulation Number: P.73 / Menhut-II / 2014: Business Plan for Utilization of Carbon Absorption and / or Storage in Production Forests; 22 September 2014	This regulation is relevant to SPCP as it establishes guidelines for carbon absorption and storage utilization in production forests, directly supporting carbon project implementation. To adhere to this regulation, SPCP will formulate a business plan that meets regulatory standards, secure the required permits, and implement sustainable forest management practices to optimize carbon sequestration.

Regulation Name	Relevance and Compliancy of the Project
Minister of Forestry Regulation Number: P.43 / Menhut-II / 2013 concerning Boundary Arrangement of Forest Utilization Permits Work Area, Principle Approval of Forest Area Use, Principle Approval of Release of Forest Areas and Management of Forest Areas in Forest Management Units and Forest Areas with Special Purpose; 19 August 2013	This regulation ensures legal certainty in forest land use by outlining guidelines for delineating forest utilization areas, making it relevant to SPCP in establishing clear project boundaries for carbon initiatives. In adherence to this regulation, SPCP will accurately define project areas, secure required forest use approvals, and comply with land management provisions within designated forest zones.
Minister of Forestry Regulation Number: P. 19 / Menhut-II / 2011 concerning Boundary Arrangement of Forest Utilization Permits Working Area;	This regulation is relevant to SPCP as it provides guidelines for establishing clear boundaries for forest utilization permit areas, ensuring legal certainty in land use for carbon projects. To comply with this regulation, SPCP will conduct boundary delineation in accordance with the prescribed procedures, secure necessary permits, and ensure all project activities remain within the designated areas.
Minister of Environment and Forestry Regulation Number: P.32 / MenLHK / Setjen / Kum.1 / 3/2016 concerning Forest and Land Fire Control; 15 March 2015	This regulation aims to ensure effective forest and land fire control through prevention, suppression, and recovery measures, making it relevant to SPCP in protecting carbon stocks. To comply, SPCP will implement fire prevention strategies, allocate response resources, and engage local communities in fire management.
Minister of Environment and Forestry Regulation Number: P.74 / Menhut-II / 2014: Application of Silvicultural Techniques in Business Utilization and / or Storage of Carbon in Production Forests; 22 September 2014	This regulation outlines silvicultural techniques for carbon absorption, aiming to enhance carbon sequestration in biomass. It is relevant to SPCP as it provides guidance on nursery development, planting, enrichment, natural regeneration, and maintenance. To comply, SPCP will implement these techniques to optimize carbon storage and ensure sustainable forest management.
Minister of Environment and Forestry Letter Number: S.661 / Menlhk-Setjen / Rokum / 2015 regarding Instruction for Peatland Management; 5 November 2015	This regulation provides directives for peatland management to prevent degradation and maintain its ecological functions. It is relevant to SPCP as it emphasizes sustainable peatland use, which is essential for carbon storage and emissions reduction.

Regulation Name	Relevance and Compliancy of the Project
	To ensure compliance, SPCP will implement the required management practices, including maintaining water levels, restricting land use, and applying conservation measures.
Minister of Environment and Forestry Circular Letter Number: SE.494 / MENLHK-PHPL / 2015 concerning Prohibition of Clearing Peatlands dated November 3, 2015; 3 November 2015	This regulation prohibits peatland clearing to protect its ecological functions and prevent carbon emissions. It is relevant to SPCP as it aligns with efforts to conserve peat ecosystems for long-term carbon storage. To adhere to this regulation, SPCP will avoid land conversion, implement sustainable land management, and apply conservation measures to maintain peatland integrity.
Letter of the Head of the Peatland Restoration Agency Number: SE.02 / KB / 11/2016 concerning Directions for Pre-Arrangement of Peatlands in the Area of Business Permits for Utilization of Forest Products in Production Forests; November 11, 2016	This letter outlines guidelines for peatland preparation in forest utilization permit areas to enhance restoration and sustainability. It is relevant to SPCP as it emphasizes responsible peatland management, which is crucial for carbon sequestration and ecosystem conservation. Following this directive, SPCP will adopt pre-restoration strategies, regulate water levels, and implement sustainable land management practices within its project sites.
Minister of Environment and Forestry Regulation Number: P.70/MENLHK/SETJEN/ KUM.1/2017 concerning Procedures for Measurement, Reporting, and Verification (MRV) of Climate Change Mitigation Actions in the Forestry Sector	This regulation establishes MRV procedures for forestry-related climate mitigation actions. It is relevant to SPCP as it provides a framework for monitoring carbon stock changes and ensuring transparency in emission reductions. To follow this regulation, SPCP will use standard MRV methods, submit regular reports, and go through verification to support national climate goals.
Minister of Environment and Forestry Decree Number: SK.130/MENLHK / SETJEN / PKL.0 / 2/2017 concerning the Establishment of the National Peat Ecosystem Function Map; 28 February 2017	This regulation defines the National Peat Ecosystem Function Map, which classifies peat areas for conservation and sustainable use. It is relevant to SPCP as it guides land use planning to protect peatland carbon stocks.

Regulation Name	Relevance and Compliancy of the Project
	To comply, SPCP will align project activities with designated peatland functions, ensuring conservation in protected areas and responsible management in utilization zones.
Minister of Environment and Forestry Decree Number: SK.129 / MENLHK / SETJEN / PKL.0 / 2/2017 concerning the Establishment of the National Peat Hydrological Unit Map; 28 February 2017	This regulation establishes the National Peat Hydrological Unit Map, defining peatland areas critical for conservation and management. It is relevant to SPCP as it provides a framework for identifying and protecting key peatland ecosystems, essential for carbon storage. To comply, SPCP will align its activities with designated hydrological units, ensuring responsible land use and conservation of peat resources.
Minister of Environment and Forestry Regulation Number: P.73 / MENLHK / SETJEN / KUM.1 / 12/2017 concerning Guidelines for Implementation and Reporting of National GHG Inventory; December 29, 2017	This regulation provides guidelines for conducting and reporting the National Greenhouse Gas (GHG) Inventory to ensure accurate and standardized emissions data. It is relevant to SPCP as it establishes the reporting framework for emissions reduction efforts, including those from forestry sector. To align with this regulation, SPCP will implement the required methods for data collection, reporting, and verification to support Indonesia's national GHG inventory system.
Minister of Environment and Forestry Regulation Number: P.72 / MENLHK / SETJEN / KUM.1 / 12/2017 concerning Guidelines for Implementation of Measurement, Reporting and Verification and Resources for Climate Change Control; December 29, 2017	The purpose of this regulation is to provide guidelines for the implementation of Measurement, Reporting, and Verification (MRV) and resource management for climate change control. It is relevant to SPCP as it supports transparency and accountability in monitoring carbon sequestration and emission reductions. To align with this regulation, SPCP will adopt the prescribed MRV methods, maintain accurate records, and report mitigation outcomes in accordance with national requirements.
Minister of Environment and Forestry Regulation Number: P.71 / MENLHK / SETJEN / KUM.1 /	The purpose of this regulation is to establish the National Registry System for Climate Change Control to track and document mitigation, adaptation, and support actions.

Regulation Name	Relevance and Compliancy of the Project
12/2017 concerning Implementation of the National Registry System for Climate Change Control; December 29, 2017	It is relevant to SPCP as it ensures that carbon sequestration activities are recorded and recognized within Indonesia's climate action framework. To align with this regulation, SPCP will register its project data, report emission reductions, and maintain transparency in accordance with national requirements.
Minister of Environment and Forestry Regulation Number: P.83 / MenLHK / Kum.1 / 10/2016 concerning Social Forestry; 25 October 2016	The purpose of this regulation is to provide a legal framework for Social Forestry, enabling community participation in forest management to improve welfare and sustainability. It is relevant to SPCP as it promotes inclusive forest governance, which aligns with community-based carbon projects. To align with this regulation, SPCP will engage local communities, support sustainable livelihood practices, and ensure community involvement in forest conservation efforts.
Minister of Environment and Forestry Regulation Number: P.16 / MENLHK / SETJEN / KUM.1 / 2/2017 concerning Technical Guidelines for Restoring the Function of Peatland Ecosystems; 9 February 2017	This regulation guides peatland restoration to maintain biodiversity, water management, and carbon storage. This regulation is relevant to SPCP as it provides a framework for restoring degraded peatlands, which is essential for maintaining carbon storage and reducing emissions. To align with this regulation, SPCP will implement measures such as rewetting, revegetation, and sustainable management to restore peatland ecosystems.
Minister of Environment and Forestry Regulation Number: P.15 / MENLHK / SETJEN / KUM.1 / 2/2017 concerning Procedures for Measuring Groundwater Levels at Peat Ecosystems Compliance Points; 9 February 2017	This regulation is highly relevant to SPCP as it establishes procedures for measuring groundwater levels in peat ecosystems, which is crucial for maintaining peat stability and carbon storage. To adhere to this regulation, SPCP will monitor and manage groundwater levels to prevent peat degradation and support emissions reduction efforts.
Minister of Environment and Forestry Regulation Number: P.14 / MENLHK / SETJEN / KUM.1 / 2/2017 concerning Procedures for Inventory	This regulation is highly relevant to SPCP as it provides guidelines for identifying and classifying peat ecosystem functions, which are essential for carbon storage and conservation efforts. To comply with this regulation, SPCP will conduct peat

Regulation Name	Relevance and Compliancy of the Project
and Determination of Peat Ecosystem Functions; 9 February 2017	ecosystem inventories and ensure proper classification to support sustainable management and emissions reduction initiatives.
Minister of Environment and Forestry Regulation Number: P.106/Menlhk/Setjen/ Kum.1/12/ 2018 on the Second Amendment to the Regulation of the Minister of Environment and Forestry Number P.20/Menlhk/Setjen/ Kum.1/6/2018 on Types of Protected Plants and Animals	This regulation is relevant to SPCP as it ensures the protection of plant and animal species within project areas, supporting biodiversity conservation alongside carbon sequestration efforts. To adhere to this regulation, SPCP will identify and safeguard protected species, integrate conservation measures into project activities, and prevent any actions that may threaten biodiversity.
Minister of Environment and Forestry Regulation Number: P.9 / MENLHK / SETJEN / KUM.1 / 3/2018 concerning Technical Criteria for Forest and Land Fire Preparedness and Emergency Status; March 7, 2018	This regulation is highly relevant to SPCP as it establishes the technical criteria for determining forest and land fire preparedness and emergency status, which is crucial for protecting carbon stocks and ensuring the sustainability of carbon projects. To comply, SPCP will implement fire prevention measures, conduct risk assessments, and respond promptly to fire emergencies in accordance with the prescribed technical criteria.
Minister of Environment and Forestry Regulation Number: P.8 / ME NLHK / SETJEN / KUM.1 / 3/2018 concerning Fixed Procedures for Field Checking Information on Hotspots and / or Information on Forest and Land Fires; March 7, 2018	This regulation provides standardized procedures for verifying hotspot information and forest and land fire occurrences, ensuring accurate reporting and timely response. It is highly relevant to SPCP as reliable fire monitoring is essential for protecting carbon stocks and maintaining ecosystem integrity. To comply, SPCP will adopt prescribed field-checking methods, integrate remote sensing data, and coordinate with relevant authorities to ensure effective fire prevention and mitigation efforts.
Minister of Environment and Forestry Regulation Number: P.21/MENLHK/SETJEN/	This regulation is highly relevant to SPCP as it ensures clear delineation of forest boundaries, preventing land-use conflicts and securing project areas. Accurate

Regulation Name	Relevance and Compliancy of the Project
KUM.1/2019 concerning Forest Boundary Arrangement, which regulates the mapping of state forest physical boundaries.	boundary mapping is essential for effective carbon project implementation and long-term conservation efforts. In adherence to this regulation, SPCP will follow official boundary mapping guidelines and coordinate with authorities to verify designated forest zones, ensuring alignment with national regulations.
Minister of Environment and Forestry Regulation Number: P.10 / Menlhk / Setjen / Kum.1 / 3/2019 concerning Determination, Determination and Management on top of Peat Dome Based on Peat Hydrological Unit; March 20, 2019	This regulation is highly relevant to SPCP as it guides the management of peat domes within Peat Hydrological Units (KHG) to maintain ecosystem stability and carbon storage. SPCP adheres to this regulation by applying the prescribed management principles to support peatland conservation and emission reduction.
Minister of Environment and Forestry Regulation Number: P.14/MENLHK/SETJEN/ KUM.1/2021 concerning Greenhouse Gas (GHG) Inventory in the Forestry Sector	This regulation establishes guidelines for GHG inventory in the forestry sector and is relevant to SPCP as it provides a framework for consistent carbon measurement and reporting. To comply with this regulation, SPCP will implement these standards to support national climate targets.
Minister of Environment and Forestry Regulation Number 9 of 2021 on Management of Social Forestry	This regulation is highly relevant to SPCP as it promotes community-based forest management, contributing to sustainable land use and ecosystem resilience. To comply with this regulation, SPCP will collaborate with local communities to implement sustainable forestry practices, enhance carbon storage, and strengthen community involvement in conservation efforts.
Minister of Environment and Forestry Regulation Number 8 of 2021 on the Forestry Management and the Preparation of Forestry Management Plan, as well as Forestry Utilization in Protected Forest and Production Forest	This regulation is highly relevant to SPCP as it establishes guidelines for sustainable forest management and utilization in protected and production forests, ensuring ecological balance and resource sustainability.

Regulation Name	Relevance and Compliancy of the Project
	To comply with this regulation, SPCP will align its forestry activities with the approved management plans, apply responsible utilization practices, and monitor forest conditions to support long-term carbon sequestration and conservation goals.
Minister of Environment and Forestry Regulation Number 7 of 2021 concerning Forestry Planning, Changes in the Designation of Forest Areas and Changes in the Functions of Forest Areas, as well as the Use of Forest Areas	This regulation provides a framework for forestry planning, reclassification, and forest area utilization to balance conservation and development, making it relevant to SPCP as it ensures project activities align with designated forest functions to support carbon storage and ecosystem conservation. To comply with this regulation, SPCP will ensure that its activities align with designated forest functions, adhere to permitted land uses, and support sustainable forest management to enhance carbon sequestration.
Minister of Manpower Regulation Number 5 of 2021 concerning Procedures for the Implementation of the Work Accident Insurance, Death Insurance, and Old Age Security Programs	This regulation is highly relevant to SPCP as it ensures the protection of workers involved in project activities by regulating work accident insurance, death insurance, and old age security. To comply with this regulation, SPCP will provide the necessary social security coverage for its workforce, ensuring their safety and well-being while carrying out project operations.
Minister of Environment and Forestry Regulation Number: P.15/MENLHK/SETJEN/ KUM.1/2022 concerning Procedures for Land-Based Comprehensive Forest Inventory (IHMB), which requires holders of IUPHHK-HA, IUPHHK-HTI, and IUPHHK-RE to conduct IHMB every 10 years	This regulation is highly relevant to SPCP as it mandates comprehensive forest inventory (IHMB) every 10 years, which is essential for monitoring project areas, assessing carbon stocks, and tracking land use changes over time. To comply with this regulation, SPCP will conduct periodic forest inventories following the prescribed methods, supporting sustainable forest management and carbon monitoring efforts.

Regulation Name	Relevance and Compliancy of the Project
Decree of the Minister of Environment and Forestry Number: SK.1295/MENLHK/ SETJEN/PLA.2/12/2022 concerning the Indicative Map and Social Forestry Areas (PIAPS)	This regulation is highly relevant to SPCP as it designates forest areas for social forestry, ensuring community involvement in sustainable forest management and conservation. To comply with this regulation, SPCP will align its activities with designated PIAPS areas, support community-based forest initiatives, and integrate social forestry practices into carbon project strategies.
Minister of Environment and Forestry Regulation Number 21 of 2022 on the Guidelines of Carbon Economic Value Implementation	This regulation is highly relevant to SPCP as it provides guidelines for implementing carbon economic value, including carbon trading, results-based payments, and other market mechanisms. To comply with this regulation, SPCP will align its carbon accounting and reporting practices with national standards, ensuring transparency and eligibility for participation in Indonesia's carbon market.
Minister of Environment and Forestry Regulation Number 11 of 2022 on the Profession and Competence of Forest Management Technical staff	This regulation provides competency standards for forest management technical staff, making it relevant to SPCP in ensuring qualified personnel for sustainable project implementation. To comply, SPCP will engage certified professionals and enhance staff capacity to meet national competency requirements in forest management.
Circular Letter of the Minister of Environment and Forestry Number: SE.6/MenLHK/Setjen/ KUM.1/12/2022 on Approval of Work Plans for Multi-Enterprise Forest Utilization Businesses	This regulation provides SPCP with guidelines for the approval of work plans for Multi-Enterprise Forest Utilization Businesses (RKUPH Multiusaha Kehutanan), a crucial step in accelerating multi-enterprise forestry, as mandated by Law Number 11 of 2020 on Job Creation. To comply with this regulation, SPCP will ensure that the work plans for forest utilization within the project follow the RKUPH Multiusaha Kehutanan approval process and that the required environmental documents are updated accordingly.

Regulation Name	Relevance and Compliancy of the Project
Minister of Environment and Forestry Regulation Number: P.38/MENLHK/SETJEN/ KUM.1/2023 concerning Procedures for Inventory and Mapping of Forest Areas	This regulation is highly relevant to SPCP as it establishes guidelines for forest area inventory and mapping, which are crucial for accurate carbon stock assessments and sustainable land management. To comply with this regulation, SPCP ensures precise delineation of project areas, supporting effective monitoring, reporting, and verification of carbon sequestration activities.
Minister of Environment and Forestry Regulation Number 7 of 2023 concerning Procedures for Carbon Trading in the Forestry Sector	This regulation is highly relevant to SPCP as it establishes the legal foundation for carbon trading in the forestry sector, directly supporting the project's goal of generating verified carbon credits. To comply with this regulation, SPCP will adhere to the established procedures for carbon trading, accurately report emissions reductions, and ensure compliance with national policies.
Directorate decree-regulation	
Regulation of the Director General of Forestry Planning Number: P. 5 / VII-KUH / 2011 concerning Technical Guidelines for Implementation of Boundary Arrangement of Forest Utilization Permits; 22 June 2011	This regulation is highly relevant to SPCP as it establishes technical guidelines for boundary arrangement in forest utilization areas, ensuring clear delineation of project boundaries. To adhere to this regulation, SPCP will follow these guidelines to accurately define project areas, prevent land use conflicts, and support compliance with forest utilization permits.
Regulation of the Director General PHPL Number: SK.63/PHPL/SET.5/KUM.1/3/2016 concerning Technical Guidelines for IHMB in Natural Production Forest.	This regulation is highly relevant to SPCP as it provides technical guidelines for conducting Comprehensive Forest Inventory (IHMB) in natural production forests, ensuring accurate forest data collection. To adhere to this regulation, SPCP will implement IHMB following the prescribed methods to assess forest conditions, monitor carbon stocks, and support sustainable forest management.

Regulation Name	Relevance and Compliancy of the Project
Regulation of the Director General Number: P.18 / PSKL / SET / PSL.0 / 11/2016 concerning Guidelines for Preparation of Cooperation Agreement Drafts; 16 December 2016	This regulation is highly relevant to SPCP as it provides guidelines for drafting cooperation agreements, ensuring clarity and legal certainty in partnerships related to social forestry. To adhere to this regulation, SPCP will follow the prescribed framework to develop agreements that align with regulatory requirements, promote fair collaboration, and support effective project implementation.
Regulation of the Director General PSKL Number: P.23 / PSKL / SET / PSL.3 / 12/2016 concerning: Guidelines for the Role of Business Actors in the Implementation of Environmental and Forestry Protection and Management; December 30, 2016	This regulation provides guidelines for business actors in environmental and forestry protection and management, making it relevant to SPCP in ensuring responsible project implementation. To adhere to this regulation, SPCP will align its activities with these guidelines, promote sustainable forest management, and engage stakeholders in conservation efforts.
Regulation of the Director General of Sustainable Production Forest Management Number: P.14 / PHPL / SET / 4/2016 concerning Standards and Guidelines for Implementation of Performance Assessment of Sustainable Production Forest Management (PHPL) and Verification of Timber Legality (VLK); 29 April 2016	This regulation is highly relevant to SPCP as it establishes standards for assessing sustainable production forest management (PHPL) and verifying timber legality (VLK), ensuring responsible forest utilization. To adhere to this regulation, SPCP will implement sustainable forest management practices, comply with timber legality verification requirements, and support transparent reporting on forest resource use.
Regulation of the Director General of Sustainable Production Forest Management Number: P.5 / PHPL / UHP / PHPL.1 / 2/2016 concerning Guidelines for Potential Mapping and Conflict Resolution in Holders of Business Permits for Utilization of Timber Forest Products (IUPHHK) in Production Forests; 25 February 2016	This regulation is highly relevant to SPCP as it provides guidelines for mapping potential resources and resolving conflicts within timber forest product utilization permit (IUPHHK) areas, ensuring sustainable forest management. To adhere to this regulation, SPCP will conduct comprehensive mapping of project areas, identify and address potential conflicts, and implement strategies to support harmonious land use and stakeholder engagement.

Regulation Name	Relevance and Compliancy of the Project
Decree of the Head of the Peatland Restoration Agency Number: SK.05 / BRG / KPTS / 2016 concerning the Establishment of an Indicative Map for Peat Restoration; 14 September 2016	This regulation is relevant to SPCP as it establishes the Indicative Map for Peat Restoration, which serves as a guide for identifying priority areas for peatland recovery. To comply with this regulation, SPCP will align its project activities with the designated restoration zones, incorporate detailed peatland management planning, and support ecosystem protection in the targeted areas.
Regulation of the Director General of Sustainable Production Forest Management Number: P. 3 / PHPL / SET / kum.0 / 2/2017 concerning Guidelines for Periodic Forest Carbon Inventory (IKHB) in Businesses to Utilize Carbon Absorption and / or Storage in Production Forests; 27 February 2017	This regulation supports SPCP by offering a framework for periodic forest carbon inventories (IKHB), which are crucial for carbon absorption and storage in production forests. It aligns with SPCP's carbon projects by focusing on precise carbon measurement and reporting, in line with sustainable forest management practices. To comply with this regulation, SPCP will ensure the implementation of regular forest carbon inventories (IKHB), following the prescribed guidelines and reporting carbon stocks as required.
Regulation of the Director General of Climate Change Monitoring Number: P.3 / PPI / SET / KUM.1 / 1/2018 concerning the Establishment and Development of a Fire Concerned Community; 31 January 2018	This regulation is relevant to SPCP by outlining the creation of fire-conscious communities, crucial for preventing forest fires that could impact carbon projects. To comply with this regulation, SPCP will promote fire-conscious community programs and adopt fire management practices to protect carbon storage areas.
Regulation of Director General of Climate Change Monitoring Number: P. 8/PPI/PKHL/ PPI.4/10/2018 on Guidelines for Reporting Control of Forest and Land Fires	This regulation provides guidelines for reporting the control of forest and land fires, making it relevant to SPCP by ensuring proper fire risk management in carbon projects. To comply with this regulation, SPCP will implement fire management practices, monitor fire incidents, and submit the required reports to protect carbon storage areas.
Regulation of the Director General of Climate Change Monitoring Number: P.3/PPI/SET/	This regulation guides the establishment and development of fire-conscious communities, making it relevant to SPCP by helping prevent forest fires that could impact carbon projects and supporting community involvement in fire prevention and the protection of carbon storage areas.

Regulation Name	Relevance and Compliancy of the Project
KUM.1/1/2018 on the Establishment and Development of a Fire Concerned Community	To comply with this regulation, SPCP will assist in developing fire-conscious communities, implement fire prevention programs, and collaborate with local stakeholders to safeguard carbon storage areas.
Circular Letter of the Director General of Sustainable Production Forest Management Number: SE.1 / PHPL / IPHH / HPL.4 / 1/2020 concerning Implementation of GANIS PHPL Determination; 29-01-2020	This circular letter supports SPCP's carbon initiatives by guiding the proper certification and registration of professionals involved in forest management, aligning with the requirements for carbon projects in production forests. To comply with this regulation, SPCP will ensure that all relevant professionals in the project are certified according to the established standards, and will follow the procedures for registering through SIGANISHUT.
Circular Letter of Director General of Sustainable Production Forest Management Number: SE.7/PHL/PUPH/HPL.1/10/2022 on Protection of Protected Wildlife in the Working Area of Forest Utilization Permits (PBPH)	This regulation provides guidelines on the protection of protected wildlife within the working areas of forest utilization permits, making it relevant to SPCP by ensuring wildlife protection within carbon project areas. To comply with this regulation, SPCP will implement measures to protect wildlife in the project areas, including conducting regular monitoring and ensuring that activities do not negatively impact protected species.

APPENDIX 4: STAKEHOLDER DESCRIPTION TABLE

Stakeholder		**Rights, interest, and overall relevance to the project**
Communities	**Project-zone village residents**	All communities residing in the 14 villages within and/or adjacent to the project area, whose income, livelihoods, or cultural values are derived from the area, are collectively referred to as the project-zone communities.
Groups	**Farmers**	Groups of people who make living through traditional farming (e.g., rice, corn and vegetables), agroforestry (such as rubber plantation and honey production) and raising animals such as chickens, pigs and cattle. Some of these groups are still practising shifting cultivation as well as slash and burn which can pose a threat to the project area.
	Fishermen	Groups of people who are dependent on rivers in the project area (i.e. Seluan River, Uluk Palin River, and Sibau River) a for a living through traditional fisheries and/or aquaculture.
	Non-timber forest product (NTFP) collectors	Groups of people who make a living by collecting non-timber forest products such as mushroom, honey, rattan, resin, kratom, medicinal plants, and more from the forested area of the project area. Additionally, they engage in the processing of rattan into handcrafted items such as hats, mats, baskets, bags, and kitchen storage, while also producing textiles from natural dyes and crafting mats from fibers like Purun.
	Loggers	Groups of people engaged in the extraction of commercial timber from the project area and selling logs to local communities based on demand. Additionally, some individuals utilize timber for personal use

	Hunters	Individuals or groups of people engaged in hunting wildlife from the project area (e.g. birds, deer, pigs) for consumption and/or to generate household income.
	Marginalized Groups	Communities in the project area who are vulnerable due to factors such as disability, widowhood, or advanced age, which often result in social and economic marginalization. These groups typically face limited access to programs and services that could enhance their livelihoods, hindered by physical, geographical, or economic barriers. Moreover, they are frequently excluded from decision-making processes, with their needs and concerns neglected in local governance initiatives.
Other stakeholders		
Central government	Ministry of Forestry (BKSDA, TN Betung Kerihun, BPHL, BPKH, Manggala Agni)	A central government authority responsible for formulating policies, overseeing and supervising forestry activities up to the provincial level, thereby shaping the project through regulatory frameworks and strategic cooperation. This project will engage in close collaboration with these agencies, ensuring seamless alignment with their mandates and institutional responsibilities.
Local government	Provincial Forestry Government (Dishut Provinsi, KPH)	A provincial government entity charged with the implementation of forestry policies, management, and oversight, exerting influence on the project through policy guidance, technical support, and the monitoring of forestry activities. The project will pose no detrimental effects; rather, it will engage in close collaboration, reinforcing and aligning with the entity's mandates and responsibilities.

	District Government (DLH, Dinas Pertanian, BPMDES, BPBD)	A local government body at the municipal/regency level, functioning under the principle of autonomy, entrusted with the administration of regional affairs and accountable to the central government. This entity possesses the capacity to exert substantial influence on the project through its policy frameworks and regional development initiative, particularly within the sectors of agriculture, environmental stewardship, and community empowerment. The project will engage in constructive collaboration with this entity, ensuring alignment with its strategic and regional priorities.
	Sub-district Government (Camat)	The Sub-district head (Camat) serves as a liaison between the district government and village governments, overseeing matters related to development, village boundaries, inter-village conflict, and the supervision of village administration. In relation to the project, the Camat acts as a mediator between the company and the village governments, facilitating the resolution of issues, particularly those concerning project activities at the village level. The implementation of the project will have no adverse impacts on the sub-district authority but will instead foster constructive collaboration to ensure alignment with local governance structures.
	Village Government (Pemdes, BPD, Bumdes)	The Village Government (Pemdes) serves as the primary administrative authority at the village level, functioning as the local arm of both central and regional governments. It plays a pivotal role in implementing development initiatives and managing community affairs. Through its decisions and policies, Pemdes can directly shape project outcomes within the village. Supporting this structure, the Village Consultative Body (BPD) acts as a representative institution with legislative and oversight responsibilities, offering strategic value in drafting village regulations particularly those related to environmental protection and the prevention of illegal logging. Complementing these governance roles, the Village Owned Enterprise

		(Bumdes) operates as an economic instrument to harness local potential, positioning itself as key partner in scaling and marketing community driven business initiatives.
Customary Institution	Dayak Customary Council (DAD)/Dewan Adat Dayak (DAD)	The Dayak Customary Council is a traditional institution composed of representatives from various Dayak sub-ethnic groups across both district and provincial levels. Its role parallels that of customary institutions at the village and customary territory (ketemenggungan) levels, particularly in preserving cultural traditions, resolving conflicts through customary mechanisms, safeguarding customary lands, and serving as a bridge between local communities and the government. As the highest customary authority at the district and provincial level, the Dayak Customary Council may serve as a key mediator in addressing customary issues arising between the company and local customary institutions at the village or ketemenggungan level within the context of the project.
	Regional Indigenous People / Ketemenggungan	The Ketemenggungan is a customary institution overseeing multiple villages, holding greater authority than village-level customary bodies, particularly in matters of customary law and territorial rights. Its decisions carry significant weight for project activities within the concession area, which is traditionally recognized as part of its ancestral domain.
	Village Indigenous People / Lembaga adat desa	The village-level customary institution holds significant influence, serving to preserve traditional customs, resolve conflicts through customary law, safeguard ancestral territories, and act as a liaison between the community and the village government. Its decisions and customary laws, such as activity restrictions or customary sanctions can directly affect project operations within the concession area, which is regarded as part of ancestral land. The project has formally informed this institution that its

		implementation will not cause adverse environmental impacts and will fully align with customary norms and regulations
Non-Governmental Organizations (NGOs)	Yayasan Sangga Buana Lestari	A local NGO focused on environmental conservation and community development, actively supporting the establishment of Village Forests (Hutan Desa) and Customary Forests (Hutan Adat) in areas that may intersect with the Project Area. Should these proposals be approved, they would require careful coordination to ensure alignment with project boundaries and to support mutually respectful land management practices.
	Taruna Tani Permata Khatulistiwa	A youth-based organization engaged in sustainable agriculture, with a focus on promoting organic farming through hydroponics. It also supports hydroponic initiatives for women's groups (PKK) at both district and village levels. Given its expertise, the organization presents strong potential for collaboration with the project's supported farmer groups to advance eco-friendly agriculture and enhance local livelihoods in line with the project's objectives.
	PRCF	Since 2016, PRCF (People Resources and Conservation Foundation) has played a key role in environmental conservation in Nanga Lauk Village. It established and continues to support the Village Forest Management Institution (LPHD), overseeing 1,430 hectares. PRCF provides capacity building for forest patrols to detect illegal activities, supports ecosystem rehabilitation, and promotes forest-based enterprises such as rattan, honey, and rubber. The foundation holds strong influence in Nanga Lauk through its institutional support, patrol team development, enterprise facilitation, and contribution to village-level regulations. In relation to the project, PRCF offers valuable opportunities for collaboration in forest monitoring, livelihood development, and regulatory strengthening at the village level.

	Aliansi Masyarakat Adat Kapuas Hulu (AMAKH)	The Kapuas Hulu Indigenous Peoples Alliance (AMAKH) is part of the national AMAN network, which focuses on indigenous rights through policy advocacy, territorial mapping, and economic empowerment. AMAKH holds significant influence among indigenous communities in North Putussibau and has actively supported the establishment of customary forests in Banua Tengah, Nanga Nyabau, and Sungai Uluk Palin.
	Bentang Kalimantan Tangguh	Bentang Kalimantan Tangguh is a local NGO based in West Kalimantan, focusing on tropical forest conservation, sustainable natural resource management, and community empowerment. Although its operational areas do not overlap with the project's concession villages, the organization holds influence in Kapuas Hulu on issues related to forest governance and carbon trading. In the context of the project, it may shape village government perspectives on carbon market mechanisms within the concession area.
	Mananang Banua	Mananang Buana is a youth organization legally constituted as an association, representing the young people of the Tamambaloh Apalin Ketemenggungan. The organization advocates for the establishment of village and customary forests in four villages (Sungai Uluk Palin, Nanga Nyabau, Banua Tengah, and Lauk). With significant influence within the indigenous community, local governments, and the residents of Tamambaloh, Mananang Buana is well-positioned to serve as a mediator or conciliator in resolving conflicts or issues in Nanga Nyabau, Sungai Uluk Palin, and Banua Tengah.
Private Sector	PT BIA	A palm oil company in close proximity to the Project Area, whose activities, including the expansion of oil palm plantations by local communities partnered with the company, may impact the project.

	PT Harkat Luhur Ekosistem	A PBPH operating near the project area, which could be seen as a potential partner besides a competitor to the project.
	Kalimantan Agro Lestari	A palm oil company operating near the project area, particularly in North Putussibau District, which may impact the project through the expansion of oil palm plantation areas in several nearby villages, potentially altering land-use patterns.
	Keling Kumang Agro	A cooperative-based enterprise specializing in livestock and agriculture, particularly in providing layers (egg-laying chickens) and feed, hybrid corn seeds, farming tools, and related training. Additionally, it serves as a buyer for products from its partners, such as eggs and corn. This organization may impact the project positively, especially through collaboration with local community business groups within the project zone.

APPENDIX 5: LIST OF CONSULTATION MEETINGS

Appendix 5.1 Informational meetings with communities and local government

Date	Type of Engagement	Description	Community representation	Participants		
				Male	Female	Total
27-Jul-22	Introductory meeting	Introduction and socialization about PT ASK with village leaders, district representative, and indigenous leaders in Putussibau Utara Sub-District.	9 villages government, district level stakeholder, indigenous figures representatives	19	4	23
28-Jul-22	Introductory meeting	Introduction and socialization about PT ASK with village leaders, district representative, and indigenous leaders in Embaloh Hilir Sub-District.	5 villages government, district level stakeholder, indigenous figures representatives	13	6	19
Aug - Oct 2022	Introductory and socialization meeting	Introduction and socialization about PT ASK in 14 villages, involving the local community, community public figures, indigenous village representative.	Sibau Hulu, Tanjung Lasa, Nanga Awin, Tanjung Beruang, Jangkang, Seluan, Nanga Nyabau, Sungai Uluk Palin, Benua Tengah, Nanga Lauk, Nanga Palin, Keliling Semulung, Pala Pintas, and Kirin Nangka	159	479	638

Date	Type of Engagement	Description	Community representation	Participants		
				Male	Female	Total
Dec 2022 - Feb 2023	Socio-Economic Baseline Assessment	Village potential survey in 14 villages through household in-depth interview and field checking. Consent was obtained from interview subjects before commencing each interview.	Sibau Hulu, Tanjung Lasa, Nanga Awin, Tanjung Beruang, Jangkang, Seluan, Nanga Nyabau, Sungai Uluk Palin, Benua Tengah, Nanga Lauk, Nanga Palin, Keliling Semulung, Pala Pintas, and Kirin Nangka	104	261	365
May 2023 – Feb 2024	Socio-Economic Baseline Result Socialization	Socialization of village potential (Socio-Economic Baseline Assessment) survey results and village potentials that can collaborate with ASK in 10 villages.	Sibau Hulu, Tanjung Lasa, Nanga Awin, Jangkang, Nanga Palin, Kirin Nangka, Tanjung Beruang, Keliling Semulung, Benua Tengah, Pala Pintas	63	228	291
18-Oct-23	FPIC Desa Tanjung Lasa	Community participation in related with ASK works and community enterprise program	Village government and local community of Tanjung Lasa	28	15	43
22-Oct-23	FPIC Desa Nanga Palin	Community participation in related with ASK works and community enterprise program	Village government and local community of Nanga Palin	23	4	27

Date	Type of Engagement	Description	Community representation	Participants		
				Male	Female	Total
25-Oct-23	FPIC Desa Sibau Hulu	Community participation in related with ASK works and community enterprise program	Village government and local community of Sibau Hulu	25	9	34
14-Dec-23	FPIC Desa Keliling Semulung	Community participation in related with ASK works and community enterprise program	Village government and local community of Keliling Semulung	35	9	44
19-Feb-24	FPIC Desa Kirin Nangka	Community participation in related with ASK works and community enterprise program	Village government and local community of Kirin Nangka	39	5	44
23-Feb-24	FPIC Desa Pala Pintas	Community participation in related with ASK works and community enterprise program	Village government and local community of Pala Pintas	23	19	42
Dec-23	Community Workshop	First workshop with three communities' group on administration for group (financial reporting, proposal preparation)	Community group member	133	79	212

Date	Type of Engagement	Description	Community representation	Participants		
				Male	Female	Total
Dec-23	Community Workshop	second workshop for two communities' group on Feed Corn and agricultural training	Collaboration ASK with CU Keling Kumang, community group member	36	27	63
Dec-23	Community Workshop	Third workshop for two communities' group on laying hen farming and pig farming	Collaboration ASK with Region Agricultural Agency and veterinary, and community group member			

Appendix 5.2 Informational meetings with related stakeholders

Date	Type of Engagement	Description	Remarks
Mar-23	Introductory meeting	Introduction and discussion with the New Manpower Agency head and her team and Kapuas Hulu Labour Inspector	Manpower Agency Kapuas Hulu
Jun-23	Introductory meeting	First contact with Temenggung Dayak Taman Banua Sio - in charge of Adat in Sibau Hulu & Tanjung Lasa	Temanggung Dayak Taman Banua Sio
Jul-23	Engagement Meeting	Coordination and discussion on anticipation of community land preparation (burning season) with BPBD (*Badan Penanggulangan Bencana Daerah*-District Disaster Management Agency) and KPH (*Kesatuan*	Head of BPBD and KPH Kapuas Hulu Utara

Date	Type of Engagement	Description	Remarks
		Pemangkuan Hutan-Forest Management Unit) Kapuas Hulu Utara	
Jul-23	Coordination Meeting	ASK Join the Fire preparedness Task Force in Kapuas with Polres, Kodim (*Komando Distrik Militer*-District Military Command), Pemda (*Pemerintah Daerah*-Local Government), KPH and other stakeholders.	Regional Agencies related with the Fire preparedness
Aug-23	Engagement Meeting	ASK Join the fire preparedness with Kodim Putussibau and others stakeholder	Kodim Putussibau
Sep-23	Coordination Meeting	Coordination and discussion with Agricultural field Technician on upcoming ASK agricultural empowerment program	Agriculture extension agents
Oct-23	Introduction and Coordination Meeting	Coordination and discussion with Agricultural Sub Agency head (Kepala Bidang Penyuluhan) on upcoming ASK agricultural empowerment program	Agricultural Sub Agency head - Kapuas Hulu

APPENDIX 6: LIST OF MID-LARGE MAMMALS IN THE PROJECT AREA

Each table shows Common Name and Scientific Name. IUCN categories: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient. CITES categories: App. I = International trade prohibited, except in exceptional non-commercial cases; App. II = International trade may be permitted, but requires export permit; App. III = Limited trade; NE = Not Evaluated. Species protected in Government of Indonesia (Minister of Environment and Forestry Regulation No. P.106/2018): P = Protected; NO = Not Protected.

No	Common Name	Scientific Name	IUCN	GoI	CITES
1	Abbott's Gray Gibbon	*Hylobates abbotti*	EN	NO	App. I
2	Asian Small-clawed Otter	*Aonyx cinereus*	VU	NO	App. I
3	Banded Civet	*Hemigalus derbyanus*	NT	NO	App. II
4	Banded Linsang	*Prionodon linsang*	LC	P	App. II
5	Bearded Pig	*Sus barbatus*	VU	NO	NE
6	Binturong	*Arctictis binturong*	VU	P	App. III
7	Bornean Banded Langur	*Presbytis chrysomelas*	CR	NO	App. II
8	Bornean Orangutan	*Pongo pygmaeus*	CR	P	App. I
9	Bornean Yellow Muntjac	*Muntiacus atherodes*	NT	P	NE
10	Clouded Leopard	*Neofelis diardi*	VU	P	App. I
11	Flat-headed Cat	*Prionailurus planiceps*	EN	P	App. I

No	Common Name	Scientific Name	IUCN	GoI	CITES
12	Hairy-nosed Otter	*Lutra sumatrana*	EN	P	App. II
13	Horse-tailed Squirrel	*Sundasciurus hippurus*	NT	NO	NE
14	Horsfield's Tarsier	*Cephalopachus bancanus*	VU	NO	NE
15	Large treesthrew	*Tupaia tana*	LC	NO	NE
16	Lesser Oriental Chevrotain	*Tragulus kanchil*	LC	P	NE
17	Long-tailed Macaque	*Macaca fascicularis*	EN	NO	App. II
18	Long-tailed Porcupine	*Trichys fasciculata*	LC	NO	NE
19	Low's Squirrel	*Sundasciurus lowii*	LC	NO	NE
20	Mainland Leopard Cat	*Prionailurus bengalensis*	LC	P	App. I
21	Malay Civet	*Viverra tangalunga*	LC	NO	NE
22	Malayan Porcupine	*Hystrix brachyura*	LC	NO	NE
23	Marbled Cat	*Pardofelis marmorata*	NT	P	App. I
24	Moonrat	*Echinosorex gymnura*	LC	NO	NE
25	Otter Civet	*Cynogale bennettii*	EN	P	App. II
26	Pale Giant Squirrel	*Ratufa affinis*	NT	NO	App. II
27	Plantain Squirrel	*Callosciurus notatus*	LC	NO	NE
28	Prevost's Squirrel	*Callosciurus prevostii*	LC	NO	NE
29	Proboscis Monkey	*Nasalis larvatus*	EN	NO	App. I

No	Common Name	Scientific Name	IUCN	GoI	CITES
30	Red Langur	*Presbytis rubicunda*	VU	P	App. II
31	Short-tailed Mongoose	*Urva brachyura*	NT	NO	NE
32	Shrew-faced Squirrel	*Rhinosciurus laticaudatus*	NT	NO	NE
33	Slender Squirrel	*Sundasciurus tenuis*	LC	NO	NE
34	Small-toothed Palm Civet	*Arctogalidia trivirgata*	LC	NO	NE
35	Southern Pig-tailed Macaque	*Macaca nemestrina*	EN	NO	App. II
36	Sun Bear	*Helarctos malayanus*	VU	P	App. I
37	Sunda Pangolin	*Manis javanica*	CR	P	App. I
38	Tufted Ground Squirrel	*Rheithrosciurus macrotis*	VU	NO	NE
39	Yellow-throated Marten	*Martes flavigula*	LC	NO	NE

APPENDIX 7: LIST BIRDS FOUND WITHIN PROJECT AREA

Each table shows Common Name and Scientific Name. IUCN categories: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient. CITES categories: App. I = International trade prohibited, except in exceptional non-commercial cases; App. II = International trade may be permitted, but requires export permit; App. III = Limited trade; NE = Not Evaluated. Species protected in Government of Indonesia (Minister of Environment and Forestry Regulation No. P.106/2018): P = Protected; NO = Not Protected.

No	Common Name	Scientific Name	IUCN	GoI	CITES
1	Argus Pheasant	*Argusianus argus*	VU	P	App. II
2	Ashy Tailorbird	*Orthotomus ruficeps*	LC	NO	NE
3	Banded Kingfisher	*Lacedo pulchella*	LC	NO	NE
4	Banded Broadbill	*Eurylaimus javanicus brookei*	LC	NO	NE
5	Bar-winged Flycather-shrike	*Hemipus picatus*	LC	NO	NE
6	Black backed Kingfisher	*Ceyx erithacus*	NT	NO	NE
7	Black Drongo	*Dicrurus macrocercus*	LC	NO	NE
8	Black Eagle	*Ictinaetus malaiensis*	LC	P	App. II
9	Black Hornbill	*Anthracoceros malayanus*	VU	P	App. II
10	Black Partridge	*Melanoperdix niger*	VU	NO	NE
11	Black-and-red Broadbill	*Cymbirhynchus macrorhynchos*	LC	NO	NE
12	Black-and-yellow Broadbill	*Eurylaimus ochromalus*	LC	NO	NE
13	Black-bellied Malkoha	*Phaenicophaeus diardi*	NT	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
14	Black-capped Babbler	*Pellorneum nigrocapitatum*	LC	NO	NE
15	Black-crowned Night-heron	*Nycticorax nycticorax*	LC	NO	NE
16	Black-headed Bulbul	*Brachypodius atriceps*	LC	NO	NE
17	Black-hooded Oriole	*Oriolus xanthornus*	LC	NO	NE
18	Black-naped Monarch	*Hypothymis azurea*	LC	NO	NE
19	Black-nest Swiftlet	*Aerodramus maximus*	LC	NO	NE
20	Black-winged Flycatcher-shrike	*Hemipus hirundinaceus*	LC	NO	NE
21	Blue-crowned hanging parrot	*Loriculus galgulus*	LC	P	App. II
22	Blue-eared Barbet	*Psilopogon cyanotis*	LC	NO	NE
23	Blue-eared Kingfisher	*Alcedo meninting*	LC	NO	NE
24	Blue-winged Leafbird	*Chloropsis cochinchinensis*	EN	P	NE
25	Bornean Bristlehead	*Pityriasis gymnocephala*	VU	NO	NE
26	Bornean Brown Barbet	*Caloramphus fuliginosus*	LC	P	NE
27	Bornean Crested Fireback	*Lophura ignita*	VU	NO	NE
28	Bornean Crestless Fireback	*Lophura pyronota*	EN	P	NE
29	Bornean Frogmouth	*Batrachostomus mixtus*	LC	P	NE
30	Bornean Ground-cuckoo	*Carpococcyx radiceus*	VU	NO	NE
31	Brahminy Kite	*Haliastur indus*	LC	P	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
32	Brown Boobook	*Ninox scutulata*	LC	NO	App. II
33	Brown-backed Flowerpecker	*Dicaeum everetti*	LC	NO	NE
34	Brown-throated Sunbird	*Anthreptes malacensis*	LC	NO	NE
35	Buff-rumped Woodpecker	*Meiglyptes grammithorax*	LC	NO	NE
36	Bushy-crested Hornbill	*Anorrhinus galeritus*	NT	P	App. II
37	Cattle egret	Bubulcus ibis	LC	NO	NE
38	Chestnut-bellied Malkoha	*Phaenicophaeus sumatranus*	NT	NO	NE
39	Chestnut-breasted Malkoha	*Phaenicophaeus curvirostris*	LC	NO	NE
40	Collared Kingfisher	*Todirhamphus chloris*	LC	NO	NE
41	Common Flameback	*Dinopium javanense*	LC	NO	NE
42	Common Hill Myna	*Gracula religiosa*	LC	P	App. II
43	Common Iora	*Aegithina tiphia*	LC	NO	NE
44	Common Sandpiper	*Actitis hypoleucos*	LC	NO	NE
45	Crested Goshawk	*Accipiter trivirgatus*	LC	P	App. II
46	Crested Serpent-eagle	*Spilornis cheela*	LC	P	App. II
47	Crimson Sunbird	*Aethopyga siparaja*	LC	P	NE
48	Crow-billed Drongo	*Dicrurus annectans*	LC	NO	NE
49	Dark-necked Tailorbird	*Orthotomus atrogularis*	LC	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
50	Diard's Trogon	*Harpactes diardii*	NT	P	NE
51	Dusky Broadbill	*Corydon sumatranus*	LC	NO	NE
52	Dusky Munia	*Lonchura fuscans*	LC	NO	NE
53	Eurasian Tree Sparrow	*Passer montanus*	LC	NO	NE
54	Fairy Pitta	*Pitta nympha*	VU	P	NE
55	Glossy Swiftlet	*Collocalia esculenta*	LC	NO	NE
56	Great Egret	*Ardea alba*	LC	P	NE
57	Great Slaty Woodpecker	*Mulleripicus pulverulentus*	VU	P	NE
58	Greater Coucal	*Centropus sinensis*	LC	NO	NE
59	Greater Green Leafbird	*Chloropsis sonnerati*	EN	P	NE
60	Greater Racquet-tailed Drongo	*Dicrurus paradiseus*	LC	NO	NE
61	Green Imperial-pigeon	*Ducula aenea*	NT	NO	NE
62	Green lora	*Aegithina viridissima*	NT	NO	NE
63	Green-backed Heron	*Butorides striata*	LC	NO	NE
64	Grey-breasted Spiderhunter	*Arachnothera affinis*	LC	NO	NE
65	Grey-capped Emerald Dove	*Chalcophaps indica*	LC	NO	NE
66	Grey-chested Jungle-flycatcher	*Cyornis umbratilis*	NT	NO	NE
67	Grey-headed Fish-eagle	*Icthyophaga ichthyaetus*	NT	P	App. II

No	Common Name	Scientific Name	IUCN	GoI	CITES
68	Grey-streaked Flycatcher	*Muscicapa griseisticta*	LC	NO	NE
69	House Swallow	*Hirundo javanica*	LC	NO	NE
70	House Swift	*Apus nipalensis*	LC	NO	NE
71	Intermediate Egret	*Ardea intermedia*	LC	NO	NE
72	Javan Pond-heron	*Ardeola speciosa*	LC	NO	NE
73	Jerdon's Baza	*Aviceda jerdoni*	LC	P	App. II
74	Large Green-pigeon	*Treron capellei*	VU	NO	NE
75	Lesser Coucal	*Centropus bengalensis*	LC	NO	NE
76	Lesser Green Leafbird	*Chloropsis cyanopogon*	NT	P	NE
77	Lesser Yellownape	*Picus chlorolophus*	LC	NO	NE
78	Little Egret	*Egretta garzetta*	LC	NO	NE
79	Little Spiderhunter	*Arachnothera longirostra*	LC	NO	NE
80	Malay Blue-flycatcher	*Cyornis turcosus*	NT	NO	NE
81	Moustached Babbler	*Malacopteron magnirostre*	LC	NO	NE
82	Olive-winged Bulbul	*Pycnonotus plumosus*	LC	NO	NE
83	Orange-backed Woodpecker	*Chrysocolaptes Validus*	LC	NO	NE
84	Orange-bellied Flowerpecker	*Dicaeum trigonostigma*	LC	NO	NE
85	Oriental Darter	*Anhinga melanogaster*	LC	P	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
86	Oriental Magpie-robin	*Copsychus saularis*	LC	NO	NE
87	Oriental Paradise-flycatcher	*Terpsiphone affinis*	LC	NO	NE
88	Oriental Pied Hornbill	*Anthracoceros albirostris*	LC	P	App. II
89	Pacific swift	*Apus pacificus*	LC	NO	NE
90	Pied Fantail	*Rhipidura javanica*	LC	NO	NE
91	Pink-necked Green-pigeon	*Treron vernans*	LC	NO	NE
92	Plain Flowerpecker	*Dicaeum minullum*	LC	NO	NE
93	Plain Sunbird	*Anthreptes simplex*	LC	NO	NE
94	Plaintive Cuckoo	*Cacomantis merulinus*	LC	NO	NE
95	Raffles's Malkoha	*Rhinortha chlorophaea*	LC	NO	NE
96	Red-crowned Barbet	*Psilopogon rafflesia*	NT	P	NE
97	Red-eyed Bulbul	*Pycnonotus brunneus*	LC	NO	NE
98	Red-naped Trogon	*Harpactes kasumba*	NT	P	NE
99	Red-throated Barbet	*Psilopogon mystacophanos*	NT	P	NE
100	Rhinoceros Hornbill	*Buceros rhinoceros*	VU	P	App. II
101	Rufous-crowned Babbler	*Malacopteron magnum*	NT	NO	NE
102	Rufous-tailed Shama	*Copsychus pyrropygus*	NT	NO	NE
103	Rufous-tailed Tailorbird	*Orthotomus sericeus*	LC	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
104	Scarlet-rumped Trogon	*Harpactes duvaucelii*	NT	P	NE
105	Short-tailed Babbler	*Pellorneum malaccense*	NT	NO	NE
106	Silver-rumped Spinetail	*Rhaphidura leucopygialis*	LC	NO	NE
107	Slender-billed Crow	*Corvus enca*	LC	NO	NE
108	Sooty-capped Babbler	*Malacopteron affine*	NT	NO	NE
109	Spectacled Bulbul	*Ixidia erythropthalmos*	LC	NO	NE
110	Spotted Fantail	*Rhipidura perlata*	LC	NO	NE
111	Stork-billed Kingfisher	*Pelargopsis capensis*	LC	NO	NE
112	Thick-billed Green-pigeon	*Treron curvirostra*	LC	NO	NE
113	Violet Cuckoo	*Chrysococcyx xanthorhynchus*	LC	NO	NE
114	Whiskered Treeswift	*Hemiprocne comata*	LC	NO	NE
115	White- breasted Kingfisher	*Halcyon smyrnensis*	LC	NO	NE
116	White-chested Babbler	*Pellorneum rostratum*	NT	NO	NE
117	White-rumped Shama	*Copsychus malabaricus*	LC	NO	App. II
118	White-throated Fantail	*Rhipidura albicollis*	LC	NO	NE
119	Wreathed Hornbill	*Rhyticeros undulatus*	VU	P	App. II
120	Yellow-vented Bulbul	*Pycnonotus goiavier*	LC	NO	NE

APPENDIX 8: LIST REPTILES AND AMPHIBIANS FOUND WITHIN PROJECT AREA

Appendix 8.1 List Reptiles Found Within Project Area

Each table shows Common Name and Scientific Name. IUCN categories: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient. CITES categories: App. I = International trade prohibited, except in exceptional non-commercial cases; App. II = International trade may be permitted, but requires export permit; App. III = Limited trade; NE = Not Evaluated. Species protected in Government of Indonesia (Minister of Environment and Forestry Regulation No. P.106/2018): P = Protected; NO = Not Protected.

No	Common Name	Scientific Name	IUCN	GoI	CITES
1	Asian Giant Tortois	*Manouria emys*	CR	P	App. II
2	Asian Leaf Turtle	*Cyclemys dentata*	NT	NO	App. II
3	Asiatic Softshell Turtle	*Amyda cartilaginea*	VU	NO	App. II
4	Beautiful Bronzeback Tree Snake	*Dendrelaphis formosus*	LC	NO	NE
5	Beccari's Keeled Skink	*Tropidophorus beccarii*	LC	NO	NE
6	Bornean Keeled Green Pit Viper	*Tropidolaemus subannulatus*	LC	NO	NE
7	Bornean River Turtle	*Orlitia borneensis*	CR	P	App. II
8	Borneo Skink	*Dasia vittata*	LC	NO	NE
9	Common House Gecko	*Hemidactylus frenatus*	LC	NO	NE
10	Common Mabuya	*Eutropis multifasciata*	LC	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
11	Common Water Monitor	*Varanus salvator*	LC	NO	App. II
12	False Gharial	*Tomistoma schlegelii*	EN	P	App. I
13	Flat-bodied House Gecko	*Hemidactylus platyurus*	LC	NO	NE
14	Gray Bronzeback	*Dendrelaphis caudolineatus*	LC	NO	NE
15	Green Crested Lizard	*Bronchocela cristatella*	LC	NO	NE
16	Linne's Water Snake	*Homalopsis buccata*	LC	NO	NE
17	Mangrove Cat Snake	*Boiga dendrophila*	LC	NO	NE
18	Red-Tailed Racer	*Gonyosoma oxycephalum*	LC	NO	NE
19	Rough Mabuya	*Eutropis rudis*	LC	NO	NE
20	Roughneck Monitor	*Varanus rudicollis*	DD	NO	App. II
21	Tropical Forest Dragon	*Gonocephalus liogaster*	LC	NO	NE

Appendix 8.2 List Amphibians found within project area

Each table shows Common Name and Scientific Name. IUCN categories: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient. CITES categories: App. I = International trade prohibited, except in exceptional non-commercial cases; App. II = International trade may be permitted, but requires export permit; App. III = Limited trade; NE = Not Evaluated. Species protected in Government of Indonesia (Minister of Environment and Forestry Regulation No. P.106/2018): P = Protected; NO = Not Protected.

No	Common Name	Scientific Name	IUCN	GoI	CITES
1	Baram River Frog	*Pulchrana baramica*	LC	NO	NE
2	Boie's Wart Frog	*Fejervarya limnocharis*	LC	NO	NE
3	Bornean Horned Frog	*Pelobatrachus nasutus*	LC	NO	NE
4	Broad-headed Creek Frog	*Limnonectes conspicillatus*	DD	NO	NE
5	Collett's Whipping Frog	*Polypedates colletti*	LC	NO	NE
6	Common Green Frog	*Hylarana erythraea*	LC	NO	NE
7	Dring's Dwarf Litter Frog	*Leptobrachella juliandringi*	LC	NO	NE
8	False Toad	*Pseudobufo subasper*	LC	NO	NE
9	File-eared Tree Frog	*Polypedates otilophus*	LC	NO	NE
10	Frilled Tree Frog	*Kurixalus chaseni*	LC	NO	NE
11	Giant River Frog	*Limnonectes leporinus*	LC	NO	NE
12	Giant River Toad	*Phrynoidis juxtasper*	LC	NO	NE
13	Java Whipping Frog	*Polypedates leucomystax*	LC	NO	NE
14	Large White-lipped Frog	*Chalcorana megalonesa*	LC	NO	NE
15	Lesser Swamp Frog	*Limnonectes paramacrodon*	LC	NO	NE
16	Philippine Oriental Frog	*Occidozyga laevis*	LC	NO	NE
17	Red-eyed Spadefoot Toad	*Leptobrachium hendricksoni*	LC	NO	NE
18	Spotted Stream Frog	*Pulchrana picturata*	LC	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
19	White-lipped Frog	*Chalcorana raniceps*	LC	NO	NE

APPENDIX 9: LIST FISHES FOUND WITHIN PROJECT AREA

Each table shows Common Name and Scientific Name. IUCN categories: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient. CITES categories: App. I = International trade prohibited, except in exceptional non-commercial cases; App. II = International trade may be permitted, but requires export permit; App. III = Limited trade; NE = Not Evaluated. Species protected in Government of Indonesia (Minister of Environment and Forestry Regulation No. P.106/2018): P = Protected; NO = Not Protected.

No	Common Name	Scientific Name	IUCN	GoI	CITES
1	Angler Catfish	*Chaca bankanensis*	NT	NO	NE
2	Bantak Batu	*Osteochilus spilurus*	LC	NO	NE
3	Bantak/Tetek	*Crossocheilus cobitis*	LC	NO	NE
4	Batu	*Diplocheilichthys jentinkii*	LC	NO	NE
5	Baung tikus	*Leiocassis micropogon*	LC	NO	NE
6	Baung tikus	*Pseudomystus stenomus*	LC	NO	NE
7	Beardless Barb	*Cyclocheilichthys apogon*	LC	NO	NE
8	Black Snakehead	*Channa melasoma*	LC	NO	NE
9	Buin	*Cyclocheilichthys janthochir*	LC	NO	NE
10	Buntal	*Pao palembangensis*	LC	NO	NE
11	Buruk baju	*Puntigrus anchisporus*	LC	NO	NE
12	Daun buluh	*Nandus nebulosus*	LC	NO	NE
13	Engkadik	*Syncrossus hymenophysa*	LC	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
14	Engkuruyuk	*Nemacheilus kapuasensis*	LC	NO	NE
15	Forest Halfbeak	*Hemirhamphodon pogonognathus*	LC	NO	NE
16	Forest Snakehead	*Channa lucius*	LC	NO	NE
17	Giant Snakehead	*Channa micropeltes*	LC	NO	NE
18	Hampala Barb	*Hampala macrolepidota*	LC	NO	NE
19	Horse-faced Loach	*Acantopsis dialuzona*	LC	NO	NE
20	Ikan tanah	*Desmopuntius trifasciatus*	LC	NO	NE
21	Ikan tanah	*Puntioplites waandersi*	LC	NO	NE
22	Indochinese Needlefish	*Xenentodon canciloides*	LC	NO	NE
23	Java Combtail	*Belontia hasselti*	LC	NO	NE
24	Kalui/Umil	*Osphronemus septemfasciatus*	LC	NO	NE
25	Kebali/Palau	*Osteochilus kahajanensis*	LC	NO	NE
26	Kelabau	*Osteochilus melanopleura*	LC	NO	NE
27	Kelik panau	*Clarias kapuasensis*	EN	NO	NE
28	Kelik panau	*Clarias leiacanthus*	LC	NO	NE
29	Kenjuar	*Luciosoma trinema*	LC	NO	NE
30	Kenjulung/Kenyulung	*Dermogenys collettei*	LC	NO	NE
31	Kenjulung/Kenyulung	*Hemirhamphodon kapuasensis*	LC	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
32	Kepiat/Tepiat	*Mystacoleucus marginatus*	LC	NO	NE
33	Kerandang	*Channa pleurophthalma*	NT	NO	NE
34	Kissing Gourami	*Helostoma temminckii*	LC	NO	NE
35	Kuruyuk	*Aperioptus robertsi*	DD	NO	NE
36	Kuruyuk	*Barbucca diabolica*	LC	NO	NE
37	Kuruyuk	*Kottelatlimia pristes*	VU	NO	NE
38	Lais bangah	*Phalacronotus apogon*	LC	NO	NE
39	Lais butuk	*Ompok rhadinurus*	LC	NO	NE
40	Lais libai	*Silurichthys citatus*	DD	NO	NE
41	Lais libai	*Silurichthys phaiosoma*	NT	NO	NE
42	Lais	*Ompok eugeneiatus*	LC	NO	NE
43	Landin	*Mystus singaringan*	LC	NO	NE
44	Lekat	*Homalopteroides sp.*	LC	NO	NE
45	Long Pectoral-fin Minnow	*Macrochirichthys macrochirus*	LC	NO	NE
46	Malayan Leaffish	*Pristolepis fasciata*	LC	NO	NE
47	Palau	*Osteochiluls triporos*	NE	NO	NE
48	Patik	*Hemibagrus capitulum*	LC	NO	NE
49	Patik	*Hemibagrus cf. semotus*	DD	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
50	Patik	*Hemibagrus olyroides*	NT	NO	NE
51	Pearl Gourami	*Trichopodus leerii*	NT	NO	NE
52	Piam/Tiam	*Leptobarbus melanopterus*	NT	NO	NE
53	Redstripe Rasbora	*Trigonopoma pauciperforatum*	LC	NO	NE
54	Sarai	*Labiobarbus leptocheilus*	LC	NO	NE
55	Sarai	*Labiobarbus ocellatus*	LC	NO	NE
56	Sarai/Pantak	*Labiobarbus festivus*	DD	NO	NE
57	Seluang biasa	*Rasbora myersi*	LC	NO	NE
58	Seluang kerangas	*Rasbora simonbirchi*	NE	NO	NE
59	Seluang kerapa	*Parachela sp*	NE	NO	NE
60	Seluang	*Rasbora borneensis*	LC	NO	NE
61	Seluang	*Rasbora cephalotaenia*	LC	NO	NE
62	Seluang	*Rasbora hosii*	LC	NO	NE
63	Seluang	*Rasbora kalbarensis*	LC	NO	NE
64	Seluang	*Trigonopoma gracile*	LC	NO	NE
65	Semah	*Tor tambra*	DD	NO	NE
66	Siamese Algae-eater	*Crossocheilus oblongus*	LC	NO	NE
67	Somang/Empala	*Betta taeniata*	DD	NO	NE

No	Common Name	Scientific Name	IUCN	GoI	CITES
68	Sucker Barb	*Barbichthys laevis*	LC	NO	NE
69	Tapah	*Wallagonia leerii*	LC	NO	NE
70	Tebalang	*Barbodes banksi*	LC	NO	NE
71	Tempala/Empala	*Betta enisae*	DD	NO	NE
72	Tempala/Empala	*Betta krataios*	DD	NO	NE
73	Tempalak bunyun	*Luciocephalus pulcher*	LC	NO	NE
74	Tilan	*Mastacembelus unicolor*	LC	NO	NE
75	Tinfoil Barb	*Barbonymus schwanefeldii*	LC	NO	NE
76	Tingang	*Schismatorhynchos heterorhynchos*	LC	NO	NE
77	Tiny scale barb	*Thynnichthys thynnoides*	LC	NO	NE
78	Waandersii's Hard-lipped Barb	*Osteochilus waandersii*	LC	NO	NE

APPENDIX 10: LIST FLORA FOUND WITHIN PROJECT AREA

Each table shows Common Name and Family. IUCN categories: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient. CITES categories: App. I = International trade prohibited, except in exceptional non-commercial cases; App. II = International trade may be permitted, but requires export permit; App. III = Limited trade; NE = Not Evaluated. Species protected in Government of Indonesia (Minister of Environment and Forestry Regulation No. P.106/2018): P = Protected; NO = Not Protected.

No	Scientific Name	Family	IUCN	GoI	CITES
A	Non-Tree species				
1	*Nepenthes ampullaria*	Nepenthaceae	LC	NO	App. II
2	*Nepenthes bicalcarata*	Nepenthaceae	VU	P	App. II
3	*Nepenthes hirsuta*	Nepenthaceae	LC	P	App. II
4	*Nepenthes rafflesiana*	Nepenthaceae	LC	NO	App. II
B	Tree species				
1	*Hydnocarpus polypetala* (Sloot.) Sleumer	Achariaceae	NE	NO	NE
2	*Ryparosa* sp.	Achariaceae	NE	NO	NE
3	*Bouea oppositifolia* (Roxb.) Meisn	Anacardiaceae	LC	NO	NE
4	*Buchanania sessifolia* Blume	Anacardiaceae	LC	NO	NE
5	*Campnosperma coriaceum* (Jack) Hallier f.	Anacardiaceae	LC	NO	NE
6	*Dracontomelon dao* (Blanco) Merr. & Rolfe	Anacardiaceae	LC	NO	NE
7	*Drimycarpus luridus* (Hook.f.) Ding Hou	Anacardiaceae	LC	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
8	*Gluta renghas* L.	Anacardiaceae	NT	NO	NE
9	*Gluta wallichii* (Hook.f.) Ding Hou	Anacardiaceae	LC	NO	NE
10	*Parishia insignis* Hook.f.	Anacardiaceae	LC	NO	NE
11	*Pentaspadon motleyi* Hook.f.	Anacardiaceae	LC	NO	NE
12	*Swintonia glauca* Engl.	Anacardiaceae	LC	NO	NE
13	*Combretocarpus rotundatus* (Miq.) Danser	Anisophylleaceae	LC	NO	NE
14	*Cyathocalyx sumatrana* Scheff.	Annonaceae	NE	NO	NE
15	*Drepananthus biovulatus* (Boerl.)	Annonaceae	LC	NO	NE
16	*Goniothalamus malayanus* Hook.f. & Thomson	Annonaceae	LC	NO	NE
17	*Maasia glauca* (Hassk.) Mols	Annonaceae	LC	NO	NE
18	*Mezzettia parviflora* Becc.	Annonaceae	LC	NO	NE
19	*Polyalthia glauca* (Hassk.) F. Muell.	Annonaceae	LC	NO	NE
20	*Polyalthia lateriflora* Blume	Annonaceae	LC	NO	NE
21	*Polyalthia rumphii* (Blume) Merr.	Annonaceae	LC	NO	NE
22	*Polyalthia* sp.	Annonaceae	NE	NO	NE
23	*Polyalthia sumatrana* (Mig.) Kurz	Annonaceae	LC	NO	NE
24	*Popowia* sp	Annonaceae	NE	NO	NE
25	*Sageraea lanceolata* Miq.	Annonaceae	LC	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
26	*Xylopia* ferruginea Baill.	Annonaceae	LC	NO	NE
27	*Xylopia malayana Hook.f. & Thomson*	Annonaceae	LC	NO	NE
28	*Xylopia* sp.	Annonaceae	NE	NO	NE
29	*Xylopia stenopetala* Oliv.	Annonaceae	LC	NO	NE
30	*Alstonia angustifolia* Wall. Ex. DC.	Apocynaceae	LC	NO	NE
31	*Alstonia iwahigensis* Elmer	Apocynaceae	LC	NO	NE
32	*Alstonia pneumatophora* Backer ex L.G.Den Berger	Apocynaceae	LC	NO	NE
33	*Dyera polyphylla* Hook.f	Apocynaceae	VU	NO	NE
34	*Ilex cymosa* Blume	Aquifoliaceae	LC	NO	NE
35	*Ilex maingayi* Hook.f.	Aquifoliaceae	VU	NO	NE
36	*Agathis borneensis* Warb.	Araucariaceae	EN	NO	NE
37	*Canarium hirsutum* Willd.	Burseraceae	LC	NO	NE
38	*Canarium* sp.	Burseraceae	NE	NO	NE
39	*Dacryodes incurvata* (Engl.) H.J.Lam	Burseraceae	LC	NO	NE
40	*Dacryodes rostrata* (Blume) H.J.Lam	Burseraceae	LC	NO	NE
41	*Dacryodes rugosa* (Blume) H.J.Lam	Burseraceae	LC	NO	NE
42	*Santiria apiculata* A.W.Benn.	Burseraceae	LC	NO	NE
43	*Santiria griffithii* (Hook.f.) Engl.	Burseraceae	LC	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
44	*Santiria laevigata* Blume	Burseraceae	LC	NO	NE
45	*Santiria rubiginosa* Blume	Burseraceae	LC	NO	NE
46	*Santiria* sp.	Burseraceae	NE	NO	NE
47	*Santiria tomentosa* Blume	Burseraceae	LC	NO	NE
48	*Calophyllum inophyllum* L.	Calophyllaceae	LC	NO	NE
49	*Calophyllum lanigerum* Miq.	Calophyllaceae	NE	NO	NE
50	*Calophyllum nodusum* Vesque	Calophyllaceae	NE	NO	NE
51	*Calophyllum pulcherrimum* Wall. Ex Choisy	Calophyllaceae	LC	NO	NE
52	*Calophyllum sclerophyllum* Vesque	Calophyllaceae	LC	NO	NE
53	*Calophyllum soulattri* Burm. ex F.Mull.	Calophyllaceae	LC	NO	NE
54	*Calophyllum* sp.	Calophyllaceae	NE	NO	NE
55	*Calophyllum sundaicum* P.F. Stevens	Calophyllaceae	LC	NO	NE
56	*Garcinia bancana* (Miq.) Miq.	Calophyllaceae	LC	NO	NE
57	*Garcinia nitida* Pierre	Calophyllaceae	NT	NO	NE
58	*Garcinia parvifolia* (Miq.) Miq.	Calophyllaceae	LC	NO	NE
59	*Garcinia* sp.	Calophyllaceae	NE	NO	NE
60	*Messua* sp.	Calophyllaceae	NE	NO	NE
61	*Kokoona* sp.	Celastraceae	NE	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
62	*Bhesa paniculata* Arn.	Centroplacaceae	LC	NO	NE
63	*Licania splendens* (Korth.) Prance	Chrysobalanaceae	LC	NO	NE
64	*Kayea borneensis* P.F.Stevens	Clusiaceae	VU	NO	NE
65	*Kayea* sp.	Clusiaceae	NE	NO	NE
66	*Terminalia foetidissima* Griff.	Combretaceae	LC	NO	NE
67	*Vernonia arborea* Buch.-Ham.	Compositae	NE	NO	NE
68	*Mastixia* sp.	Cornaceae	NE	NO	NE
69	*Dactylocladus stenostachys* Oliv.	Crypteroniaceae	NE	NO	NE
70	*Ctenolophon* sp.	Ctenolophonaceae	NE	NO	NE
71	*Daphniphyllum* sp.	Daphniphyllaceae	NE	NO	NE
72	*Dillenia excelsa* (Jack) Gilg	Dilleniaceae	LC	NO	NE
73	*Anisoptera grossivenia* Sloot.	Dipterocarpaceae	LC	NO	NE
74	*Cotylelobium burckii* (Heim) Heim	Dipterocarpaceae	EN	NO	NE
75	*Cotylelobium melanoxylom* (Hook.f.) Pierre	Dipterocarpaceae	LC	NO	NE
76	*Dipterocarpus borneensis* Slooten	Dipterocarpaceae	NT	NO	NE
77	*Dipterocarpus confertus* Sloot.	Dipterocarpaceae	NT	NO	NE
78	*Dipterocarpus crinitus* Dyer	Dipterocarpaceae	VU	NO	NE
79	*Dipterocarpus gracilis* Blume	Dipterocarpaceae	VU	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
80	*Dipterocarpus lowii* Hook.f	Dipterocarpaceae	NT	NO	NE
81	*Dipterocarpus* sp.	Dipterocarpaceae	NE	NO	NE
82	*Dipterocarpus stellatus* Vesque	Dipterocarpaceae	VU	NO	NE
83	*Dipterocarpus validus* Blume	Dipterocarpaceae	LC	NO	NE
84	*Dryobalanops lanceolata* Burck	Dipterocarpaceae	LC	NO	NE
85	*Dryobalanops oblongifolia* Dyer	Dipterocarpaceae	LC	NO	NE
86	*Hopea mengerawan* Miq.	Dipterocarpaceae	VU	NO	NE
87	*Hopea micrantha* Hook.f.	Dipterocarpaceae	CR	NO	NE
88	*Hopea pachycarpa* (Heim) Sym.	Dipterocarpaceae	VU	NO	NE
89	*Hopea* sp.	Dipterocarpaceae	NE	NO	NE
90	*Parashorea* sp.	Dipterocarpaceae	NE	NO	NE
91	*Shorea almon* Foxw.	Dipterocarpaceae	NT	NO	NE
92	*Shorea atrinervosa* Symington	Dipterocarpaceae	VU	NO	NE
93	*Shorea balangeran* (Korth.) Burck	Dipterocarpaceae	VU	NO	NE
94	*Shorea beccariana* Burck	Dipterocarpaceae	LC	NO	NE
95	*Shorea coriacea* Burck	Dipterocarpaceae	NT	NO	NE
96	*Shorea hopeifolia* (Heim) Symington	Dipterocarpaceae	LC	NO	NE
97	*Shorea laevis Dyer*	Dipterocarpaceae	VU	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
98	*Shorea leprosula* Miq.	Dipterocarpaceae	NT	NO	NE
99	*Shorea macroptera* Dyer	Dipterocarpaceae	LC	NO	NE
100	*Shorea multiflora* (Burck) Symington	Dipterocarpaceae	LC	NO	NE
101	*Shorea ochracea* Symington	Dipterocarpaceae	VU	NO	NE
102	*Shorea parvifolia* Dyer	Dipterocarpaceae	LC	NO	NE
103	*Shorea parvistipulata* Heim	Dipterocarpaceae	LC	NO	NE
104	*Shorea pauciflora* King	Dipterocarpaceae	NT	NO	NE
105	*Shorea peltata* Symington	Dipterocarpaceae	VU	NO	NE
106	*Shorea pinanga* Scheff.	Dipterocarpaceae	LC	NO	NE
107	*Shorea platycarpa* Heim.	Dipterocarpaceae	EN	NO	NE
108	*Shorea retusa* Meijer	Dipterocarpaceae	VU	NO	NE
109	*Shorea revoluta* P.S.Ashton	Dipterocarpaceae	CR	NO	NE
110	*Shorea rotundifolia* P.S.Ashton	Dipterocarpaceae	CR	NO	NE
111	*Shorea seminis* (de Vriese) Sloot	Dipterocarpaceae	LC	NO	NE
112	*Shorea* sp.	Dipterocarpaceae	NE	NO	NE
113	*Shorea teysmanniana* Dyer ex Brandis	Dipterocarpaceae	CR	NO	NE
114	*Shorea uliginosa* Foxw.	Dipterocarpaceae	EN	NO	NE
115	*Upuna borneensis* Sym.	Dipterocarpaceae	VU	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
116	*Vatica oblongifolia* Hook.f.	Dipterocarpaceae	LC	NO	NE
117	*Vatica odorata* (Griff.) Sym.	Dipterocarpaceae	LC	NO	NE
118	*Vatica pauciflora* (Korth.) Blume	Dipterocarpaceae	VU	NO	NE
119	*Vatica* sp.	Dipterocarpaceae	NE	NO	NE
120	*Diospyros confertiflora* (Hiern) Bakh.	Ebenaceae	NE	NO	NE
121	*Diospyros evena* Bakh.	Ebenaceae	NE	NO	NE
122	*Diospyros maingayi* (Heirn) Bakh.	Ebenaceae	NE	NO	NE
123	*Diospyros pendula* Hasselt ex Hassk.	Ebenaceae	LC	NO	NE
124	*Diospyros pseudomalabarica*	Ebenaceae	NE	NO	NE
125	*Diospyros* sp.	Ebenaceae	NE	NO	NE
126	*Elaeocarpus conoideus* Knuth	Elaeocarpaceae	LC	NO	NE
127	*Elaeocarpus griffithii* (Wight) A. Gray)	Elaeocarpaceae	LC	NO	NE
128	*Elaeocarpus marginatus* Stapf ex Weibel	Elaeocarpaceae	NE	NO	NE
129	*Elaeocarpus mastersii* King	Elaeocarpaceae	LC	NO	NE
130	*Elaeocarpus* sp.	Elaeocarpaceae	NE	NO	NE
131	*Elaeocarpus stipularis* Blume	Elaeocarpaceae	LC	NO	NE
132	*Sloanea javanica* (Miq.) K.Schum.	Elaeocarpaceae	LC	NO	NE
133	*Blumeodendron calophyllum* Airy Shaw	Euphorbiaceae	NE	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
134	*Blumeodendron tokbrai* (Blume) Kurz	Euphorbiaceae	LC	NO	NE
135	*Breynia reclinata* (Roxb.) Hook.f.	Euphorbiaceae	LC	NO	NE
136	*Chaetocarpus castanocarpus* (Roxb.) Thwaites	Euphorbiaceae	LC	NO	NE
137	*Croton argyratus* Blume	Euphorbiaceae	LC	NO	NE
138	*Elateriospermum tapos* Blume	Euphorbiaceae	LC	NO	NE
139	*Koilodepas* sp.	Euphorbiaceae	NE	NO	NE
140	*Macaranga bancana* (Miq.) Müll.Arg.	Euphorbiaceae	LC	NO	NE
141	*Macaranga conifera* (Zoll.) Mull.Arg.	Euphorbiaceae	LC	NO	NE
142	*Macaranga gigantea* (Reichb.f. & Zoll.) Müll.Arg.	Euphorbiaceae	LC	NO	NE
143	*Macaranga lowii* King ex Hook.f.	Euphorbiaceae	LC	NO	NE
144	*Macaranga pearsonii* Merr.	Euphorbiaceae	LC	NO	NE
145	*Mallotus eucaustus* Airy Shaw	Euphorbiaceae	NE	NO	NE
146	*Mallotus lackeyi* Elmer	Euphorbiaceae	LC	NO	NE
147	*Mallotus penangensis* Müll.Arg.	Euphorbiaceae	LC	NO	NE
148	*Neoscortechinia kingii* (Hook.f.) Pax & K.Hoffm.	Euphorbiaceae	LC	NO	NE
149	*Pimelodendron griffithianum* (Mull.Arg.) Benth.	Euphorbiaceae	LC	NO	NE
150	*Ptychopyxis* sp.	Euphorbiaceae	NE	NO	NE
151	*Trigonostemon laevigatus* Mull.Arg.	Euphorbiaceae	LC	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
152	*Copaifera palustris* (Sym.) de Wit	Fabaceae	EN	NO	NE
153	*Archidendron clypearia* (Jack) I.C.Nielsen	Fabaceae	LC	NO	NE
154	*Dialium indum* L.	Fabaceae	LC	NO	NE
155	*Dialium platysepalum* Baker	Fabaceae	LC	NO	NE
156	*Koompassia excelsa* (Becc.) Taub.	Fabaceae	NE	NO	NE
157	*Koompassia malaccensis* Maing.ex Benth.	Fabaceae	LC	NO	NE
158	*Parkia speciosa* Hassk.	Fabaceae	LC	NO	NE
159	*Saraca declinata* (Jack) Miq.	Fabaceae	LC	NO	NE
160	*Sindora velutina* Baker	Fabaceae	LC	NO	NE
161	*Sindora wallichii* Benth.	Fabaceae	LC	NO	NE
162	*Castanopsis* sp.	Fagaceae	NE	NO	NE
163	*Lithocarpus conocarpus* (Oudem.) Rehder	Fagaceae	NE	NO	NE
164	*Lithocarpus coopertus* (Blanco) Rehder	Fagaceae	LC	NO	NE
165	*Lithocarpus ewyckii* (Korth.) Rehder, J	Fagaceae	LC	NO	NE
166	*Lithocarpus gracilis* (Korth.) Soepadmo	Fagaceae	LC	NO	NE
167	*Lithocarpus pseudokunstleri* A. Camus	Fagaceae	NE	NO	NE
168	*Lithocarpus* sp.	Fagaceae	NE	NO	NE
169	*Cleistanthus erycibifolius* Airy Shaw	Hypericaceae	NE	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
170	*Cratoxylum glaucum* Korth.	Hypericaceae	LC	NO	NE
171	*Cratoxylum sumatranum* (Jack) Blume	Hypericaceae	LC	NO	NE
172	*Platea* sp.	Icacinaceae	NE	NO	NE
173	*Engelhardtia serrata* Blume	Juglandaceae	LC	NO	NE
174	*Teijsmanniodendron bogoriense* Kds.	Lamiaceae	LC	NO	NE
175	*Teijsmanniodendron simplicifolium* Merr.	Lamiaceae	LC	NO	NE
176	*Actinodaphne borneensis* Meisn.	Lauraceae	LC	NO	NE
177	*Actinodaphne* sp.	Lauraceae	NE	NO	NE
178	*Alseodaphne bancana* Miq.	Lauraceae	LC	NO	NE
179	*Alseodaphne* sp.	Lauraceae	NE	NO	NE
180	*Beilschmiedia* sp.	Lauraceae	NE	NO	NE
181	*Cinnamomum sintox* Blume.	Lauraceae	NE	NO	NE
182	*Cryptocarya crassinervia* Miq.	Lauraceae	LC	NO	NE
183	*Cryptocarya densiflora* Blume	Lauraceae	LC	NO	NE
184	*Cryptocarya* sp.	Lauraceae	NE	NO	NE
185	*Dehaasia* sp.	Lauraceae	NE	NO	NE
186	*Endiandra kingiana Gamble*	Lauraceae	LC	NO	NE
187	*Eusideroxylon zwageri* Teijsm. & Binn.	Lauraceae	VU	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
188	*Litsea angulata* Blume	Lauraceae	LC	NO	NE
189	*Litsea elliptibacca* Merr.	Lauraceae	NE	NO	NE
190	*Litsea firma* (Blume) Hook.f.	Lauraceae	LC	NO	NE
191	*Litsea oppositifolia* L.S.Gibbs	Lauraceae	NE	NO	NE
192	*Litsea* sp.	Lauraceae	NE	NO	NE
193	*Neolitsea* sp.	Lauraceae	NE	NO	NE
194	*Barringtonia asiatica* Druce	Lecythidaceae	LC	NO	NE
195	*Barringtonia macrostachya* Jack	Lecythidaceae	LC	NO	NE
196	*Barringtonia reticulata* (Blume) Miq.	Lecythidaceae	LC	NO	NE
197	*Magnolia candollii* (Blume) H.Keng	Magnoliaceae	NE	NO	NE
198	*Magnolia* sp.	Magnoliaceae	NE	NO	NE
199	*Commersonia bartramia* (L.) Merr.	Malvaceae	LC	NO	NE
200	*Durio carinatus* Mast.	Malvaceae	NT	NO	NE
201	*Durio dulcis* Becc.	Malvaceae	VU	NO	NE
202	*Durio griffithii* (Mast.) Bakh.	Malvaceae	NE	NO	NE
203	*Durio kutejensis* (Hassk.) Becc.	Malvaceae	VU	NO	NE
204	*Durio oxleyanus* Griff.	Malvaceae	NT	NO	NE
205	*Durio* sp.	Malvaceae	NE	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
206	*Heritiera simplicifolia* (Mast.) Kosterm.	Malvaceae	LC	NO	NE
207	*Microcos* sp.	Malvaceae	NE	NO	NE
208	*Pentace adenophora* Kosterm.	Malvaceae	LC	NO	NE
209	*Pentace erectinevia* Kosterm.	Malvaceae	LC	NO	NE
210	*Pentace triptera* Mast.	Malvaceae	LC	NO	NE
211	*Sterculia rhoidifolia* Stapf. Ex Ridley	Malvaceae	VU	NO	NE
212	*Sterculia* sp.	Malvaceae	NE	NO	NE
213	*Scaphium macropodum (Miq.) Beumee ex Heine*	Malvaceae	LC	NO	NE
214	*Bellucia pentamera* Naudin	Melastomataceae	LC	NO	NE
215	*Memecylon* sp.	Melastomataceae	NE	NO	NE
216	*Pternandra azurea* (Blume) Burkill	Melastomataceae	LC	NO	NE
217	*Pternandra coerulescens* Jack.	Melastomataceae	LC	NO	NE
218	*Aglaia rubiginosa* (Hiern) Pannell	Meliaceae	LC	NO	NE
219	*Aglaia silvestris* (M.Roem.) Merr.	Meliaceae	LC	NO	NE
220	*Aglaia* sp.	Meliaceae	NE	NO	NE
221	*Dysoxylum* sp.	Meliaceae	NE	NO	NE
222	*Sandoricum beccarianum* Baill.	Meliaceae	DD	NO	NE
223	*Artocarpus anisophyllus* Miq.	Moraceae	VU	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
224	*Artocarpus elasticus* Blume	Moraceae	LC	NO	NE
225	*Artocarpus integer* (Thunb.) Merr.	Moraceae	LC	NO	NE
226	*Artocarpus kemando* Miq.	Moraceae	NT	NO	NE
227	*Artocarpus lanceifolius* Roxb.	Moraceae	LC	NO	NE
228	*Artocarpus odoratissimus* Miq.	Moraceae	NT	NO	NE
229	*Artocarpus* sp.	Moraceae	NE	NO	NE
230	*Artocarpus teysmannii* Miq.	Moraceae	LC	NO	NE
231	*Ficus benjamina* L.	Moraceae	LC	NO	NE
232	*Ficus* sp.	Moraceae	NE	NO	NE
233	*Ficus spathulifolia* Corner	Moraceae	NT	NO	NE
234	*Parartocarpus bracteatus* (King) Becc.	Moraceae	LC	NO	NE
235	*Prainea limpato* (Miq.) Blume ex Heyne	Moraceae	LC	NO	NE
236	*Gymnacranthera farquhariana* (Hook.f.& Thomson) Warb.	Myristicaceae	LC	NO	NE
237	*Horsfieldia carnosa* Warb.	Myristicaceae	NT	NO	NE
238	*Horsfieldia crassifolia* (Hook.f. & Thomson) Warb.	Myristicaceae	LC	NO	NE
239	*Horsfieldia grandis* (Hook.f.) Warb.	Myristicaceae	LC	NO	NE
240	*Horsfieldia* sp.	Myristicaceae	NE	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
241	*Knema furfuracea* Warb.	Myristicaceae	LC	NO	NE
242	*Knema glaucescens* Jack	Myristicaceae	LC	NO	NE
243	*Knema latericia* Elmer	Myristicaceae	LC	NO	NE
244	*Knema latifolia* Warb.	Myristicaceae	LC	NO	NE
245	*Knema* sp.	Myristicaceae	NE	NO	NE
246	*Myristica iners* Blume	Myristicaceae	LC	NO	NE
247	*Myristica lowiana* King	Myristicaceae	NT	NO	NE
248	*Myristica maxima* Warb.	Myristicaceae	LC	NO	NE
249	*Myristica* sp.	Myristicaceae	NE	NO	NE
250	*Eugenia caudatilimba* Merr.	Myrtaceae	LC	NO	NE
251	*Eugenia stapfiana* King	Myrtaceae	LC	NO	NE
252	*Syzygium bankense* (Hassk.) Merrill &Perry	Myrtaceae	NE	NO	NE
253	*Syzygium caudatilimbum* (Merr.) Merr. & Perry	Myrtaceae	LC	NO	NE
254	*Syzygium cerinum* (M.R. Hend.) I.M.Turner	Myrtaceae	NE	NO	NE
255	*Syzygium chloranthum* (Duthie) Merrill & Perry	Myrtaceae	LC	NO	NE
256	*Syzygium claviflorum* (Roxb.) Wall.ex Steudel	Myrtaceae	LC	NO	NE
257	*Syzygium hirtum* (Korth.) Merr. & Perry	Myrtaceae	LC	NO	NE
258	*Syzygium leptostemon* (Korth.) Merrill & Perry	Myrtaceae	LC	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
259	*Syzygium lineatum* (DC) Merr. & Perry	Myrtaceae	LC	NO	NE
260	*Syzygium nigricans* (King) Merr. & Perry	Myrtaceae	LC	NO	NE
261	*Syzygium* sp.	Myrtaceae	NE	NO	NE
262	*Syzygium tawahense* (Korth.) Merr.& L.M.Perry	Myrtaceae	LC	NO	NE
263	*Tristaniopsis grandifolia* (Ridl.) P.G.Wilson & J.T.Waterh	Myrtaceae	NE	NO	NE
264	*Tristaniopsis merquensis* Griff.	Myrtaceae	NE	NO	NE
265	*Tristaniopsis obovata* (Benn.) Wilson & Waterhouse	Myrtaceae	NE	NO	NE
266	*Tristaniopsis* sp.	Myrtaceae	NE	NO	NE
267	*Gomphia serrata* (Gaertn.) Kanis	Ochnaceae	LC	NO	NE
268	*Scorodocarpus borneensis* (Baill.) Becc.	Olacaceae	LC	NO	NE
269	*Sarcotheca diversifolia* (Miq.) Hallier f.	Oxalidaceae	LC	NO	NE
270	*Adinandra dumosa* Jack.	Pentaphylacaceae	LC	NO	NE
271	*Ternstroemia magnifica* Stapf ex Ridl.	Pentaphylacaceae	LC	NO	NE
272	*Ternstroemia* sp.	Pentaphylacaceae	NE	NO	NE
273	*Antidesma coriaceum* Tul.	Phyllanthaceae	LC	NO	NE
274	*Aporosa nervosa* Hook.f.,Fl. Br.	Phyllanthaceae	LC	NO	NE
275	*Aporusa confusa* Gage	Phyllanthaceae	NE	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
276	*Aporusa dioica* (Roxb.) Müll.Arg.	Phyllanthaceae	NE	NO	NE
277	*Aporusa frutescens* Blume	Phyllanthaceae	NE	NO	NE
278	*Aporusa grandistipula* Merr.	Phyllanthaceae	NE	NO	NE
279	*Baccaurea bracteata* Mull.Arg.	Phyllanthaceae	LC	NO	NE
280	*Baccaurea pyriformis* Gage	Phyllanthaceae	LC	NO	NE
281	*Baccaurea* sp.	Phyllanthaceae	NE	NO	NE
282	*Baccaurea tetrandra* (Baill.) Mull.Arg	Phyllanthaceae	LC	NO	NE
283	*Cleistanthus myrianthus* (Hassk.) Kurz	Phyllanthaceae	NE	NO	NE
284	*Cleistanthus* sp.	Phyllanthaceae	NE	NO	NE
285	*Xanthophyllum amoenum* Chodat	Polygalaceae	NE	NO	NE
286	*Xanthophyllum griffithii* Hook.f.ex Benn.	Polygalaceae	LC	NO	NE
287	*Xanthophyllum rufum* A.W.Benn.	Polygalaceae	LC	NO	NE
288	*Xanthophyllum* sp.	Polygalaceae	NE	NO	NE
289	*Xanthophyllum stipitatum* A.W.Benn.	Polygalaceae	LC	NO	NE
290	*Ardisia platyclada* King & Gamble	Primulaceae	NE	NO	NE
291	*Ardisia* sp.	Primulaceae	NE	NO	NE
292	*Drypetes kikir* Airy Shaw	Putranjivaceae	LC	NO	NE
293	*Drypetes ochrothrix* Airy Shaw	Putranjivaceae	NE	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
294	*Drypetes polyneura* Airy Shaw	Putranjivaceae	LC	NO	NE
295	*Drypetes* sp.	Putranjivaceae	NE	NO	NE
296	*Glochidion arborescens* Blume	Putranjivaceae	NE	NO	NE
297	*Glochidion littorale* Blume	Putranjivaceae	NE	NO	NE
298	*Glochidion sericeum* (Blume) Zoll. & Mor.	Putranjivaceae	NE	NO	NE
299	*Ziziphus angustifolius* (Miq.) Hatusima ex Steenis	Rhamnaceae	NE	NO	NE
300	*Carallia brachiata* (Lour.) Merr.	Rhizophoraceae	LC	NO	NE
301	*Pellacalyx axillaris* Korth.	Rhizophoraceae	LC	NO	NE
302	*Prunus* sp.	Rosaceae	NE	NO	NE
303	*Canthium* sp.	Rubiaceae	NE	NO	NE
304	*Gardenia pterocalyx* Valeton	Rubiaceae	EN	NO	NE
305	*Jackiopsis ornata* (Wall.) Ridsdale	Rubiaceae	LC	NO	NE
306	*Porterandia anisophylla* (Jack ex Roxb.) Ridl.	Rubiaceae	LC	NO	NE
307	*Rothmannia schoemanii* (Teijsm. & Binn.) Triveng.	Rubiaceae	LC	NO	NE
308	*Streblosa pubescens* Ridl.	Rubiaceae	NE	NO	NE
309	*Timonius flavescens* (Jacq.) Baker	Rubiaceae	LC	NO	NE
310	*Timonius* sp.	Rubiaceae	NE	NO	NE
311	*Acronychia pedunculata* (L.) Miq.	Rutaceae	LC	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
312	*Melicope glabra* (Blume) T.G.Hartley	Rutaceae	LC	NO	NE
313	*Melicope lunu-ankenda* (Gaertn.) T.G. Hartley	Rutaceae	LC	NO	NE
314	*Tetractomia tetrandrum* (Roxb.) Merr.	Rutaceae	NE	NO	NE
315	*Homalium* sp.	Salicaceae	NE	NO	NE
316	*Dimocarpus longan* Lour.	Sapindaceae	DD	NO	NE
317	*Nephelium cuspidatum* Blume	Sapindaceae	LC	NO	NE
318	*Nephelium mangayi* Hiern	Sapindaceae	NE	NO	NE
319	*Nephelium mutabile* Blume	Sapindaceae	NE	NO	NE
320	*Nephelium ramboutan-ake* (Labill.) Leenh.	Sapindaceae	LC	NO	NE
321	*Nephelium* sp.	Sapindaceae	NE	NO	NE
322	*Nephelium uncinatum Radlk.ex Leenh.*	Sapindaceae	LC	NO	NE
323	*Pometia acuminatisima* Jacobs	Sapindaceae	NE	NO	NE
324	*Xerospermum laevigatum* Radlk.	Sapindaceae	LC	NO	NE
325	*Madhuca borneensis van* Royen	Sapotaceae	NE	NO	NE
326	*Madhuca motleyana* (de Vriese) J.F.Macbr	Sapotaceae	NT	NO	NE
327	*Madhuca* sp.	Sapotaceae	NE	NO	NE
328	*Palaquium beccarianum* (Pierre) van Royen	Sapotaceae	LC	NO	NE
329	*Palaquium cochleariifolium P. Royen*	Sapotaceae	LC	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
330	*Palaquium leiocarpum Boerl.*	Sapotaceae	NT	NO	NE
331	*Palaquium pseudocuneatum* H.J.Lam	Sapotaceae	LC	NO	NE
332	*Palaquium* sp.	Sapotaceae	NE	NO	NE
333	*Palaquium stenophyllum* H.J.Lam	Sapotaceae	NE	NO	NE
334	*Payena acuminata* (Blume) Pierre	Sapotaceae	LC	NO	NE
335	*Payena leerii* (Teijsm. & Binn.) Kurz	Sapotaceae	NT	NO	NE
336	*Payena lucida* (G.Don) DC.	Sapotaceae	NT	NO	NE
337	*Payena* sp.	Sapotaceae	NE	NO	NE
338	*Planchonella maingayi* (C.B. Clarke) P.K.	Sapotaceae	NT	NO	NE
339	*Stemonurus scorpioides* Becc.	Stemonuraceae	LC	NO	NE
340	*Cantleya corniculata* (Becc.) R.A.Howard	Stemonuraceae	VU	NO	NE
341	*Tetramerista glabra* Miq.	Tetrameristaceae	VU	NO	NE
342	*Ploiarium alternifolium* Melch.	Theaceae	LC	NO	NE
343	*Aquilaria beccariana* Van Teigh,	Thymelaeaceae	VU	NO	App. II
344	*Gonystylus affinis* Radlk.	Thymelaeaceae	VU	NO	App. II
345	*Gonystylus bancanus* Radlk.	Thymelaeaceae	CR	NO	App. II
346	*Gonystylus macrophyllus*	Thymelaeaceae	LC	NO	App. II
347	*Trigoniastrum hypoleucum* Miq.	Trigoniaceae	NE	NO	NE

No	Scientific Name	Family	IUCN	GoI	CITES
348	*Gironniera nervosa* Planch.	Ulmaceae	LC	NO	NE
349	*Geunsia pentandra* Merr.	Verbenaceae	NE	NO	NE

APPENDIX 11: BIODIVERSITY MONITORING PLAN

Objective	Indicator	Unit of Measurement	Data Source	Frequency
During project period, diversity (and/or structure/composition) of the wildlife/fauna communities and population are well documented/ monitored, and maintained or enhanced	Richness/diversity, relative abundance, and density or (spatial distribution) of birds, mammals, herpetofauna, and fish can be well documented (and maintained). The community structure has not changed significantly within critical limits (home range/distribution)	1. Number of species 2. Value of diversity indices 3. Number of individuals 4. Number of individuals per ha	1. Avifauna baseline and monitoring using point count/ line transects survey 2. Medium-large mammals' baseline and monitoring using camera trap survey 3. Herpetofauna baseline and monitoring using visual encounter survey 4. Ichthyofauna baseline and monitoring survey	Annually
Population dynamics of flagship species (Bornean orangutan) is well monitored and or maintained/enhanced	Population size, density, and distribution (or demographic structure) of the Bornean orangutan (P. pygmaeus pygmaeus) are well documented (or maintained and did not show significant changes, demographically and ecologically critical life cycle stages continued to be represented. The population size of the Bornean orangutan is maintained within natural variation	No. of individuals /km2 No. of individuals	Orangutan population baseline and monitoring survey	Once per 4 years

Objective	Indicator	Unit of Measurement	Data Source	Frequency
Diversity and forest vegetation vertical structure and composition are well documented/monitored (and or maintained/or enhanced) during project period	During the project period, changes in forest and land cover (temporal/time series trend), do not significantly decrease (instead increasing). The community structure of forest vegetation, the temporal variation is not significantly change. The vegetation/tree structure does not change significantly compared to the baseline data.	1. Nominal of each stratum 2. Area of each stratum (in hectare) 3. Percent cover of trees (%) 4. Percent (%) cover of shrub 5. Percent (%) cover of open area	Remote sensing, GIS (RS-GIS)	Annualy
	The presence of trees (seedling, saplings) and shrub regeneration and growth indicate biomass productivity	1. Number per hectare of seedling 2. Number per hectare of sapling 3. Number per hectare of shrub 4. Number per hectare of figs/Ficus sp.	Vegetation survey (IHMB)	Annually
	Richness, diversity and relative abundance of species from seedlings, poles, saplings and trees did not change	1. Number of species 2. Value of diversity indices	Vegetation survey	Annually

Objective	Indicator	Unit of Measurement	Data Source	Frequency
	significantly compared to the baseline data	3. Number of individuals 4. Number of individuals per ha		
Threats to biodiversity are well documented/monitored (maintained and or reduced)	Human-induced pressures from (uncontrolled) forest fire which has impact to removal of forest vegetation (as proxy/habitat of biodiversity)	Area (in m^2/ha/year)	Fire spot monitoring	Annually
	Human-induced pressures comes from encroachment, illegal logging and harvesting	1. Threats status (%/TRA index) 2. Frequency (No./year) 3. Types (Crown, ground, surface) 4. Amount of timber harvested (m3/ha/year) 5. Fuel-wood harvested (kg/ha/year) 6. Other NTFPs by products and species (kg/ha/year)	1. Threat Reduction Assessment 2. Household survey 3. Stump survey 4. Forest protection patrol	Annually

Objective	Indicator	Unit of Measurement	Data Source	Frequency
	Spatial extent/coverage of illegal harvesting and hunting of fish and wildlife and the number of species taken/traded from habitat/forest	1. Threats status (%/TRA index) 2. Area (m2 or hectare/year) 3. Number of species per year 4. Frequency per year 5. Number of persons Involved per year	1. Threat Reduction Assessment 2. Household survey Forest protection patrol	Annually
Perception and practices of local community toward biodiversity value of the peat-swamp forest are well documented (or has positive trend)	Change in knowledge and attitude, of local communities related to promotion of forest ecosystem regeneration (and or restoration) as important biodiversity enhancing factors (HCVs)	1. Percentage of local population that changes positively (%) 2. Commitment of poor people to treats Reduction (4-point ordinal scale) 3. Provision of habitat management (Yes/No) 4. Provision of red-listed species of	1. Threat Reduction Assessment 2. Household survey Forest protection patrol	Annually

Objective	Indicator	Unit of Measurement	Data Source	Frequency
		flora and fauna (Yes or No) 5. Delineation of important social and religious area (Yes or No) 6. Economically important species (Yes or No)		
	Actions/practices of of local communities/government (villages) related to biodiversity conservation	1. Village mitigation plan (Yes or No) 2. Implementation of threats mitigation plan (Yes or No) 3. Changes in threats status (%) 4. Poor people's perception of threats and its mitigation (plan 4-point ordinal scale) 5. Medium people's perception to	1. Threat Reduction Assessment 2. Household survey Forest protection patrol	Annually

Objective	Indicator	Unit of Measurement	Data Source	Frequency
		threats and its mitigation (plan 4-point ordinal scale) 6. Rich people's perception to threats and its mitigation plan (4-point ordinal scale)		

APPENDIX 12: DATA AND PARAMETERS AVAILABLE AT VALIDATION FOR REDD (APDEG AND APD)

Data Unit / Parameter:	Aplanned,i
Data unit:	ha
Value	Aplanned_Deg = 18,395.10 Ha Aplanned_Def = 4,297.95 Ha Aplanned_Strip Planting = 3,964.57 Ha
Description:	Total area of planned deforestation and degradation over the fixed baseline period for stratum i
Source of data:	Technical proposal 2019 and ASK license
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	N/A

Data/ parameter:	fj(X,Y…)
Data unit:	t d.m. tree-1
Description:	Allometric equation(s) for species j linking measured tree variable(s) to aboveground biomass of living trees
Source of data:	Manuri et.al. 2013. Tree biomass equations for tropical peat swamp forest in Kapuas Hulu District Manuri et.al. 2014. Tree biomass equations for tropical dryland forest ecosystem in Kapuas Hulu District.

	Ref: Forest Ecology and Management 334 (2014) 241–253
Measurement procedures (if any):	N/A
Purpose of data	To estimate tree biomass for C stock calculation of baseline and project scenario
Any comment:	The equation used in the calculation is for mixed PSF tree species with DBH as a single parameter.

Data/ parameter:	CFj
Data unit:	tC·td.m.-1
Description:	Carbon fraction of dry matter for species j
Source of data:	IPCC 2006 default value is used.
Value applied	0.47
Purpose of data	The value used to convert dried weight biomass to carbon
Any comment:	None

Data Unit / Parameter:	CAB_tree,i
Data unit:	tC
Value	-
Description:	Carbon stock in aboveground biomass in trees in the baseline in stratum i
Source of data	Data sheet and the analysis result of C stock of forest
Module parameter originates in:	Module CP-AB
Any comment:	N/A

Data/ parameter:	VEX,j,i|BSL
Data unit:	m3·
Description:	-
Source of data:	The timber harvest plan sets the allowable mean extracted volume from the merchantable volume of timber in the forest inventory (Vj,i|BSL),based on legal limits. The value derived from inventory data collected in 45 Permanent Sampling Plots within the project areas, categorized into two timber classes; dipterocarp and other commercial tree species. Detail information on the technical process in generating this data can be seen in Section 3.2.1.1
Value applied:	-
Measurement procedures (if any):	N/A
Any comment:	N/A

Data/ parameter:	Ai,p
Data unit:	Ha
Value	See sheet A_i,p in the REDD parameter spreadsheet
Description:	Area covered by stratum i over land parcel p
Source of data:	The overlapping of the final AGB stratification map and timber harvest plan.
Measurement procedures (if any):	N/A
Any comment:	It must be assumed ex-ante that land parcel boundaries and strata areas must not change through time

Data/ parameter:	Asp

Data unit:	Ha
Value	11.25 Ha
Description:	Area of sample plots p N total within project area: 45 PSP
Source of data:	Recording and archiving of size of sample plots
Measurement procedures (if any):	Standard procedures for plot delineation in forest timber inventory surveys is applied
Any comment:	Ex-ante the size of the plots will be defined and recorded in the monitoring plan.

Data / Parameter	FRSD|BSL
Data unit	Dimensionless
Description	Residual Stand Damage Factor
Source of data	Pinards and Putz (1996)
Value applied	2.30
Justification of choice of data or description of measurement methods and procedures applied	No specific reference is available on the Residual Stand Damage Factor (RSD) for Indonesia case. Based on this reason, the RSD value applied in the calculation use the RSD value of neighbouring country (Malaysia) as studied by Pinards and Putz in 1996. The similarity in the context of forest characteristic and logging practices between both countries believed to be relevant to ensure the conservativeness of the calculation.
Purpose of Data	Determination of baseline scenario
Comments	-

Data/ Parameter:	Vl,j,i,sp
Data unit:	m3/ha

Value	-
Description:	Merchantable volume for tree l of species j in sample plots p in stratum i
Source of data:	Calculated from volume tables derived from the data of breast height (DBH- at typically 1.3 m aboveground level) and merchantable height (MH).
Measurement procedures (if any):	Available in the Standard Operating Procedure (Annex 1 SOP Biomass Survey)
Any comment:	Merchantable Volume (V) is calculated by using formula commonly applied in timber concession in Indonesia as below: V= 1/4*DBH^2*MV* 0.6. The merchantable volume is calculated in unit of m3. The field data and calculation sheet is available at validation. As suggested by the methodology, the merchantable volume further analysed into two tree classes; Dipterocarpaceae and mixed tree species.

Data/ parameter:	BCEFR
Data unit:	t.d.mm-3
Description:	Biomass conversion and expansion factor applicable to wood removals in the project area
Source of data:	IPCC 2006 INV AFOLU Chapter 4, Table 4.5. Default value BCEF Tonnes Biomass (M3 of wood volume) with the growing stock of 80-120 m3/ha
Value applied	1.5
Measurement procedures (if any):	N/A
Any comment:	N/A

Data/ parameter:	OF, SLF, WW
Data unit:	Kg kg-1

Used in equations:	
Description:	OF, SLF and WW are used for oxidation and the decay of wood product in IFM-LtFP OF = Fraction of wood products that will be emitted to the atmosphere between 3 and100 years after production; SLF = Fraction of wood products that will be emitted to the atmosphere within 3 years of production; and WW = Fraction of extracted biomass effectively emitted to the atmosphere during production Wood Waste fraction (WW): Winjum et al (1998) indicate the proportion of extracted biomass that is oxidized (burning or decaying) from the production of commodities for developing and developed countries. Short-lived fraction (SLF) Winjumetal1998 give decay rates for proportions of wood products, which were converted to with short-term (<3yr) Additional Oxidized Fraction (OF) Winjum et al 1998 gives annual oxidation fractions for each class of wood products. This gives the additional proportion that is oxidized between the 3rd and the 100th.
Source of data:	The source of data is the published paper of Winjum et al.199838
Value applied:	Wood Waste fraction (WW): 24% (for developing countries) Short-lived fraction (SLF)

	Sawn wood: 0.12 Wood base panels: 0.06 Additional Oxidized Fraction (OF) Sawn wood: 0.86 Wood base panel:0.98
Measurement procedures (if any):	N/A
Any comment:	

APPENDIX 13: DATA AND PARAMETERS MONITORED FOR REDD

Data / Parameter:	Project Forest Cover Monitoring Map
Data Unit:	Ha
Description:	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Source of data:	Remote sensing in combination with GPS data collected during ground truthing
Justification of choice of data or description of measurement methods and procedures applied:	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
Any comment:	Where forest land contains more than one forest class, the map must be stratified into forest classes using Module X-STR.

Data / Parameter:	Degradation PRA Results
Source of data:	PRA
Justification of choice of data or description of measurement methods and procedures applied:	The PRA shall consist of semi-structured interviews / questionnaires. The PRA shall evaluate whether timbe harvest (illegal logging) may be occurring in the project area

	If ≥ 10% of those interviewed/surveyed believe that degradation may be occurring within the project boundary then the limited on-the-ground degradation survey shall be triggered An additional output of the PRA shall be a depth of penetration of degradation pressure. A maximum distance shall be recorded for penetration into the forest from access points (such as roads, rivers, already cleared areas) for the purpose of timber. It is likely that differing distances shall exist for each degradation pressure. If multiple pressures exist in the same stratum the deepest depth of penetration shall be used to define Adeg,i Frequency: every two years
Any comment:	Ex ante, an estimation shall be made of degradation in the with-project case. If the belief is that zero degradation will occur within the project boundaries then this parameter may be set to zero if clear infrastructure, hiring and policies are in place to prevent deforestation.

Data / Parameter:	Result of Limited Degradation Survey
Justification of choice of data or description of measurement methods and procedures applied:	Sampled by surveying several transects of known length and width across the access-buffer area (equal in area to at least 1% of ADeg,i) to check whether new tree stumps are evident or not. Frequency: Must be repeated each time the PRA indicates a potential for degradation
Any comment:	Ex ante, an estimation shall be made of degradation in the with-project case. If the belief is that zero degradation will occur within the project boundaries then this parameter may be set to zero if clear infrastructure, hiring and policies are in place to prevent deforestation.

Data / Parameter:	ADegW,i

Data Unit:	ha
Description:	Area potentially impacted by degradation processes in stratum i
Source of data:	GIS delineation and ground truthing
Justification of choice of data or description of measurement methods and procedures applied:	ADegW,i shall be composed of a buffer from all access points (access buffer), such as roads and rivers or previously cleared areas. The width of the buffer shall be determined by the depth of degradation penetration as defined as a PRA output. Frequency: Must be repeated each time the PRA indicates a potential for degradation
Any comment:	Ex ante, a limited survey can be used to determine a likely depth of degradation penetration

Data / Parameter:	APi
Data Unit:	ha
Description:	Total area of degradation sample plots in stratum i
Source of data:	Ground measurement
Justification of choice of data or description of measurement methods and procedures applied:	The sampling plan must be designed using plots systematically placed over the buffer zone so that they sample at least 3% of the area of the buffer zone. Frequency: Shall be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Any comment:	Ex ante, an estimation must be made of area of plots. This must be set to exactly 3% of the buffer zone ADeg,i

Data / Parameter:	CDegW,i,t

Data Unit:	tCO2e
Description:	Biomass carbon of trees cut and removed through illegal logging process from plots measured in stratum i in year t
Source of data:	Field measurement
Justification of choice of data or description of measurement methods and procedures applied:	The diameter of all tree stumps is the designated plots will be measured and conservatively assumed to be the same as the DBH. The above ground carbon stock of each harvested tree must be estimated using the same allometric regression equation for estimating the carbon pool in trees (CP-AB) in the baseline scenario. 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
Any comment:	Ex-ante an estimation shall be made of likely degradation in the with-project case. Such an estimation shall be based on rates of degradation in surrounding areas and the degree of protection that will be in place (e.g. forest guards) in the with-project scenario.

Data / Parameter:	ADefPA,i,u,t
Data Unit:	ha
Description:	Area of recorded deforestation in the project area in stratum i converted to land use u in year t
Source of data:	Remote sensing imagery
Justification of choice of data or description of measurement methods and procedures applied:	Frequency: will be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination would occur prior to any verification event
Any comment:	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

	boundaries, then this parameter may be set to zero if clear infrastructure, hiring and policies are in place to prevent deforestation.

APPENDIX 14: DATA AND PARAMETERS AVAILABLE AT VALIDATION FOR WRC

Data/Parameter	A_{WRC}
Unit	ha
Value	17,003.09 hectares
Description	Total area used in calculating GHG emissions for WRC activity
Purpose	Calculation of GHG emissions
Source	Calculated based on significant peat area and EAC
Justification	Justified areas whose peat carbon stocks in project scenario would exceed those under baseline scenario after 100 years ± 5%

Data/Parameter	C or $EF_{CO2\text{-}proxy}$
Unit	tCO2e/ha/y/m-wtd
Value	90
Description	Emission factor used in calculating baseline and WPS CO2 emissions due to microbial decomposition of peat soils, by using water table as proxy
Purpose	Calculation of baseline emissions in the baseline and project scenarios
Source	Several peer reviewed publications
Justification	We conservatively took the lower part of the spectrum

Data/Parameter	$WTD_{BSL,i,t}$
Unit	m
Value	See annex 3
Description	Water table depth (measured from soil surface) in the baseline as proxy for calculating CO2 emissions from microbial decomposition of peat soils

Purpose	Calculation of GHG emissions from microbial decomposition of peat soils in the baseline scenario
Source	Modeled
Justification	Modeled with a robust, proven, spatially distributed model

Data/Parameter	$WTD_{WPS,i,t}$
Unit	m
Value	See annex 3
Description	Water table depth (measured from soil surface) in the project scenario as proxy for calculating CO2 emissions from microbial decomposition of peat soils
Purpose	Calculation of GHG emissions from microbial decomposition of peat soils in the project scenario
Source	Modeled
Justification	Modeled with a robust, proven, spatially distributed model

Data/Parameter	$Depth_{peat\text{-}BSL,i,t0}$ and $Depth_{peat\text{-}WPS,i,t0}$
Unit	meter
Value	See annex 3
Description	Peat thickness map
Purpose	Calculation of peat emission and carbon stock dynamics
Source	Field assessment and peatland mapping
Justification	Sufficient sampling points and mapping technique were used to generate peat map of the project area

Data/Parameter	$SubsidenceBSL_{i,t}$
Unit	m/y

Value	See annex 3
Description	Subsidence for each cell per each year, baseline scenario
Purpose	Calculation of baseline emissions Tracking PDT during calculation
Source	Modelled based on physical properties of peat soils
Justification	Modeled based on in situ parameters and robust, proven, model

Data/Parameter	$SubsidenceWPS_{i,t}$
Unit	m/y
Value	See annex 3
Description	Subsidence for each cell per each year, project scenario
Purpose	Calculation of baseline emissions Tracking PDT during calculation
Source	Modelled based on physical properties of peat soils
Justification	Modeled based on in situ parameters and robust, proven, model

Data/Parameter	$CProfileBSL_{i,t}$
Unit	kg C m-2
Value	See annex 3
Description	Carbon density under baseline scenario
Purpose	Calculating carbon stock dynamics
Source	Modeled
Justification	Modeled based on in situ parameters and robust, proven, model

Data/Parameter	CprofileWPSi,t

Unit	kg C m-2
Value	See annex 3
Description	Carbon density under project scenario
Purpose	Calculating carbon stock dynamics
Source	Modeled
Justification	Modeled based on in situ parameters and robust, proven, model

Data/Parameter	GHGpeatsoil-BSL,CO2,i,t
Unit	t CO2e yr-1
Value	See annex 3
Description	CO2 emissions from microbial decomposition of the peat soil in stratum i in year t in the baseline scenario
Purpose	Calculation of baseline emissions
Source	Calculated using water table proxy
Justification	Water table proxy model has been widely accepted

Data/Parameter	GHGpeatsoil-WPS,CO2,i,t
Unit	t CO2e yr-1
Value	See annex 3
Description	CO2 emissions from microbial decomposition of the peat soil in stratum i in year t in the project scenario
Purpose	Calculation of baseline emissions
Source	Calculated using water table proxy
Justification	Water table proxy model has been widely accepted

Data/Parameter	GHGpeatburn-BSL,CO2,i,t
Unit	t CO2e yr-1
Value	See annex 3
Description	CO2 emissions from burning of peat within the project boundary in the baseline scenario in stratum i in year t
Purpose	Calculation of baseline emissions
Source	Calculated using default EF and burn scar depth
Justification	Based on published literature and IPCC guidelines

Data/Parameter	GHGpeatburn-WPS,CO2,i,t
Unit	t CO2e yr-1
Value	See annex 3
Description	CO2 emissions from burning of peat within the project boundary in the project scenario in stratum i in year t
Purpose	Calculation of baseline emissions
Source	Calculated using default EF and burn scar depth
Justification	Based on published literature and IPCC guidelines

Data/Parameter	$BDProfileBSL_{i,t}$
Unit	Kg/m3
Value	See also annex 3:
Description	Bulk density dynamics of peat soils under baseline scenario
Purpose	Calculation of peat carbon stock Calculation of dry mass burnt Calculation of initial subsidence Calculation of annual subsidence

Source	Modeled
Justification	Based on in situ parameters and a robust model

Data/Parameter	$BDProfileWPS_{i,t}$
Unit	Kg/m3
Value	See also annex 3
Description	Bulk density dynamics of peat soils under baseline scenario
Purpose	Calculation of peat carbon stock Calculation of dry mass burnt Calculation of initial subsidence Calculation of annual subsidence
Source	Modeled
Justification	Based on in situ parameters and a robust model

Data/Parameter	C_c
Unit	g/g
Value	0.5
Description	Carbon content of peat soils in term of unit weight of carbon content per unit dry mass of peat soils
Purpose	Calculation of peat carbon stock Calculation of annual subsidence
Source	Page et.al. (2004)
Justification	Adopted from a peer-reviewed publication

Data/Parameter	$D_{peatburnt,BSL,it}$
Unit	m

Value	See also annex 3
Description	Burn scar depth as resulted by fires on peatlands in the baseline and the project scenarios
Purpose	Calculation of dry mass burnt Calculation of annual subsidence
Source	Modeled based on historical hot spot and actual fire variables from relevant proxy area
Justification	Based on empirical parameters, using robust stochastic modelling, and from a peer-reviewed publication, and Page et.al. (2014)

Data/Parameter	G_g
Unit	g/g
Value	See annex 3
Description	Emission factor for GHG gases CO2, CH4 and N2O as resulted from the combustion of peat soils in term of unit mass of gases per unit dry mass of peat soils
Purpose	Calculation of GHG emissions from the combustion of peat soils in the baseline and the project scenarios
Source	Christian, et.al. (2003), Hatano, et.al. (2016)
Justification	Adopted from a peer-reviewed publication

Data/Parameter	GWP_g
Unit	-
Value	See annex 3
Description	GHG potential of GHG gases CO2, CH4 and N2O in term of life in the atmosphere relative to GHG CO2
Purpose	Calculation of GHG emissions from the combustion of peats oils in the baseline and the project scenarios

Source	IPCC Fifth Assessment Report, 2014 (AR5)
Justification	Default IPCC value

Data/Parameter	D_{upper}
Unit	m
Value	0.4
Description	Depth of upper layer of peat soils, where most of microbial decomposition and peat combustion take place
Purpose	Calculation of BD_{upper} of peat soils in the baseline and the project scenarios
Source	Assumption based on estimated maximum depth of plant root zone in peat soils in tropical peatlands
Justification	Transition from peat surface to the lower depth is not abrupt but gradual and the determination of the boundary may be subjective in most cases

Data/Parameter	$A_{peatburn\text{-}BSL,it}$
Unit	ha
Value	See annex 3
Description	Annual area burnt in the baseline scenario
Purpose	Calculation of GHG emissions from the combustion of peat soils in the baseline scenario
Source	Modeled, idem
Justification	Based on empirical parameters and robust model

APPENDIX 15: DATA AND PARAMETERS MONITORED FOR WRC

Data/Parameter	$WTD_{wps,i,j,t}$
Unit	m
Description	Yearly average water table depth at stratum i, cell j, year t, in the project area, for use as a proxy in estimating CO2 emissions from microbial decomposition of peat soils
Description of measurement methods and procedures to be applied:	Spatial and temporal distributions of water table depths in a defined physical boundary of peatlands are the result of dynamics of water balance and follow established laws of physics. Measured water table depths distributed over several locations do not by themselves represent the average value(s) from the system, unless unrealistically large number of monitoring devices are in place, which makes it out of option for this project. Water balance modelling is a more appropriate method for estimating spatial and temporal distributions of water table depths. Measured water table depths from dipwells however can be used as useful initial information and indicative values, and, most importantly, as a source of data for model calibration. Water balance model for this project incorporates the following input-output system of water: - Daily rainfall (water input) - Daily evapotranspiration (water output) - Groundwater water flow (water output) - Overland flow (water output) - Open channel flow (water output) - Storage change (water balance) Governing model parameters/variables include: - Hydraulic conductivity of aquifer (peat soils) - DTM - Storage coefficient of aquifer - Aquifer thickness Boundary condition: - Water levels in canals

	This water balance model uses the following sub-models: - Darcy for groundwater flow - Darcy-Weisbach for overland flow - Saint Venant for open channel flow Daily rainfall will be recorded by at least one rainfall station installed in the project area, and can be further enriched by using additional stations(s) outside project area, such as one from Rahadi Oesman Station in Ketapang. Measured water table depths (WTD_o) will be provided by installing at least 50 dipwells distributed over the project area. Water levels of existing canals will be measured by using at least 5 staff gauges. Hydraulic conductivity of peat soils will be sampled at least at 20 random locations by using auger hole (Van Bavel & Kirkham) method and/or inversed auger hole (Porchet) method. Storage coefficient will be sampled at least at 20 random locations by using sample-core saturation method. This water balance model will be schematized with finite difference schematization and will be run in daily time-step. Model output includes water table heads (h) i.e., water table height above mean sea level. Modelled water table depths (WTD_m) were calculated by subtracting DTM by h. For calibration purpose WTD_m will be compared against WTD_o. Parameters storage coefficient, and/or hydraulic conductivity, and/or evapotranspiration will be optimized recursively, in such a way, with the objective of reducing RMSE between WTD_m and WTD_o. We accept RMSE within 10 percent of WTD range. Final result of daily WTD_m will be averaged by year and can be used as a proxy for calculating CO2 emissions from microbial decomposition of peat soils.
Frequency of recording	Water table depths will be modelled in daily values and will be averaged by year. Measured water table depths for calibration will be recorded using manual dipwells with 2-weekly interval, and with automatic dipwells with 30-minutes interval.
Monitoring equipment	-Manual dipwells use PVC perforated-screened case with millimeter scale rod -Automatic dipwells use PVC perforated-screened case with HOBO 20-L automatic water level logger -Manual staff gauges are custom-built using wooden rod and measuring scale -Automatic staff gauges use PVC perforated-screened case with HOBO 20-L automatic water level logger -Rainfall stations use Davis Weather Station
Purpose of data	Calculation of project emissions

Calculation method	NA
QA/QC procedures to be applied	Responsible staff will be trained well before carrying out any measurement campaign. SOP and standard data sheet will be provided and must be mastered by all operators. Crucial measurements will be documented with photos and/or videos. First-level QC will be performed by field supervisor to ensure appropriate entry and to identify obvious artefacts such as typos, misreading, etc. Second-level QC will be performed in Bogor for reassuring data quality by using manual/visual inspections, standard statistics, comparison between wells/stations, trend analysis, etc.
Comments	-

Data/Parameter	$Ratepeatloss\text{-}WPS,i,t$
Unit	m/y
Description	Rate of peat loss due to subsidence and fire in the project scenario in stratum *i* in year *t*
Description of measurement methods and procedures to be applied:	Subsidence from fire can be derived from burn scar depth, based on fire history. Subsidence from microbial decomposition of peat soils can be back-calculated from GHG emissions
Frequency of monitoring	At each monitoring event
Monitoring equipment	Subsidence model
Purpose of data	Calculation of project emissions
Calculation method	Subsidence from 1st fire = 18 cm/y Subsidence from 2nd fire = 11 cm/y Subsidence from ≥3rd fire = 4 cm/y Subsidence from microbial decomposition of peat soils is back-calculated from GHG emissions, soil physical properties (described in PD)

	Calculated value will be cross-checked by measured value (e.g. subsidence poles, levelling surveys)
QA/QC procedures to be applied	-
Comments	-

Data/Parameter	$GHG_{peatsoil,CO2,i,t}$
Unit	t CO2e yr-1
Description	CO2 emissions from microbial decomposition of the peat soil in stratum *i* in year *t*
Description of measurement methods and procedures to be applied:	Calculated using water table depth as proxy
Frequency of monitoring	At each monitoring event
Monitoring equipment	Water table depth model
Purpose of data	Calculation of project emissions
Calculation method	$$GHG_{peatsoil-CO2,i,j,t} = c \times WTD_{BSL,i,j,t}$$ Where: $GHG_{peatsoil-CO2,i,j,t}$: CO_2 emissions from the peat soil within the project boundary in the baseline scenario in stratum *i* parcel *j* at year *t** ($tCO_2e\ ha^{-1}\ yr^{-1}$) calculated using a water table proxy up to 1-meter WTD; leveling off to 90 at 1 meter water table depth (Hooijer, et.al., 2006) $WTD_{BSL,i,j,t}$: Baseline water table depth in stratum *i* parcel *j*, at time *t* (m from soil surface) *c* : Water table proxy constant, whose value approximately 90 $tCO_2e\ ha^{-1}yr^{-1}m^{-1}$ ($tCO_2e\ ha^{-1}\ yr^{-1}\ m^{-1}$)

QA/QC procedures to be applied	-
Comments	-

Data/Parameter	*GHGpeatburn,CO2,i,t*
Unit	t CO2e yr-1
Description	CO2 emissions from burning of peat within the project boundary in the project scenario in stratum *i* in year *t*
Description of measurement methods and procedures to be applied:	Calculated based on monitored burn scar area, burn scar depth, BD_{upper}, GHG_{CO2} and GWP_{CO2}.
Frequency of monitoring	At each monitoring event
Monitoring equipment	Satellite imagery and GPS for tracking burn scar area.
Purpose of data	Calculation of project emissions
Calculation method	$$GHG_{peatburn,CO2,i,t} = \sum_{g=1}^{G} \left(P_{i,j,t} \times G_{CO2} \times 10^{-3} \times GWP_{CO2}\right)$$ $$P_{i,t} = D_{peatburn,i,j,t} \times BD_{upper,i,j,t} \times 10^{4}$$ Where: $GHG_{peatburn\text{-}BSL,i,j,t}$: GHG emissions due to peat burning in the baseline scenario in stratum *i* parcel *j* in year *t* of GHG CO_2 (t $CO2_e$ ha^{-1} yr^{-1}) $P_{i,j,t}$: Average mass of peat burnt in the baseline scenario in stratum *i*, parcel *j* year *t* (t d.m. ha^{-1}) G_{CO2} : Emission factor for gas *CO2* (kg t^{-1} d.m. burnt) GWP_{CO2} : Global warming potential for gas *CO2* (t CO_2/t *g*) $P_{i,j,t}$: Average mass of peat burnt in stratum *i* parcel *j* year *t* (t d.m. ha^{-1}) $D_{peatburn,i,j,t}$: Average fire scar depth in stratum *i* in year *t* (m)

	$BD_{upper,l,j,t}$: Bulk density of the upper peat in stratum *i* parcel *j* year t (g cm^{-3}) *i* : 1, 2, 3 … *M* Strata (unitless) *j* : 1, 2, 3 … *N* parcel (unitless) *t* : 1, 2, 3, … *t** Time elapsed since the start of the project activity (year)
QA/QC procedures to be applied	-
Comments	-

Data/Parameter	*GHGpeatburn,CH4,i,t*
Unit	t CO2e yr-1
Description	CH4 emissions from burning of peat within the project boundary in the project scenario in stratum *i* in year *t*
Description of measurement methods and procedures to be applied:	Calculated based on monitored burn scar area, burn scar depth, BD_{upper}, GHG_{CH4} and GWP_{CH4}.
Frequency of monitoring	At each monitoring event
Monitoring equipment	Satellite imagery and GPS for tracking burn scar area.
Purpose of data	Calculation of project emissions
Calculation method	$$GHG_{peatburn,CH4,i,t} = \sum_{g=1}^{G} \left(P_{i,j,t} \times G_{CH4} \times 10^{-3} \times GWP_{CH4}\right)$$ Where: $GHG_{peatburn\text{-}BSL,i,j,t}$: GHG emissions due to peat burning in the baseline scenario in stratum *i* parcel *j* in year *t* of GHG CH_4 (t $CO2_e$ ha^{-1} yr^{-1})

	$P_{i,j,t}$: Average mass of peat burnt in the baseline scenario in stratum *i*, parcel *j* year *t* (t d.m. ha^{-1}) G_{CO2} : Emission factor for gas *CH4* (kg t^{-1} d.m. burnt) GWP_{CO2} : Global warming potential for gas *CH4* (t CO_2/t *g)* $P_{i,j,t}$: Average mass of peat burnt in stratum *i* parcel *j* year *t* (t d.m. ha^{-1}) $D_{peatburn,i,j,t}$: Average fire scar depth in stratum *i* in year *t* (m) $BD_{upper,I,j,t}$: Bulk density of the upper peat in stratum *i* parcel *j* year t (g cm^{-3}) *i* : 1, 2, 3 … *M* Strata (unitless) *j* : 1, 2, 3 … *N* parcel (unitless) *t* : 1, 2, 3, … *t** Time elapsed since the start of the project activity (year)
QA/QC procedures to be applied	-
Comments	-

Data/Parameter	*GHGpeatburn,N2O,i,t*
Unit	t CO2e yr-1
Description	N_2O emissions from burning of peat within the project boundary in the project scenario in stratum *i* in year *t*
Description of measurement methods and procedures to be applied:	Calculated based on monitored burn scar area, burn scar depth, BD_{upper}, GHG_{N2O} and GWP_{N2O}.
Frequency of monitoring	At each monitoring event
Monitoring equipment	Satellite imagery and GPS for tracking burn scar area.
Purpose of data	Calculation of project emissions

Calculation method	$$GHG_{peatburn,N2O,i,t} = \sum_{g=1}^{G} \left(P_{i,j,t} \times G_{N2O} \times 10^{-3} \times GWP_{N2O}\right) P_{i,t}$$ $$= D_{peatburn,i,j,t} \times BD_{upper,i,j,t} \times 10^{4}$$ Where: $GHG_{peatburn\text{-}BSL,i,j,t}$: GHG emissions due to peat burning in the baseline scenario in stratum *i* parcel *j* in year *t* of GHG N_2O (t $CO2_e$ ha^{-1} yr^{-1}) $P_{i,j,t}$: Average mass of peat burnt in the baseline scenario in stratum *i*, parcel *j* year *t* (t d.m. ha^{-1}) G_{CO2} : Emission factor for gas N_2O (kg t^{-1} d.m. burnt) GWP_{CO2} : Global warming potential for gas N_2O (t CO_2/t *g*) $P_{i,j,t}$: Average mass of peat burnt in stratum *i* parcel *j* year *t* (t d.m. ha^{-1}) $D_{peatburn,i,j,t}$: Average fire scar depth in stratum *i* in year *t* (m) $BD_{upper,l,j,t}$: Bulk density of the upper peat in stratum *i* parcel *j* year t (g cm^{-3}) *i* : 1, 2, 3 … *M* Strata (unitless) *j* : 1, 2, 3 … *N* parcel (unitless) *t* : 1, 2, 3, … *t** Time elapsed since the start of the project activity (year)
QA/QC procedures to be applied	-
Comments	-