New Planting Procedure - Summary of Assessments

RSPO Roundtable on Sustainable Palm Oil	Bumitama Agri Ltd.	**TÜVRheinland®** Precisely Right.

NPP Reference Number:	RSPO New Planting Procedure (NPP) 2021
Country of the NPP submission:	Indonesia
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Section 1: General Information

PT Agro Manunggal Sawitindo (PT AMS) which located in Nanga Tayap District, Ketapang Regency, West Kalimantan Province, is a palm oil company that is a member of the RSPO under its parent company Bumitama Agri Ltd. In its plantation operations, PT AMS has a plantation business permit (Izin Usaha Perkebunan, IUP) and has carried out the Environmental Impact Assessemnt (EIA/ AMDAL) which has been approved by the government

PT AMS has plans to develop land for oil palm, with the focus areas for new plantings are based on Plantation Business Permit No. 308/DISBUN-D/2013 was approved on 17 June 2014 for an area of ± 10,400 ha. Along the process, PT AMS will adopt the RSPO NPP guideline 2021 RSPO. As a part of the process, PT AMS has carried out the integrated HCV-HCS Assessment which also has been stated satisfactory by HCVRN Quality Panel Review, Soil and Topography Study, Land Use Changes Analysis (LUCA), Social Impact Assessment (SIA), Green House Gas (GHG) calculator through the alternatives of land clearance and carry out socialization to the surrounding community by applying the principle of FPIC.

The results of each assessment will be displayed in this NPP summary of assessments report.

Company Information and Contact Person

Company Name	:	PT Agro Manunggal Sawitindo (AMS)
Company Address	:	Jalan Melawai Raya No. 10, South Jakarta Jakarta-Indonesia, 12160
Type of business	:	Oil Palm Plantation
Capital Status	:	Foreign Investment (*Penanaman Modal Asing, PMA*)
Geographical Location		1o35'3.62" - 1o45'1.48" S and 110o30'30.11" - 110o36'48.61" E See Figure 1, Figure 2, and Figure 3

Surrounding Entities

North	:	Plantation area of PT Agro Lestari Mandiri, Lestari Gemilang Intisawit
South	:	Plantation area of PT Sentosa Prima Agro
West	:	Plantation area of PT Wahana Hijau Indah
East	:	IUPHHK-HT OT Wana Hijau Pesaguan

	Contact person	Martin Mach
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Table 1. Types of permits and recommendations PT AMS

No	Licenses and recommendations	Issued by	Number	Note
1.	Deed of Establishment	Tintin Surtini, SH, MH.	53	Registered 29-06-2007
2.	Tax Registration Code Number	Directorate General of Taxes, Ministry of Finance	02.596.846.2-703.001	
3.	Principle approval	Regent of Ketapang (Bupati Ketapang)	525/1073/DPU-TR	Registered 04-08-2011
4.	Permitted Area (Izin Lokasi)	Regent of Ketapang (Bupati Ketapang)	No.458	Registered 07-11-2011
5.	Plantation Business Permit (Izin Usaha Perkebunan)	Regent of Ketapang (Bupati Ketapang)	No. 308/DISBUN-D/2013 (size ± 10,400 Ha)	Registered 17-06-2013
6.	Environmental Permit (Izin Kelayakan Lingkungan)	- Governor of West Kalimantan - Governor of West Kalimantan	- No. 286 tahun 2009 size ± 12,350 Ha - No. 660.1/615/BLHD-A size ± 12,350 Ha	- Registered: 20-05-2009 - Registered: 13-08-2012
7.	Land Right Title		SK 89/HGU/Kem-ATR-BPN/2017 Size: 3,739.68 ha	Registered: 21 – 08 – 2017

Area and time-plan for new plantings

The proposed new planting area by PT AMS is in the location in the Plantation Permit (Izin Usaha Perkebunan, IUP), which have been agreed by the owners of the land will be made available to the company through the FPIC (free, prior, and informed consent). Land development and planting of oil palm will begin by following the procedures of the RSPO New Planting Procedures (NPP), using NPP Guidelines 2021.

The new plant will be divided into 5 years planning. This due to the community still utilize land with rubber plantations and will release it slowly while PT AMS assists for alternative livelihood programs.

Table 2. New Planting Projection Plan PT AMS

Description		Area	
		Ha	%
A. Develop Area		4,671.69	45%
Planted Area	3,589.82		
Community Land	982.37		
Built-up Land	39.55		
Infrastructure	59.94		

B.	**Conservation Area**	1,120.88	11%
	Integrated HCV & HCS	1,120.88	
C.	**Potential Area for Development**	4,621.58	44%
	2022	944.63	
	2023	932.40	
	2024	991.46	
	2025	704.57	
	2026	1,048.51	
	Total Area (A + B + C)	10,414.14*	100%

There is a difference between what is written on the IUP (permit) & on the shp file provided by the relevant agencies. This may be caused during the digitization process.

Section 2: Maps
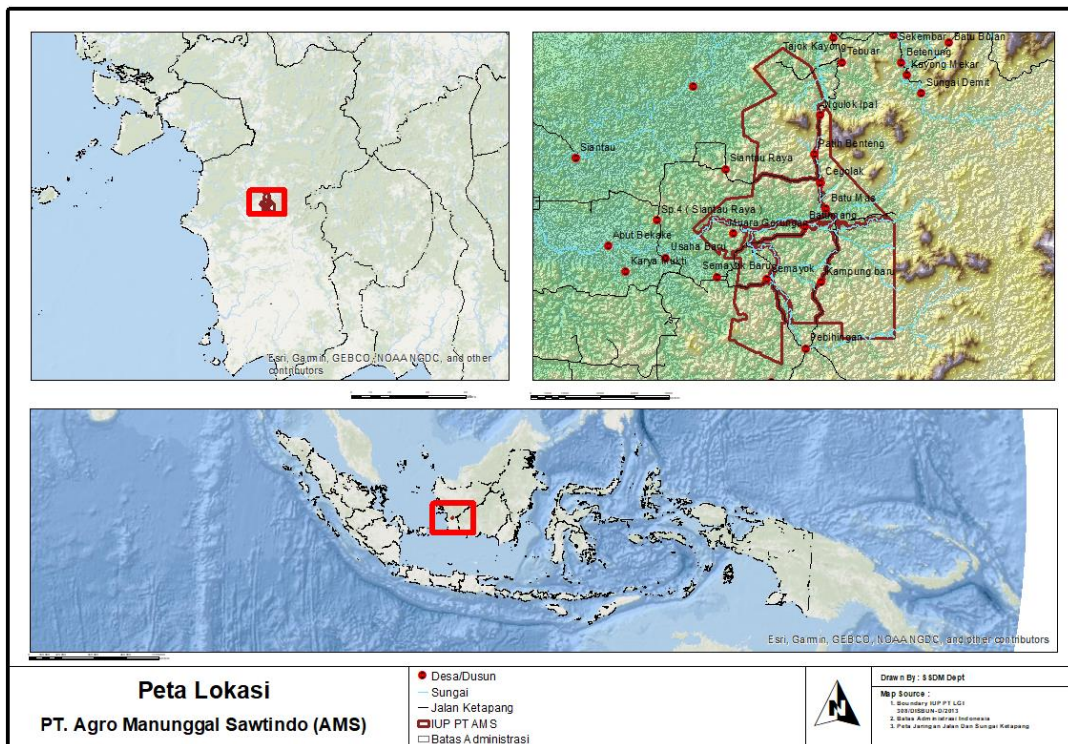
Figure 1. Map of the location of PT AMS in Sub-district of Nanga Tayap, District of Ketapang, West Kalimantan
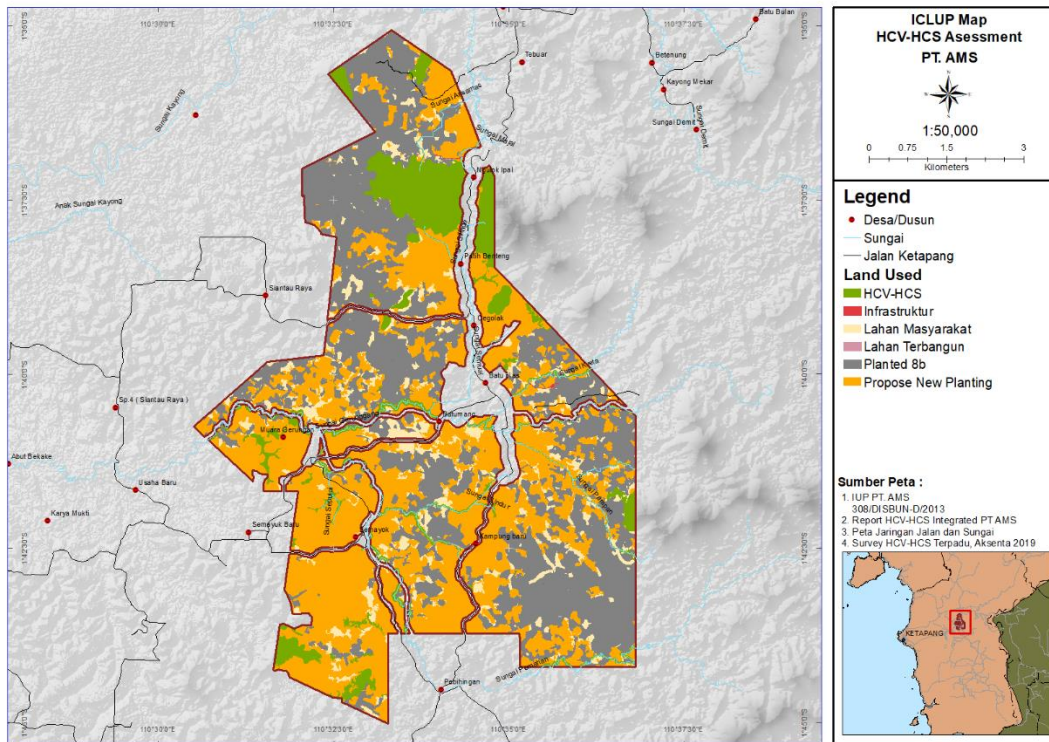
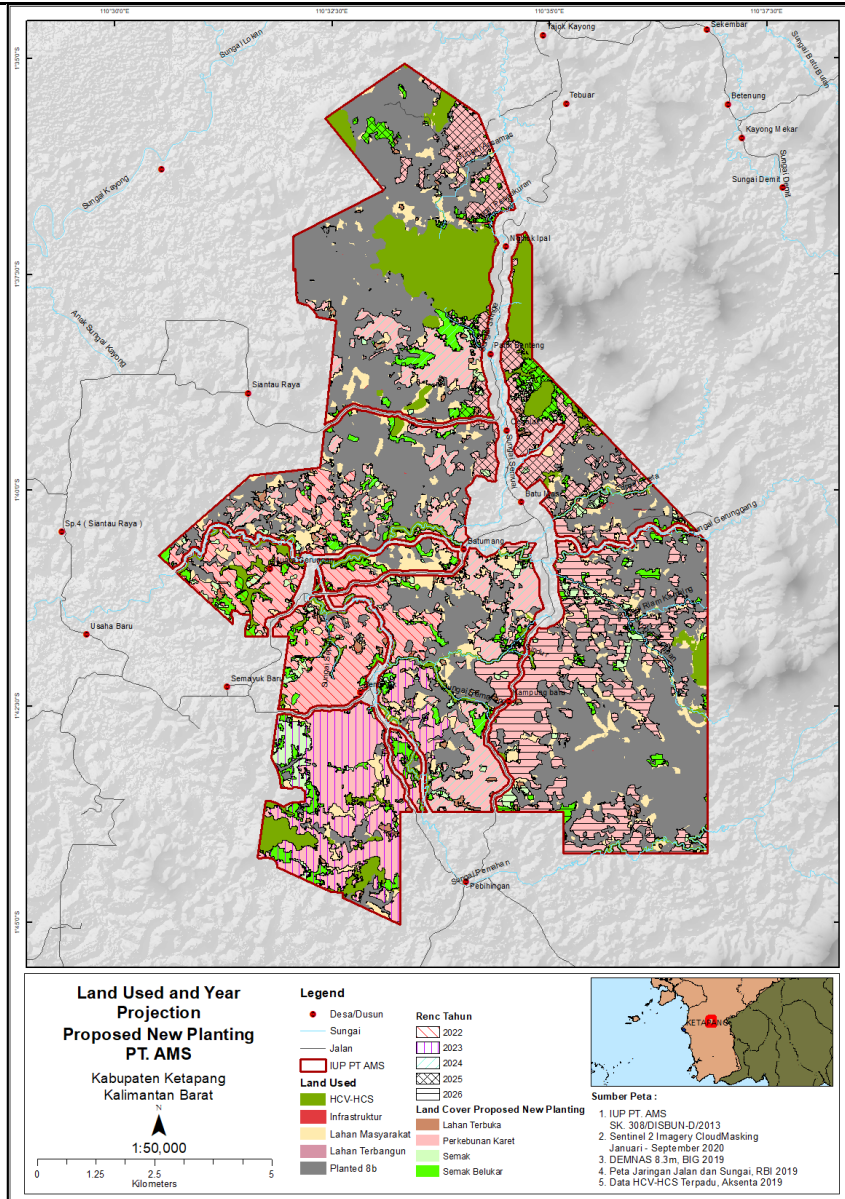Figure 2. Map of Indicative Conservation Land Use Plan of PT AMS

Figure 3. Map of Planting Projection, Area Proposed for New Planting of PT AMS

Section 3: SEIA

Environment Impact Assessment

The Environment Impact Assessment of PT AMS was carried out by CV. Inhasa Persada Consultant, with address at Jl. Putri Candramidi No. 57, West Kalimantan (Telephone No: +62 561 731801).

The key consultants conducting these assessments are accredited with the Competency certificate which was approved by The National Association of Professional Consultants of Indonesia:

Table 3. Person and Expertise EIA Team Assessor in PT Agro Manunggal Sawitindo

Team composition	Name	Specification	Competence certificate
Team Leader	Stefan Agung Dhewandanu Wahyudi, S,Si.	Environment Management	Team Leader (AMDAL B)
Sub Team Geo - Physic – Chemist	Ir. Edy Syafril Hayat, MP	Environment Technic	Member

	Yuan Adhi Negara, S,Pi.		Member
	Diana, SP. M, Si.	Agribusiness Technic	Member
	Dian Susanti, ST	Environment Technic	Member
Sub Team Biology	Nurul Pudji Nurwulan, S, Si.	Water Biota	AMDAL B
	Dewi Sartika, S. Hut	Forestry	Member
Sub Team Leader of social culture-community health	Endang Mulyadi, AK., S. Hut., M,Si.	Social	Member
	dr. Eni Nuraen, M.Kes	Public Health	Member

Assessment Methods (data sources, collection, dates, program, and visited places)

The data collection process was strongly associated with the type of data that collected. In generally, studies will be conducted based on primary data and secondary data. Primary data obtained through observation, measurement and field interviews, and secondary data obtained from the literature collected, either from the company, or directly from related institutions in the study of this area. The methods that were used to collect the data adjusted with components that can be studied. The used data must be accurate and reliable so that it could be used to analyse, measure and observe the environmental components which was predicted would be affected and components of action plan which was predicted to give significant impacts to the surrounding environment. The data were collected was as follow:

- Physic – Chemist Components (Climate, Air Quality and Hydrology, and Soil).

- Biological Components (Vegetation, Animals, and Water Biota).

- Socio-Economic Culture Components (Demography/ Population, Social, Economic, Social and Cultural).

- Environmental Health and Public Health Components (Environmental sanitation, public health level, level of public health services).

Methods of Significant Impact Estimation

Determination of the significant impact to the environment caused by the development activities of the plantation and the palm oil mill is only intended as an attempt to estimate the large and important environmental quality changes that are caused by the plantation development activities and the palm oil mills of PT AMS in Nanga Tayap District, Ketapang Regency. Method of significant impact estimation is by differentiating the magnitude impact and significant impacts.

A. Estimation on the Magnitude of Impact

Magnitude of the Impact is measured from the environmental quality changes. On estimates of changes in environmental quality are used formal and informal methods.

1. Formal Methods

   Formal methods are used to estimate the impact of parameters which the system characteristics can be identified or estimated by using the approach of environmental threshold at national and regional levels.

2. Non-Formal Methods

   Non-formal method is a method that is based on the professional judgment of experts, logical frame analysis and analogy. This method is used to estimate the environmental parameters which characteristics system finds difficult to identify or estimated by modelling approach such as models, socio-cultural systems.

   To simplify estimates of magnitude Impact from changes in quality of the matrix filling, then used the approach of environmental quality assessment scale. Level of environmental quality assessment scale using a scale of 1-5. Based

on these figures assessment, environmental quality differentiated as: excellent (5), good (4), fair (3), bad (2), and very poor (1).

B. Determination of Important Impact Characteristics

Assessment of the important impact characteristics were in accordance to BAPEDAL decision Number: KEP-056 of 1994 on Guidelines Regarding Significant Impacts size. Meanwhile, in relation to the impact evaluation conducted by Important Impact scaling into two categories: important and less important. Characteristics Impact divided into two groups, negative impacts, and positive impacts. It will be regarded as negative if the changes/ impact estimated is get adverse towards the environmental, and it is positive if the changes/ impact estimated giving beneficial to the environment.

C. Methods of Important Impact Evaluation

The Important Impact evaluation explore "holistic causative" against expected environmental components that is affected. For this purpose, the supporting tools used is such as interactions matrix. Interactions matrix between activity components and environmental components contain magnitude of Impact and Importance of Impact. This Important Impact evaluation will conduct careful and thorough study to the primary impact (positive / negative) and secondary impacts (positive / negative), and other derivative impacts on the environment component and activities component.

The study of the important source impact and hypothetical impact can identify the key issues that need to be managed. Results of the Important impact evaluation are also expected to assist the decision-making process in the selection of a viable alternative plan that takes into consideration of the environmental aspects of the proposed area.

Summary of Assessment Findings

The development of oil palm plantation and palm oil mill of PT AMS in Nanga Tayap District, Ketapang Regency raises awareness of the environmental impact on the physical-chemical, biological, and social, economic, cultural, and local public health, both positive and negative impacts. In the implementation of plantations development and palm oil mill of PT AMS, one aspect of which is the main consideration is the preservation of the environment, to ensure sustainable development.

The scoping study of the area boundary for Environmental Impact Assessment (EIA) of Oil Palm Plantation activities consider four (4) factors, namely: limit project / activity, ecological boundaries, social boundaries and administrative boundaries.

Plantation activities and palm oil mill was predicted to impact the environment, so it needs to be explored in depth including the four phases of activities: Pre-Construction Phase, Construction Phase, Operational Phase and Post-Operational Phase.

Magnitude and importance of the impact that needed attention in the study of EIA Plantation and Palm Oil Mill of PT AMS at pre-construction phase, is a change in attitudes and perceptions and containing social unrest. At this phase the identified activities to be explored is the socialization and boundary demarcation and land acquisition.

Magnitude and importance of the impact that needed attention in the construction phase is a decrease in air quality and noise levels, decrease in the quality of surface water, land and forest fire potential, decreased in the diversity of flora and fauna species diversity decreased, increase in jobs and business opportunities, increase in incomes, changes in attitudes and perceptions as well as the decrease in public health. At this stage of identified activities could be the mobilization of heavy equipment, manpower recruitment, land clearing, construction of facilities and infrastructure, seeding and planting, maintenance of immature plants, factory construction and wastewater treatment plant, construction of water channels and roads.

At the operational phase, the importance impact that needed attention is the reduction of air quality and increased in noise level, increased job and business opportunities, increase incomes, changing attitudes and perceptions, decreased levels of public health in the study area. At this stage the identified activities could be nursery, FFB harvesting and transport, mobilization of heavy equipment and maintenance of oil palm trees.

While, for the post operation phase is the reduction of air quality and increased in noise level, decrease of local income, changing attitudes and perceptions, and community unrest, are impacts that needed more attention. At this phase the

identified activities could be labor dismissals, demobilization of heavy equipment, reforestation, and revegetation, and also land handover to government and community.

Changes in some aspects of the environment (abiotic, biotic, social, economic, cultural and public health) in Sub-District Nanga Tayap, District of Ketapang, due to these activities require further tightening in the utilization of available natural resources and optimizing the management and monitoring efforts which needed to be integrated into all components of the integrated business.

Magnitude and importance of the impacts that will be managed and monitored in the Environmental Management Plan and Environmental Monitoring Plan based on the results of the impact evaluation are: 1) Physical-chemical environment components include air quality, surface water quality, and forest fires potential; 2) Social culture and public health components including: social unrest, job and business opportunities, perceptions, local revenue and public health level.

Environmental management of the environmental components that are experiencing fundamental changes, both positive and negative as an effect of the Oil Palm Development plan of PT AMS to be carried out in terms of the three approaches, are: technological, socio-economic-cultural and institutional.

The implementation of environmental monitoring carried out by PT AMS. The environmental monitoring reports will be submitted annually to the technical adviser of the government agencies.

Social Impact Assessment

This assessment goes through three stages; pre-assessment, field assessment, and post-assessment, which was carried out from January to April 2022. Was carried out by Ecotrop with the composition of the team as follows:

Table 4. Assessment team member

No	Name	Role	Expertise
1	T. Ade Fachlevi	Team Leader	*Social Economic & stakeholders' engagement and FPIC* expert
2	Bias Berlio P	Team Member	*Social mapping & community development expert*
3	Reza Abdillah	Team Member	*GIS & land use specialist*

Assessment Methods

This assessment uses a qualitative and quantitative approach. A qualitative approach is an approach that produces descriptive data regarding oral and written information and the behaviour of the object being observed so that it can describe the reality in an event and show the quality of the object of assessment. While the quantitative approach is used to measure the object observed through indicators or criteria that have been set in the assessment so that it can provide a measure of the object of the assessment.

Data Collection

This assessment using the primary and secondary data. Secondary data is obtained from statistical data searches, and documents of social and environmental studies that have been carried out in the assessment area (list of secondary data see Table 5). Meanwhile, primary data was obtained through survey and consultation activities using the Rapid Appraisal Method, as follows:

- Focus Group Discussion (FGD). This method is one of the qualitative data collection techniques designed to obtain information on the wants, needs, perspectives, beliefs, and experiences of the community regarding social problems, social conditions, and social impacts of company activities.

- Direct Observation. This method is in the form of direct observation to see and directly observe the social conditions of the local community.

Table 5. Secondary data sources

No.	Secondary data sources
1	Data on Village Area Boundaries and Population in Sub-district of Nanga Tayap, 2021 (https://gis.dukcapil.kemendagri.go.id/peta/)
2	Data on Village Area Boundaries and Population in Sub-district of Pemahan, 2021 (https://gis.dukcapil.kemendagri.go.id/peta/)
3	Nanga Tayap Population Data, 2021 (http://prodeskel.binapemdes.kemendagri.go.id/mpublik/)
4	Pemahan Population Data, 2021 (http://prodeskel.binapemdes.kemendagri.go.id/mpublik/)
5	Indeks Desa Membangun, 2022 (https://idm.kemendesa.go.id/status)
6	Indonesian Earth Map, 2021
7	Sub-district of Nanga Tayap in Numbers (BPS, 2021)
8	Sub-district of Pemahan in Numbers (BPS, 2021)
9	Permitted Location of PT AMS (2011)
10	Location permit extension of PT AMS (2015)
11	Plantation Business Permit (PT AMS, 2013)
12	Land Right Title of PT AMS (2017)
13	Land Tenure Study Report (PT AMS, 2012)
14	Corporate Social Responsibility Report, Area 8B 2018-2019
15	Integrated HCV-HCS Assessment Report PT LGI, PT NAS dan PT AMS, Aksenta 2021

Sampling Technique

The local communities that are sampled for the assessment are villages that have direct interaction with the company's concession area. The criteria used to determine which villages have direct interaction with the company's concession area are the administrative boundaries of the village and the boundaries of the company's concession area at the time of this assessment.

This assessment is carried out in a participatory manner by involving community representatives and representatives of the company's internal community as resource persons. The resource persons in this assessment are individuals or group representatives who have knowledge of the social conditions of the community at the assessment site.

The number of resource persons in the assessment was 40 people, consisting of representatives of the local community as many as 30 people and the company's internal community as many as 10 people.

Sampling in local communities aims to determine the socio-economic and cultural conditions of the community, village potential, social problems, social impacts and social risks based on the perceptions of community representatives who are resource persons in this assessment. While sampling on the company's internal community aims to determine employee perceptions regarding their conditions and rights as company workers such as the availability of infrastructure, social security, and work safety.

Data analysis

- Descriptive analysis is the most basic analysis to describe the state of data and information in general. This descriptive analysis includes; frequency distribution, measurement of central tendency, and measurement of variability. Descriptive analysis is used to determine the pattern of data and information that has been collected, as well as become the basis for further analysis. The qualitative data that has been collected is then grouped based on the theme of the assessment, while the quantitative data collected is then analyzed using a central tendency measurement

approach in order to provide an overview of a measure that represents a data set such as the mean (average) and median (middle value).

- Spatial analysis is a collection of techniques that can be used to process Geographic Information Systems (GIS). There are several functions of spatial analysis, namely: classification, network, overlay, buffering, 3D analysis, and digital image processing. In this assessment, spatial analysis is carried out to assess geographical boundaries, regional spatial planning, and land use. Spatial analysis is carried out using tools that allow the assessor to comprehensively review the assessment area.

- Livelihood analysis in this assessment systematically describes the accessibility of livelihood assets and community livelihood strategies at the assessment site. The accessibility of livelihood assets is analyzed using a pentagonal model of assets consisting of five assets, namely: human capital, social capital, physical capital, natural capital, and financial capital.). Meanwhile, livelihood strategies were analyzed using the household socioeconomic status approach.

- The ranking matrix is a way to identify the problems faced and determine the priority of the problems to be solved. In this assessment, ranking matrix analysis is used to determine the priority of the problem according to public perception. The ranking matrix described is the result of the scoring criteria. The scores were divided into five groups, namely: very low (score 1), low (score 2), moderate (score 3), high (score 4), and very high (score 5). While the criteria are divided into three groups, namely: (1) the extent of the problem: the number of people who experience social problems, (2) the consequences of the problem: how serious/dangerous the problem affects people's lives, and (3) Occurrence: how often the problem occurs and felt by society. After the measurement scoring is carried out on each criterion in each problem, then it is added up to become the total score. The total score describes the ranking order of each problem. Next, the rankings are grouped by dividing them into three groups, namely: 1-5: low priority, 6-10: medium priority, and 11-15: high priority. The ranking grouping is done to find out the priority issues in this assessment.

- Impact analysis is carried out descriptively by identifying and grouping impacts by considering the relationship between environmental, health, safety and socio-economic conditions. The next stage after the impact grouping is carried out, it is important to determine the significance of the impact by conducting a risk assessment of the impact. Risks are identified based on the level of consequence of the impact and the level of probability of the occurrence of the impact based on the perception of community representatives. Impact and likelihood can be expressed on a Likert scale. The Likert scale consists of five scales (shown as a scale value of 1 to 5) with a value of 1 indicating the lowest indicator, while a value of 5 indicating the highest indicator in assessing the level of impact and the likelihood of an impact occurring.

Table 6. Impact classification

Category	Criteria	Indicator
Nature	*Tangible*	An increase or decrease in the standard of living
	Intangible	The breakdown of social cohesion and social conflict
	Perceived	The subjective perception of the community regarding the impact or the community's experience of the impact
Direction	*Positive*	Increasing access to health services, education, accessibility, employment, and community welfare
	Negative	Increased crime rates, high cost of living and increased health risks due to pollution
Reason	*Direct*	Directly connected in space and time with project/company operational activities such as work and construction
	Indirect	Impacts that occur due to actions caused by direct impacts
	Induced	Haven't been involved in the company's project/operational activities for some time.
	Cumulative	Successive, incremental, and combined impacts of multiple projects/companies (past, present, and future)

Table 7. Risk Assessment

Chance Rate	Description	Consequence Level				
		1	2	3	4	5
		Not Significant	Small	Moderate	Large	Very Large
5	Very likely	*High*	*High*	*Extreme*	*Extreme*	*Extreme*
4	Certain	*Moderate*	*High*	*High*	*Extreme*	*Extreme*
3	Possible	*Low*	*Moderate*	*High*	*Extreme*	*Extreme*
2	Impossible	*Low*	*Low*	*Moderate*	*High*	*High*
1	Rarely	*Low*	*Low*	*Moderate*	*High*	*High*

Note:

Risk Rating:

Low

Moderate

High

Extreme

- Stakeholder analysis is a process that systematically develops an objective understanding of who the key stakeholders are important to involve and to identify how much influence and interest they have on a program. As well as setting criteria-based priorities that lead to the development of appropriate engagement strategies. Stakeholders in this assessment are defined as parties who have an interest, contribute positively and/or negatively, and have direct or indirect influence on the company's operational activities.

Summary of Assessment

Biophysical and Environmental Conditions

Seven villages that interact and potentially receive the impact of the company's operational activities are administratively located in Sub-district of Nanga Tayap and Pemahan.

Table 8. Village area

| No.	Village	Village Area (km²)	Residential Area (km²)
1	Tajok Kayong	44,4	0,74
2	Pateh Benteng	24,0	0,21
3	Cegolak	9,1	0,27
4	Batu Mas	120,8	0,91
5	Muara Gerunggang	13,7	0,31
6	Muara Semayok	14,6	0,22
7	Pebihingan	44,0	1,48

Source: https://gis.dukcapil.kemendagri.go.id/peta/
Note: * indicative village area, secondary data verified through consultation with community representatives throughout the village at the assessment location

Village	No. of Hamlet	Population By Gender		Total Population	Village Area (km²)	Population Density per km²	No. of Household (KK)	Average Number Of Family Members
		M	F					
Tajok Kayong	2	607	561	1.168	21.92	53.28	374	3
Pateh Benteng	2	215	171	386	41.43	9.32	119	3
Cegolak	2	244	222	466	120.93	3.85	144	3
Batu Mas	4	747	680	1.427	84.26	16.94	476	3
Muara Gerunggang	3	357	322	679	42.29	16.06	218	3
Muara Semayok	2	190	169	359	55.73	6.44	124	3
Pebihingan	6	102	948	1.050	69.84	15.03	695	2
Total	**21**	**2.462**	**3.073**	**5.535**	**436**	**121**	**2.150**	**20**

Table 9. Demographic Characteristics

Source: Department of Population and Civil Registration, 30 June 2021
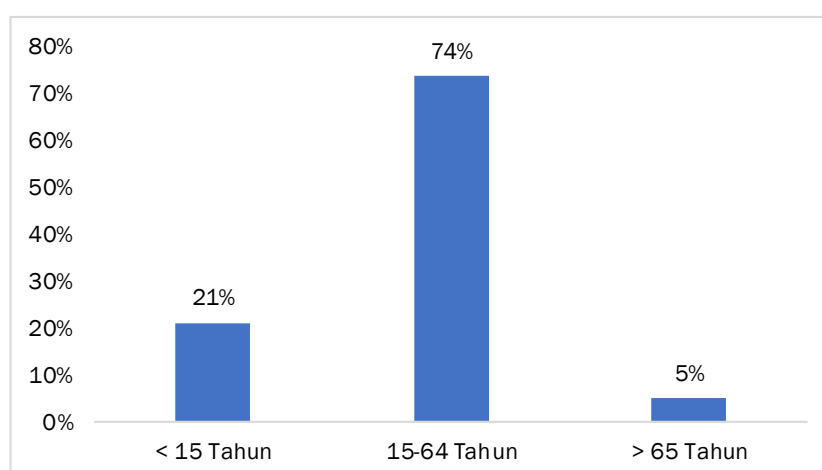
Source: Department of Population and Civil Registration, 30 June 2021

Figure 4. Percentage of population by age group

Socio-Economic Characteristics
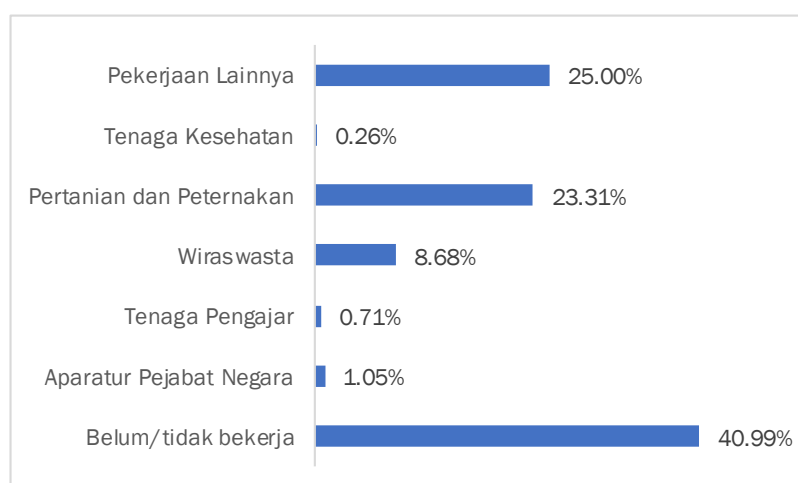
Source: Department of Population and Civil Registration, 30 June 2021

Figure 5. Percentage of population by type of livelihood

People who are included in the group not yet/not working consist of unemployed, housewives, and community members who have not entered working age (including students).

The other livelihood groups are the first largest livelihood groups carried out by the community at the assessment site. This group consists of several sub-groups, namely: retirees, religious leaders, fishermen, and private employees. Of all these sub-groups, private employees are the largest sub-group compared to other sub-groups. People who work as private employees generally work in oil palm plantation companies.

Based on the results of consultations with community representatives, the majority of people in all villages have more than one source of income, meaning that people who are registered in one livelihood group also carry out activities in other livelihood groups.

Women have a contribution to household income; this is because some of them play an active role as private employees or cultivate agricultural land independently.

Socio-Cultural Characteristics

Based on the Integrated HCV-HCSA report of PT LGI, PT NAS and PT AMS (Aksenta, 2021), the indigenous people at the assessment site consist of three main ethnic groups namely Malay, Tayap Sekayuk, and Kayong. The results of consultations with community representatives stated that there were two main ethnic groups at the assessment site, namely the Malays and the Dayaks. The Tayap Sekayuk and Kayong tribes are included in the Pesaguan Dayak group which does occupy the Nanga Tayap area. In addition to the main ethnic group, there are also immigrant tribes currently living in the assessment area, including the Javanese, Flores, Banjar, Madurese, and Chinese. The majority of the people in the assessment location embraced Islam (50.92%), Catholic (37.54%), Christian (11.01%), Buddhist (0.44%), Confucianism (0.05%), and religious beliefs (0.03%). Adherents of Islam are generally Malay, Javanese, and Banjarese, while adherents of Catholicism, Christianity, Hinduism and belief systems are generally Dayak and Flores people. While Buddhism and Confucianism are embraced by the Chinese community. The local community at the assessment site has a social organization in the form of a traditional institution. Traditional institutions at the village level are led by traditional leaders for both the Dayak and the Malays. The traditional leader is directly elected by the community for a term of six years. In addition to those related to customs, the community at the assessment site also has cooperatives and farmer groups as community organizations. Cooperatives were formed for oil palm plantation partnerships between communities and companies. Cooperative members are people who partner with the company. Meanwhile, farmer groups function as a forum to accommodate social assistance programs from the government. The role of women as a separate group was not found to be significant at the assessment site. In everyday life, women are not considered as a separate group but are part of the community as a whole. The decision-making system is dominated by men, as has been the case in the community tradition at the assessment site for a long time.

General Description of Education Level and Health Facilities
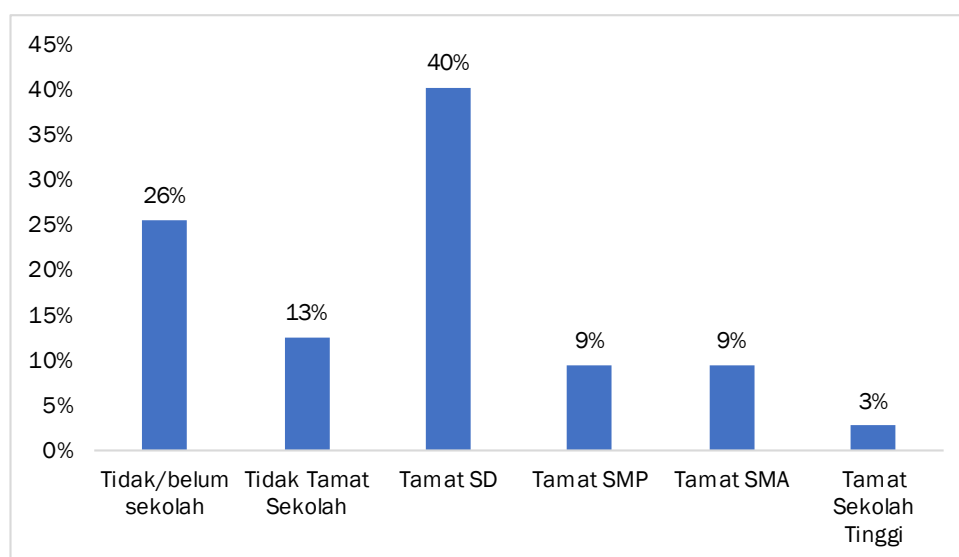
Source: Department of Population and Civil Registration, 30 June 2021

Figure 6. Percentage of population by education level

Table 10. Number of educational facilities

Village	Elementary School	Junior High School	Senior High School
Tajok Kayong	1	0	0
Pateh Benteng	0	0	0
Cegolak	1	0	0
Batu Mas	1	1	0
Muara Gerunggang	1	1	0
Muara Semayok	1	0	0
Pebihingan	2	1	1

Source: Department of Population and Civil Registration, 30 June 2021

Health facilities are available in all villages at the assessment location consisting of Public Health Centers (Puskesmas), Supporting Health Centers (Pustu), Pharmacies. The following is the number of health facilities available in all villages at the assessment site:

Table 11. Number of health facilities

Village	Public health center	Supporting Health Center	Pharmacies
Tajok Kayong	0	0	0
Pateh Benteng	0	0	0
Cegolak	0	0	0
Batu Mas	0	0	0
Muara Gerunggang	0	0	0
Muara Semayok	0	0	0
Pebihingan	1	0	0

Source: Department of Population and Civil Registration, 30 June 2021

Health facilities are only available in Pebihingan Village, while other villages in the assessment location do not yet have health facilities. However, the community in the location can access the health facilities available in Pebihingan Village. Besides that. In addition, the public can also access health facilities in the Regency Capital (Ketapang) with a travel time of about 7 hours.

Identification of Social Problems

A social problem is a condition that is perceived by society as undesirable, intolerable, or as a threat to the basic values of society and requires action to resolve it. Identification of social problems in this assessment is carried out in a participatory manner with community representatives in the villages at the assessment location.

The results of consultations with community representatives in all villages at the assessment location concluded that there were six social problems which were divided into three groups based on a priority scale.

Table 12. Ranking of social problems

Social Problem	Problem Area	Impact	Appearance	Score	Priority
The overlapping of the company's area with the community's land is a concern for community representatives throughout the village at the assessment site.	5	5	5	15	1
The high rate of FFB theft carried out by community elements, this problem has become the concern of community representatives throughout the village at the assessment location. This problem is triggered by the mindset of some people who tend to think instantaneously to obtain material. In addition, the high price of FFB is a driving factor in the occurrence of cases of theft committed by unscrupulous members of the public.	5	5	4	14	2
Conflicts of interest between communities, this problem was found in Pateh Benteng Village, where there is a stronghold that supports the presence of PT AMS and a stronghold that does not support the presence of PT AMS. This conflict of interest was triggered by Mayora's plan to collaborate with the Pateh Benteng community for sweet potato cultivation in 2012, but the plan did not work because the government gave PT AMS a permit for oil palm plantations. Currently, parties that do not support the presence of PT AMS are still using a certificate (SHM) facilitated by Mayora and inciting the public not to cooperate with PT AMS.	5	4	4	13	3
Land disputes between the community and the community and the company	3	5	3	11	6
The lack of transparency regarding the boundaries of the company's plantation area, plasma plantation area, and TKD plantation, this problem has become the concern of community representatives from all villages. Transparency of plantation boundaries is considered important for cooperation in monitoring theft incidents and other company programs.	3	3	3	9	7
Communication between the company and the community has not been good, this is triggered by the slow response given by the company to people who submit proposals.	3	3	2	8	8
The limited understanding of the community related to the company system, this problem has become the concern of community representatives from all villages. Community representatives stated that the lack of information related to company regulations caused a lot of misperceptions among community members who worked at the company and community leaders in the village environment. Some of the issues that are often discussed in the community are the absenteeism	3	2	2	7	9

system, which is considered unfair by the community, non-transparent career paths, working hours that are too early, and no transparency related to opportunities (job vacancies).					

Description	Nature	Direction	Reason	Perceived	Total
Lack of knowledge and information related to the company's CSR program, this problem is the concern of community representatives from all villages. Community representatives stated that the company does not inform the village government of their CSR program every year, this makes it difficult for the community to include the CSR program in the village work program.	1	2	2	5	11
The management of cooperative/plasma plantation is not optimal, this problem is the concern of community representatives from all villages. Community representatives stated that the poor condition of the infrastructure and agronomic techniques of plasma plantations caused the production of plasma plantations to be not as good as those of nucleus estates. This creates a negative perception of the company, some people think that the company is not serious about managing plasma plantations and only cares about the nucleus plantations.	2	1	1	4	12

Note:

Ranking	Priority
1 - 5:	High
6 - 10:	Moderate
11 - 15:	Low

Social Impact Analysis

Table 13. Social impact grouping

Impact	Nature			Direction		Reason		
	Tangible	Intangible	Perceived	Tangible	Intangible	Perceived	Tangible	Intangible
Alternative job opportunity for the community	X	O	O	X	O	X	O	O
Increased productivity and economic value of land	X	O	O	X	O	X	O	O
Increasing types of community livelihoods	X	O	O	X	O	O	X	O
Positive public perception of the company	O	O	X	X	O	X	O	O
Multiplier effect at local level	O	O	X	X	O	O	X	O
Unable to improve the legal status of the land	X	O	O	O	X	X	O	O
High rate of FFB theft	X	O	O	O	X	X	O	O
Land disputes between communities	O	X	O	O	X	X	O	X
Conflicts of interest between communities	O	X	O	O	X	X	O	X
Socio-cultural changes	O	X	O	O	X	X	O	O
Social jealousy	O	X	O	O	X	X	O	O
Negative perceptions and high public expectations of the company	O	O	X	O	X	X	O	O
River pollution	O	O	X	O	X	O	O	X
Air pollution	O	O	X	O	X	O	O	X

Social Risk Analysis

Social risk is an event or event that can lead to the potential for social vulnerability borne by individuals, families, community groups as a result of social crises, economic crises, political crises, natural phenomena, and natural disasters.

The risk assessment aims to determine the significance of the impact so that it can help prioritize the impacts that need to be mitigated. Impact risk assessment is carried out by assigning a score of likelihood and consequence of each impact that has been identified and grouped based on the perception of community representatives.

Table 14. Risk Assessment

Impact	Chance level	Consequence rate	Risk level
Alternative job opportunity for the community	5	4	20
Increased productivity and economic value of land	5	4	20
Increasing types of community livelihoods	5	4	20
Positive public perception of the company	4	4	16
Multiplier effect at local level	3	3	9
Unable to improve the legal status of the land	3	3	9
High rate of FFB theft	3	3	9
Land disputes between communities	3	3	9
Conflicts of interest between communities	3	3	9
Socio-cultural changes	3	3	9
Social jealousy	3	3	9
Negative perceptions and high public expectations of the company	3	2	6
River pollution	3	2	6
Air pollution	2	2	4

Note:

Risk Level:
Low
Moderate
High
Extreme

Signature	
Name	Tengku Ade Pahlevi
Position	Team Leader of Social Impact Assessment

Section 4: HCV-HCSA Assessment; OR

ALS HCV and Standalone HCSA assessment

Assessor and Credential

The HCV-HCS integrated assessment conducted in the Permitted Area (Izin Lokasi) of PT AMS (in one landscape assessment document, with PT LGI & NAS, another Bumitama subsidiary) was carried by Gagas Dinamiga Aksenta (Aksenta), which located at Jln. Gandaria VIII/10 Kebayoran Baru, Jakarta - Indonesia 12130. Webpage www.aksenta.com

This HCV document has been reviewed by the HCVRN and was declared satisfactory on 29 November 2021, please refer to the following link:

https://www.hcvnetwork.org/reports/laporan-penilaian-hcv-hcsa-terpadu-pt-lestari-gemilang-intisawit-pt-nabati-agro-subur-pt-agro-manunggal-sawitindo-kabupaten-ketapang-provinsi-kalimantan-barat-indonesia

Table 15. Key consultants of HCV-HCSA Integrated Assessment

Name	Role	Expertise
Idung Risdiyanto	Lead Assessor (ALS15029IR); HCS registered practitioner	Hydrology, forest ecology, spatial modelling, carbon stock, land suitability, peat survey, watershed management, and soil and water conservation
Risa D. Syarif	GIS and remote sensing expert; HCS registered practitioner	Remote sensing, GIS, spatial analysis, carbon stock, and land cover change
Tedi Setiadi	Biodiversity and ecological expert	Wildlife identification, ecological landscape and ecosystem management
Adhy W. Setiawan	Biodiversity survey	Ecology, bird, and flora taxonomy
Yanto Ardianto	Ecosystem service and physical environment expert	Environment, hydrology, soil, and ecosystem service
Andri N. Hendratno	Social, economic, and cultural expert	Socioeconomics, social impact management, sociocultural aspect, and participatory mapping
Noor Rakhmat D.	Sociocultural expert	Socioeconomics, social impact management, sociocultural aspect, participatory mapping, and organisational facilitation
Ryan K. Pratama	GIS and remote sensing expert;	Remote sensing, GIS, spatial analysis, carbon stock, and land cover change
Andrini Eka Diah	GIS and remote sensing expert	Remote sensing, GIS, spatial analysis, and land cover change
Iwan Setiawan	Biodiversity expert	Wildlife identification, ecology and wildlife conservation, and wildlife-related conflict management and redress
Ali Akbar Hutzi	Socioeconomic expert	Environmental economics, cultural socioeconomics, and social institutions
Priyo D. Utomo	GIS and remote sensing expert	GIS, remote sensing, carbon stock, land cover change
Anwar Muzakkir	Flora and carbon expert	Flora identification, forest ecology, and carbon stock
Pungky A. Febriani	GIS and remote sensing expert	GIS, remote sensing, carbon stock, land cover change
M. A. Agung Arifian	Flora and carbon expert	Flora identification, silviculture, forest ecology, and carbon stock

Table 16. Structure of the Forest Inventory Team

Name	Position
Priyo D. Utomo	Team leader
Anwar Muzakkir M. A. Agung Arifian	Species Identifcation technician
Pungky A. Febriani	Measuring assistant
Sunli Suryadi	Plot cleaner
Nanang Alap Alipius	Hip chain operator

Fauzi Mawan Ahmadi	Compass man
Petrus Viktor Timan Anzari	Line cutter

Assessment Timeline

The assessment activity series are carried out from October 2019 – December 2020. Phases of the activity refers to HCV-HCSA Assessment Manual (HCVRN, 2017).

<p align="center">Table 17. Phases and timeline of the Integrated HCV-HCSA Assessment:</p>

Phase	Activity	Location	Time
Preassessment	Basic information collection Kick off meeting Rapid due diligence Signing of contract	Jakarta	28 Oct – 8 Nov 2019
Scoping study	Desktop study (non-field work); data/secondary information collection and analysis Stakeholder identification	Jakarta	9 – 18 Nov 2019
	Initial consultation with stakeholder (Non-Governmental Organisation ("NGO"), government)*	Pontianak & Ketapang	19 – 20 Nov 2019 & 12 Dec 2019
	Field visit to verify land cover and consult with local community representatives	The MU concessions and villages within the area	19 – 26 Nov 2019
Full Assessment Preparation		Jakarta	1 Dec 2019 – 12 Jan 2020
Full Assessment	Field visit to conduct social assessment, participatory mapping, environmental assessment, biodiversity assessment, and carbon assessment	The MU concessions and villages within the area	15 – 29 Jan 2020
	Analysis and Interpretation	Jakarta & Bogor	Feb – Apr 2020
	Final Consultation	Jakarta & Ketapang	Jul – Nov 2020
	Reporting	Jakarta & Bogor	Dec 2020

Other assessments conducted in this area include Land Tenure Study (2012), Social Impact Assessment (2012), High Conservation Value Presence Identification (2013), and High Carbon Stock assessment (2014). Results of these assessments are used as supporting data and information for this Assessment.

Pre-Assessment

Preassessment activities include (i) collecting initial data and information on the Assessment area and planned development area status; (ii) collecting information and reviewing the MU policies related to the Assessment implementation; (iii) reviewing the process of Free, Prior, and Informed Consent (**"FPIC"**) that the Companies have conducted; and (iv) conducting desktop

study and initial analysis of secondary data, including spatial data, statistic data, and literature. The most important activity during preassessment phase is conducting due diligence against four preconditions (**Table 18**).

Table 18. Due diligence against four preconditions

	Precondition	Due Diligence
1.	Commitment to environmental and social conservation	BGA is committed to environmental and social protection, as indicated by its sustainability policies: forest conservation and sustainable land use; respect for local community rights; respect for human rights in workplace; and traceability and responsible sourcing. As of 31 December 2018, BGA had a conservation area (HCV, HCS, etc.) of 39,380 ha, and managed corridors between Gunung Tarak protection forest and Sungai Putri Essential Ecosystem Area ("KEE") as orangutan habitat and pathway.
2.	Commitment to a moratorium on any land clearing or land preparation until the proposed Integrated Conservation and Land Use Plan ("ICLUP") is complete or finalised.	The Group's MUs are committed to avoiding land clearing during the Assessment process until New Planting Procedure ("NPP") is met and approved by RSPO. According to Sentinel-2 satellite images taken on 26 July 2019, there was no land clearance for new plantation development in the MU concessions.
3.	Demonstrating legal land rights or exploration permits of the Area of Interest ("AoI")	Location Permit of 11,780 ha based on Location Permit Extension and Change No. 450/PEM/2015 over Location Permit No. 459/2011; HGU concession of the total area of 6,309.73 ha based on National Land Agency ("BPN") Head Decree No. 119/HGU/KEM-ATR/BPN/2017; and Plantation Business Permit ("IUP") of the total area of 11,765 ha based on District Head Decree No. 307/DISBUN-D/2013.
4.	FPIC process has been initiated with full disclosure of the proposed project, with all potentially affected communities, and further negotiation and consent are already agreed upon with fairly appointed representatives.	As part of the FPIC process, the MUs have worked on plantation development plan, company scope, land ownership transfer plan, and timeline since 2012. The MUs and cooperative partners then signed collaboration agreements. PT LGI and Jasa Kayong Sekayok Cooperative on 16 March 2016. Several meetings were held to disseminate information, consult, and map out participatory mapping for HCV, LTS, and SIA assessments. In addition, some parts of the MU concessions already have HGU permit through land compensation (*Ganti Rugi Tanam Tumbuh*/"GRTT") process for acquiring community lands. In early November 2019, the MUs addressed written and verbal notices about the Assessment to the heads of 13 villages within the MU scopes, requesting their permission to carry out the Assessment activities. All village representatives (village heads) have accepted and agreed to the Assessment plan.

Preassessment output indicates that the MU has met the four preconditions. According to evidence demonstrated by the MUs, the initial FPIC process was conducted in line with the applicable regulations. The MUs agree to all process of the Assessment activities to be completed, as well as the procedures and requirements of the Assessor Licensing Scheme (**"ALS"**) and understands the Assessment result consequences. Now that the above conditions have been fulfilled, the Assessment phase can move on to the scoping study.

Scoping Study

Scoping Study Summary

Scoping study is performed to confirm the preassessment output and the field data collection required for the Assessment. During this phase, the following activities are carried out: literature review, field visit to collect biophysical information and verify land cover, identification of and initial consultation with stakeholders to find out important Assessment-related issues, initial consultation with community representatives to identify social condition and status of the FPIC from the communities (**Table 19**).

Table 19. Summary of activities during scoping study

Activity	Description	Time
Initial information exchange	This includes discussing with the MUs about accessibility, transportation and travel distance to the addresses of stakeholder who will be visited and are located in the MUs area. An implementation plan for the targeted locations was also delivered, which included initial verification of land cover, biophysical aspects observation, and samples of villages to visit.	9 – 18 Nov 2019
Stakeholder identification and initial consultation	Interview with central government officials from Natural Resources Conservation Agency ("BKSDA") Interview with provincial government officials from Public Works and Spatial Planning Office ("DPUPR") and Forestry Office Interview with district government officials from Environmental Office and DPUPR Interview with NGO representatives from Sustainable Trade Initiative Foundation (YIDH), Aidenvironment, Tropenbos International (TI) Interview with academics from Tanjungpura University: Dr. Hari Prayogo Held interviews and Focus Group Discussions ("FGD") with community representatives	19 – 20 Nov 2019
Field visit, ground truthing, and meeting with local communities	The activities took place for seven days. These include biophysical and ecological survey to specify Area of Interest (AoI) boundary, land cover verification to identify land cover condition, and meeting with local communities to define communities' social condition and schedule meetings for participatory mapping and FGD to complete the full assessment.	19 – 26 Nov 2019

There are a total of 424 spots for field verification, consisting of 74 spots for biodiversity and biophysical survey, 21 spots for social survey, and another 329 for land cover verification (**Figure 7**). All locations identified as potentially having significant value, such as rivers, hills, natural vegetation cover (forest and shrub), and waterbody are observed for biophysical and ecological aspect verification.

In the context of land physiography, the MUs are located on flat terrain with elevation of 0-300 meters above sea level (**"masl"**) and dominant slope of 0-15%, where there are hills with steep slopes in southeast part of PT LGI. Undulating areas in PT LGI are found in Riam Batu Village, Batu Bulan Village, and River Demit. No peatlands are found within the MUs areas. Several rivers, i.e., Kayong, Tayap, Titi Kayu Are, Demit, Pemahan, Gerunggang, and Lokan pass through the MUs areas. Presence of hills and rivers should be observed further in Full Assessment in terms of their capacity to provide ecosystem services.

Findings of scoping study indicates that there are still areas natural land cover in the form of shrub and secondary forest fragments within the MUs areas. These land cover fragments are found at the rocky foothills or hilltops where land cannot be converted into rubber farm or plantation.

During this phase, a total of 13 villages are visited. General tipology of villages in the MUs areas is old villages that are divided into two major ethnic groups, i.e., Dayak and Melayu. Based on quick information, the communities primarily use artesian and

dug wells to meet their water supply needs. Some of them remain to rely on river water for their daily requirements, particularly for public bathing, washing and latrines (MCK). Rivers are also used to irrigate paddy field and for fishing.

Initial stakeholder consultation highlighted key information and issues, such as the fact that MUs are located within the designated cultivation area (based on Spatial Plans of Ketapang District and West Kalimantan Province) and found to be close Protection Forest area in the north and west. A compensation scheme is also required for community lands identified as HCV-HCS areas; verification should be carried out to ensure whether a potential mining permit is applicable in the MUs areas. The presence of orangutan habitats in Protection, Production, and Limited Production Forests around the MU has also been reported. Once the HCV-HCS areas are identified, the MUs are expected to implement good management practice. Additionally, several NGOs have expressed interests in working together to manage areas using sustainable landscape conservation approach. Also, there is a need to implement connectivity and corridor approaches for Rare, Threatened, and Endangered (**"RTE"**) species to establish HCV areas.
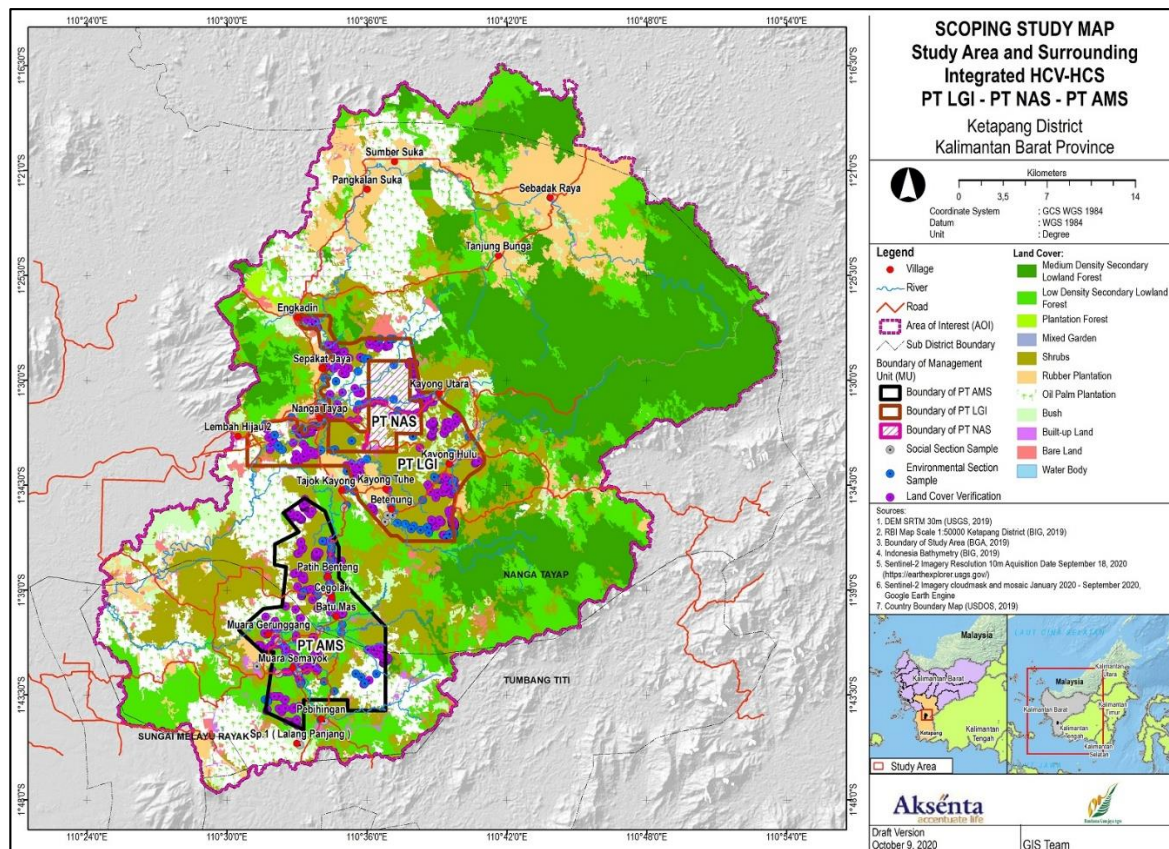
Figure 7. Ground-truth locations and villages visited during scoping study

During due diligence phase, the scoping study on issues to be verified as identification output reveals that:

- the MUs have previously conducted environmental and social assessments, such as AMDAL, HCV, and SIA; location identified as HCV areas are given an appropriate protection;

- no evidence of new land clearing;

- field visit confirms that the MU completed FPIC process for plantation development plan shortly after the Location Permit was issued (it started since 2012). Several areas have been handed over to the MUs through mutual agreement and their status already upgraded to HGU;

- communities have established cooperatives to partner with the MUs and have confirmed that the MUs CSR programmes are available;

- the MUs have initiated FPIC process for plantation development and Assessment plans. Village heads (representing all village community members) were informed of the Assessment plan and granted approval for activities to take place in their respective areas.

Findings of the initial visits and consultations show the following important issues that should be explored further during the full assessment phase.

1. HCV 1: potential presence of RTE and endemic fauna species (i.e., Bornean white-bearded gibbon and clouded leopard) and RTE and endemic flora species in the remaining forest vegetation and shrubs in the MUs.

2. HCV 2: ensure connectivity between the MUs and landscapes with potential HCV 2 value, particularly in protected forests to the west and east of the MU.

3. HCV 3: assessment of potentially threatened ecosystems, i.e., mixed dipterocarp forests in the remaining natural vegetation cover fragments in the MU, particularly on the top of several hills.

4. HCV 4: presence of rivers and riparian areas, hills, and natural vegetation cover areas that may provide potential ecosystem service.

5. HCV 5: presence of rivers and hills as sources of water and presence of paddy field.

6. HCV 6: presence of ancestral bone houses (*sandung*), sacred places, and historical places that are important to Dayak people.

7. HCS: carbon value sample representing land cover type based on land cover initial verification; participatory mapping of land use, community-important areas, and conservation areas.

As a result of the FPIC process, village communities granted their consent to the implementation of the Assessment. Communities stated that they have been informed about HCV, HCS, and FPIC processes, and will appoint representatives to participate in the Assessment activities. They can also appoint advisers and agree that the Assessment results will be shared with them to inform development and conservation plans. It can be concluded from the preassessment and scoping study that the Assessment can proceed to Full Assessment phase.

List of Consultation in Scoping Study

In scoping study phase, consultations with several stakeholders were held to identify important issues related to the Assessment substance.

Table 20. Summary of initial consultation in scoping study

Date	Name	Position/Role	Organisation/ Social Group	Main Concern and Recommendation
19-11-2019	Ridwan (M)	Implementation Section Head	West Kalimantan DPUPR	▪ The assessment should be conducted as is, in accordance with the field condition, and in terms of development areas, the MUs should comply with the applicable spatial regulations ▪ The MUs are located in the allocated plantation area
19-11-2019	Hari Prayogo (M)	Lecturer	Faculty of Forestry, Tanjungpura University	▪ Connectivity of HCV areas and protection of riparian areas should be considered when designating HCV areas ▪ Mixed gardens (tembawang) containing various kinds of fruit trees are commonly found in the Assessment area. Tembawang is often used as source of food for wildlife, particularly during fruiting season. However, the garden also has a negative side since it can potentially be used to trap vulnerable wildlife during that fruiting season.
19-11-2019	Loren (M)	Programme Manager	Sustainable Trade Initiative Foundation (YIDH)	▪ West Kalimantan is one of the working areas of YIDH, an NGO focused with local development using landscape protection principles. One of the implemented

				approaches is promoting establishment of alternative ecosystem protection area, such as KEE. ■ Establish collaboration with BGA to protect orangutan corridors in community plantations around Sungai Putri and Mount Tarak. ■ Explore potential collaboration opportunities in Assessment area, particularly in terms of implementing sustainable principles
20-11-2019	Adi Susilo (M) and Yoga Budihandoko	Head and Staff of Regional Conservation Section ("SKW")	Ketapang SKW, West Kalimantan BKSDA	■ BKSDA has the authority to manage biodiversity, both inside and outside conservation areas. ■ BKSDA cooperates with the MUs and NGOs to manage biodiversity, particularly popular species (e.g., orangutan). ■ Provide recommendations on how to conduct assessments based on the applicable guidance by prioritising precautionary principles.
20-11-2019	Devis R. (M)	Programme Manager	Aidenvironment	■ Get engaged with BGA on ecosystem conservation using landscape approaches, such as in Kendawangan, Sungai Melayu, and Sungai Putri. ■ Provide recommendation for how the Assessment should be conducted in accordance with the applicable guidance.
20-11-2019	Sauni (M)	Head of Environmental Permit and Management Division	Ketapang District Environmental Services Office	■ HCV protection is related to Environmental Maintenance Affairs. ■ Compensation for HCV-designated areas has yet to be paid by the MUs. ■ Clear land ownership status should be available in the Assessment area, particularly for lands potentially designated as conservation areas.
20-11-2019	Ronie Andio (M)	Maintenance Section Head	Ketapang District Environmental Services Office	■ Provide details on West Kalimantan Provincial Regulation No. 6/2018, which requires at least 7% of IUP area for conservation. ■ Currently, data on conservation areas in plantation company concessions in Ketapang District are being compiled.
20-11-2019	Hendra (M); Gusti Suganda (M); Abd. Hadidi (M)		Tropenbos International	■ Deliver information about Tropenbos work programmes on tourism development and protection at landscape level in Gunung Tarak and Pematang Gadung. ■ Initiate community-based economic development programmes, such as mushroom cultivation. ■ Give advice concerning engagement of communities in the Assessment and key decision making process on proposed land and conservation areas.
20-11-2019	Lamto (M)	Section Head	DPUPR	■ Provide details on protection areas adjacent to the MUs areas, i.e., Lempuding Hill, Sebayan Hill, Berubayan Protection Forest, and Sekelampai Production Forest. ■ One of the issues to be concerned about is mining concessions that overlap the Assessment area. ■ The MUs are located on APL.
12-12-2019	Agus Syamsudin	Staff	North Ketapang Forest Management Unit ("FMU")	■ There are 17 FMUs in West Kalimantan and 2 FMUs in Ketapang District (North Ketapang FMU and South Ketapang FMU). ■ Confirm the locations of PT NAS, PT LGI, and PT AMS concessions bordering Production Forest and Limited Production Forest in South Ketapang FMU.
21-11-2019	Ato Abadi (M)	Planning Coordinator	North Kayong Village	■ Request explanation on HCV and HCS definitions and activity plans. ■ Express that the team activity plan will be shared to other Village Heads and Officials. ■ Provide information about the history of North Kayong Village development.

Date	Name	Position	Village	Notes
21-11-2019	Srinem (F)	Sub-Village Head	Riam Batu II Sub-Village, North Kayong Village	▪ Take into account the designation of HCV areas that will prevent them from cultivating.
21-11-2019	Herkulanus Astra (M); P. Ivan Anditya (M); Mardia Ningsih (F)	Village Secretary; Service Section Head; Financial Coordinator	Betenung Village	▪ Explain village boundaries and plan for establishing village boundaries under Local Regulation in 2020. ▪ Provide information about presence of HCV 6 area of Sandung Bedaun.
21-11-2019	Kristina Sumanti (F)	Community Welfare Coordinator	Kayong Tuhe Village	▪ Request explanation on activity plan ▪ Have informed about the Assessment plan and agreed to it
21-11-2019	Edy Amsikan (M)	Village Secretary	Sepakat Jaya Village	▪ Ask about the possibility of a change in HCV status ▪ Inform that big mammals are present in Seberuang and Tentobos Hills in HGU area of PT SISM
21-11-2019	D. Jailani (M)	Sub-Village Head	Engkadin Sub-Village, Sepakat Jaya Village	▪ Ask about procedures for resolving issues about the HGU area that overlaps the community lands. ▪ Discuss about sacred site of Belian Kikipan in Sepakat Jaya Village.
22-11-2019	Leo Sutijo (M)	Village Secretary	Pateh Benteng Village	▪ Explain about tradition in Pateh Benteng ▪ State that big mammals (e.g., clouded leopard) are present.
22-11-2019	Florence Perada (F)	Village Secretary	Cegolak	▪ Provide information about the presence of Cegolak Customary Forest
22-11-2019	Suprianus Purba, SIP (M)	Village Head	Batumas Village	▪ Express concerns about community gold mining activities in rivers. ▪ Explain sources of community livelihood. ▪ Have been informed about the Assessment plan and agreed to it.
22-11-2019	Abu Hanifah (M)	Village Secretary	Pebihingan Village	▪ The village supports the Assessment team's activity plan.
22-11-2019	Supriadi (M)	General Coordinator	Muara Semayok Village	▪ In principle, supports the activities and to inform others about it.
22-11-2019	Ahmad Yani (M)	Village Head	Muara Gerunggang Village	▪ Discuss about the meeting with District Head over lighting system. ▪ Ask for map of BGA HGU concession to pursue Rights of Ownership Certificate ("SHM"), as BPN's land certification programme (Prona) is currently being implemented. ▪ Have been informed about the Assessment plan and agreed to it.
23-11-2019	Rusnadi (M)	Village Head	Betenung Village	▪ Propose cooperation with BGA to build firebreak and requested assistance from Manggala Agni to anticipate land fire. ▪ Community is involved in HCV area management. ▪ Demonstrate results of cooperation with BGA in village road construction. ▪ Have been informed about the Assessment plan and agreed to it.
23-11-2019	Y. Hermansyah (M)	Coordinator	Betenung Village	▪ Explain about Sandung Tinggi and Sandung Bedaun as HCV 6.
24-11-2019	Nickodimus (M)	Acting Village Head	Kayong Hulu Village	▪ Express willingness to accept the HCV assessment team.
24-11-2019	Yama (M)	Village Head	Tajuk Kayong Village	▪ Explain about Tajuk Kayong Village history. ▪ Have informed about the Assessment plan and agreed to it.
24-11-2019	Hapit Fathurohman (M)	Village Government	Nanga Tayap Village	▪ The village needs map of BGA location permit area for the purpose of Land Ownership Statement issuance. ▪ Explain about sacred sites of Uyuk Kuwek and Uyuk Agung Tombs. ▪ Agreed upon the Assessment plan

M: Male; F: Female

Full Assessment

Description of AoI

AoI Boundaries

AoI boundaries in this Assessment are determined by considering information and data, such as sociocultural data, key biodiversity area, watershed/sub-watershed boundaries, presence of natural ecosystem with natural vegetation as proxy indicator, administrative boundary data, and areas having connectivity with the MU concessions. Based on analysis of connectivity, presence of natural vegetation, and biodiversity and sociocultural aspects, boundaries of Kayong Sub-watershed are set to be used as AoI boundaries. Kayong Sub-watershed is a small part of Pawan Watershed that contains heterogenous geographic areas with various ecosystems interactions. Within these AoI boundaries, heterogeneous ecosystems include natural aquatic and terrestrial ecosystems (such as forested hilly area, river, swamp, and lake) and developed land (such as plantation, agriculture, and settlement). In this Assesment, the AoI covers a total area of 173,526 ha (**Figure 8**).
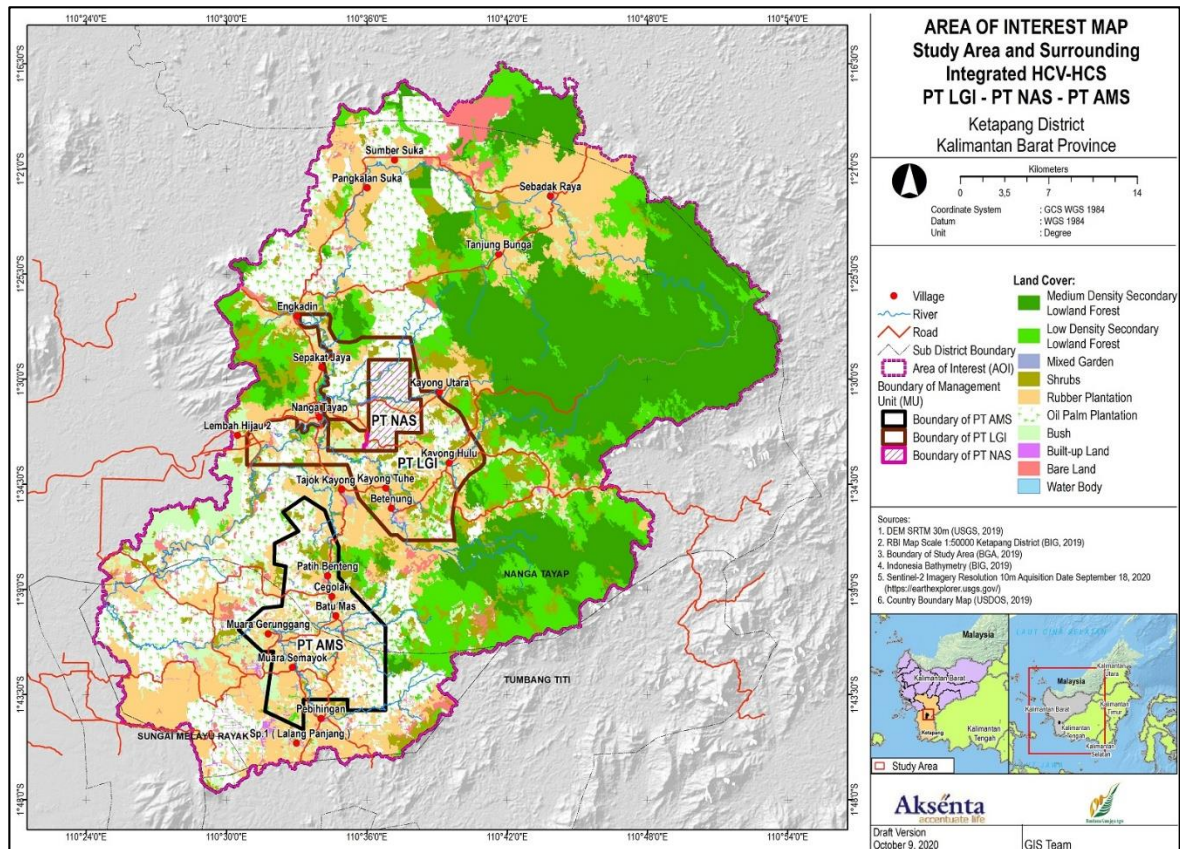
Figure 8. Landscape boundaries (AoI) of Integrated HCV-HCSA Assessment in PT LGI, PT AMS, and PT NAS

Landscape Context

Physical and Environmental Characteristic

Characteristics of physical environment in the Assessment area and its surroundings are as follow.

1. The AoI is located in the middle part of Kayong Watershed and is a part of Pawan Watershed.

2. The AoI has wet tropical climate with average rainfall of 2,700-3,100 mm/year. Temporal distribution pattern of rainfall is classified as equatorial pattern with peaks in March/April and October/November.

3. Based on land unit map, the AoI land relief is divided into six forms, i.e., plain (1.2%), undulating (8.9%), rolling (33.1%), slightly hilly (24.8%), hilly (28.2%), and mountainous (3.8%). Based on topographic map, AoI elevation ranges from 9.6 to 815 masl. Terrain analysis of topographic map divides slope classes into flat <3% (±23.7%); sloping 3-8% (±22.4%); steep (25-40%) around 11.9%, and very steep (more than 40%) around 7.6%.

4. Based on land system map, AoI is divided into nine land system types, i.e., Bawin (0.9%), Bukit Pandan (7.0%), Honja (49.2%), Lohai (3.8%), Maput (0.5%), Pakalunai (16.9%), Rangankau (9.8%), Sebangau (0.2%), and Telawi (11.7%). Land systems of Honja, Rangankau, and Bawin are situated in plain terrain. Land systems of Lohai, Pakalunai, and Maput are situated in hilly terrain. Mountainous terrain contains Bukit Pandan and Telawi land systems.

5. Based on geological map, AoI is divided into six geological formations, i.e., Batuan Gunung Api Kerabai (40.3%), Granit Sukadana (31.2%), Basal Bunga (15.4%), Komplek Ketapang (10.2%), and Malihan Pinoh (0.2%). The most dominant geological formations found across the AoI are Batuan Gunung Api Kerabai (Kuk), Granit Sukadana (Kus), and Basal Bunga (Kubu). The AoI hilly areas belong to these formations. The hilly areas are mostly rocky areas characterised by their shallow sola.

6. The entire AoI contains mineral soil. Oxisol order consists of Xanthic Hapludox (6.9%), Typic Hapludox (32.6%), and Typic Kandiudox (20.8%). Inseptisol order consists of Fluventic Dystrudepts (1.2%) and Lithic Dystrudepts (11.8%). Ultisol order consists of Acrudoxic Kandiudults (2.8%), Typic Hapludults (8.9%), Typic Kandiudults (7.7%), and Typic Kanhapludults (7.4%). The dominant soil order in AoI is Oxisol. Oxisol is a type of soil which has undergone further weathering and, therefore, contains low nutrient and mineral content. This soil has high clay and iron content, forming strong lumps that resemble sand and are not easily destroyed by erosion or rain drop hitting ground surface

Biodiversity Landscape

Borneo's biodiversity is considered high. As an illustration, it has approximately 14,500 plant species, 4,000 out of which are endemics (Roos *et al.*, 2004). In terms of flora, it has 291 species of Dipterocarpacea out of a total of 386, and 156 of these are endemics (Soepadmo and Wong, 1995). In mammal group, there has been recorded 225 terrestrial mammal species, 44 out of which are endemics (Payne *et al.*, 2000). Other groups with relatively high species richness include 639 bird species (MacKinnon *et al.*, 2000); 166 snake species (Stuebing and Inger, 1999); and approximately 140-150 amphibian species (Inger and Stuebing, 1997).

The AoI is located outside and far away from any conservation areas. The nearest conservation area is Mount Palung National Park, which is located more than 30 km northwest of the AoI. The following details clarify the AoI position on the conservation areas based on their locations.

- Key Biodiversity Area ("KBA"): The AoI is located outside KBA. The nearest KBA is Mount Palung, located more than 30 km from AoI.

- Important Bird Area ("IBA") and Endemic Bird Area ("EBA"): The closest IBA and EBA to AoI is Mount Palung, which is more than 30 km away.

- Ramsar Site: AoI is located ±175 km away from the nearest Ramsar site, i.e., Tanjung Puting National Park.

- Intact Forest Landscape ("IFL"): AoI is located outside any IFLs. The nearest IFL from the AoI is more than 50 km away. The IFL is located within the Heart of Borneo ("HoB"). The distance between AoI and and the nearest HoB boundary is 100 km.

Referring to the distribution map of biodiversity of important values listed under IUCN Red List of Threatened Species, several RTE species are known to be present within the AoI. Sunda pangolin (*Manis javanica*) and orangutan (*Pongo pygmaeus*) categorised as Critically Endangered ("CR"); Bornean clouded leopard (*Neofelis diardi borneensis*) and Bornean white-bearded gibbon (*Hylobates albibarbis*) as Endangered ("EN"); and sun bear (*Helarctos malayanus*), sambar deer (*Rusa unicolor*), false gharial (*Tomistoma schlegelii*), and Amboina box turtle (*Cuora amboinensis*) as Vulnerable ("VU"). In plant group, several RTE species are from Dipterocarpaceae family, such as meranti paya (*Shorea platycarpa*), yellow meranti/keruing (*Shorea gibbosa*), and light red meranti (*Shorea almon*).

Social, Economic, and Cultural Context

Based on the 2008 Statistics Indonesia ("BPS") data, the largest village is Pebihingan, while the largest population and the highest population density is found in Nanga Tayap (Tabel 8). Communities in AoI are socially defined by their reliance on

agricultural, plantation, and forestry activities for their livelihoods. Dominant ethnic groups in AoI that develop cultural characteristics are Dayak and Malay peoples.

Religion that is the most widely practiced in West Kalimantan is Islam (up to 59.22% of the population), followed by Catholicism (22.94%), Protestantism (11.38%), Hinduism (0.06%), Buddhism (5.41%), Confucianism (0.68%), and other religions (0.07%).

Culture, particularly community tradition, is influenced by ethnic group identities. Malay Muslims follow tradition related to Islamic observances, such as Eid al-Fitr and Prophet's Birthday. Likewise, the Dayak people in the AoI have similar traditions in terms of life cycle and rice farming. They hold traditional rites at each phase of the farming processes, from land clearance to harvesting. For instance, Betenung Village community celebrates a special ceremony called *Senggayung* during fruiting season, and *Tentobos* during rice harvesting season.

Indigenous organisation of Malay people, which is established at village level, is called Malay Cultural Customary Council (MABM), while Dayak people have Dayak Customary Council (*Dewan Adat Dayak* or DAD) at subdistrict level. At the village level, *Demung Adat* is in charge of all events related to Dayak traditions.

Table 21. Demographic condition and typology of local villages in the AoI

Subdistrict	Village	Area (km²)	Population	Population Density	Number of Family	Main Ethnic Group	Major Religion
Nanga Tayap	Sepakat Jaya	84.00	1,475	17.56	382	Malay, Tayap Sekayuk	Islam
Nanga Tayap	Nanga Tayap	86.02	4,678	54.38	1,473	Malay	Islam
Nanga Tayap	North Kayong	64.41	536	8.32	127	Kayong	Catholicism
Nanga Tayap	Kayong Tuhe	62.48	712	11.40	214	Kayong	Catholicism
Nanga Tayap	Kayong Hulu	122.95	1,423	11.57	328	Kayong	Catholicism
Nanga Tayap	Betenung	99.11	2,636	26.60	592	Kayong	Catholicism
Nanga Tayap	Tajok Kayong	108.23	987	9.12	282	Kayong	Catholicism
Nanga Tayap	Pateh Benteng	36.00	334	9.28	102	Gerunggang	Catholicism
Nanga Tayap	Cegolak	28.00	409	14.61	112	Gerunggang	Catholicism
Nanga Tayap	Batu Mas	29.00	1,219	42.03	357	Gerunggang	Catholicism
Pemahan	Muara Gerunggang	95.00	733	7.72	198	Malay	Islam
Pemahan	Muara Semayok	17.03	362	21.26	126	Malay	Islam
Pemahan	Pebihingan	204.00	2,259	11.07	717	Malay	Islam

Source: *Ketapang District in Figures 2019, Nanga Tayap Sub-District in Figures 2018, Pemahan Sub-District in Figures 2019, Muara Semayok Village Profile 2019* and field observation (2020)

The main sectors characterising the AoI economic condition are forestry and agriculture. Small-scale agricultural sector is dominated by rice farming, non-rice crop, oil palm plantation, and community rubber plantation. Impact of economic activities in medium scaled-forestry sector is the growing timber sawing and household furniture industries. At a larger scale, oil palm plantation and forestry sectors predominate the available land uses. Palm oil plantation, rubber plantation, and logging industry are the backbone of local communities and make up economic characteristic in the AoI.

Trade and service sectors begins to develop rapidly, particularly in central parts of Nanga Tayap and Pemahan Sub-Districts. Nanga Tayap and Pemahan already have shopping centres, cafes, restaurants, banks, and hotels which are decent facilities in this small town. Health facilities, such as public health centre (*Puskesmas*), pharmacies, and health clinics are accessible. Almost all villages in the AoI are connected to road and cellular telecommunication network that also provides internet access. Villages surrounding the MUs that are yet to have asphalt road are Muara Gerunggang, Muara Semayok, and Kayong Utara.

Land use and Development Trend

Based on map of West Kalimantan Provincial Spatial Plan (**"RTRWP"**) and West Kalimantan Provincial Regulation No. 10/2014, the MUs area is located in spatial pattern of the allocated plantation area with featured commodity plants, i.e., oil palm, rubber, coconut, pepper, and cocoa. Based on Ketapang District Spatial Plan (**"RTRWK"**) and Ketapang District Regulation No.

3/2015, the MU concessions is located in APL spatial pattern. This is in alignment with land legal status designation in Map of Forest Area Function based on Decree No. 733/Menhut-II/2014 on West Kalimantan Forest Area Function.

In the beginning of New Order era, logging concessions were issued to timber businesspeople, including those in Ketapang District, West Kalimantan. Since then, logging has been intensively conducted, contributing to economic characteristic in the AoI. One of the big concession holders in West Kalimantan is PT Sukajaya Makmur (PT SJM), a subsidiary of Alas Kusuma Group. This company obtained its first logging concession in 1979, with the total area of 119,000 ha.

The recent internationally traded commodity contributing to economic characteristic and use in the AoI is palm oil. In Ketapang, the first development of oil palm plantation was initiated through Community Nucleus Plantation by PT Benua Indah business group. This business group began to operate in 1992. After that, PT Sepanjang Inti Surya Mulia (PT SISM), a subsidiary of Genting business group, obtained its first concession in 2005. PT Lestari Abadi Perkasa (PT LAP) obtained its location permit in 2010.

Based on forest area map, West Kalimantan RTRWP, Ketapang RTRWK, land use, and interview with stakeholders, the AoI's development trend is dependent on agricultural, forestry, and mining sectors. Nevertheless, oil palm plantation sector is expected to develop rapidly, while forestry sector is predicted to remain stable.

Image Analysis and Land Cover Classification

Two Sentinel-2 satellite images were analysed, with the following specifications:

a) Satellite image: Sentinel-2/ L1C_T49MDU_A018462_20200918T025940; recording date: 18 September 2020; spatial resolution: 10 m; quality: cloud coverage >20% in the AoI

b) Satellite image: Sentinel-2/ S2_LGI_432_10m.tif; mosaic dan cloud masking outputs with GEE January 2020-September 2020; spatial resolution 10 m; quality: cloud coverage <20%

A series of satellite image pre-processing was conducted before land cover classification starts (spectral enhancement: layer stacking and cloud masking, and radiometric enhancement: histogram equalization). Composite bands used in layer stacking process are band 4 (red), band 3 (green), and band 2 (blue), resulting in true colour composite with 10 m resolution in Sentinel-2 image. Satellite image pre-processing of single data Sentinel-2 of 18 September 2020 was conducted using ERDAS IMAGINE 2014 software, while pre-processing of multilayer data with recording period of January 2020 to September 2020 was conducted using Google Earth Engine web application (**Figure 9**).

Land cover classification analysis was conducted when preassessment activities start. Each land cover object in this phase is categorised using two approaches, i.e., association referring to Ministry of Environment and Forestry (**"MoEF"**) global land cover and making of training sample in the form of imaginary point. The imaginary point is land cover verification point obtained from high resolution image with acquisition date closest to the Assessment time. In this case, 2017 Google Earth satellite image was used. Interpretation key of the initial land cover was formulated using 42 training sample points made on 2017 Google Earth high resolution satellite image. Hue on the selected training samples was used as reference (interpretation keys) to do initial classification in preassessment process. Classification output from this preassessment phase was used as planning references for the next phase, i.e., Scoping Study.

Land cover classification process was conducted by combining object-based image analysis (OBIA) and visual interpretation with manual digitising on Sentinel-2 image. Manual segmentation and spatial operation were processed using ArcGIS 10.4 software, while segmentation with OBIA approach used eCognition Developer 64 software. Polygons from manual digitising that cannot be segmented in OBIA process, are identified using interpretation key references based on field findings. Land cover segmentation through manual digitising considers several interpretation key components, i.e., colour, texture, shape, pattern, object size, and association (Bakker *et al.*, 2009). Naming of land cover classes refers to SNI 7645-1:2014 on Land cover classification-Part 1: Small and medium scales.

Initial land cover classification resulted in nine land cover types in the MUs area. In Scoping Study, ground truthing was conducted to initial land cover samples. Ground truthing spots were determined through purposive sampling by considering land cover classes with different colour hues. There were 329 land cover sample spots taken in the field and were used to carry out initial land cover accuracy test, where all of these points are land cover verification survey points in the Assessment area.

Initial land cover classification that has been corrected using field verification data resulted in corrected land covers. Accuracy test was done again to produce the overall accuracy value (72.95%) and kappa (67.19%). This accuracy value has met the minimum overall accuracy requirements for land cover of >70% in the toolkit, so that this corrected land covers can be referred to prepare forest inventory and Full Assessment plan.

In segmentation process and initial corrected land cover categorisation, new land covers are found, i.e. land cover class of mixed garden which matches with findings from the field visit. This land cover cannot be differentiated from shrub, oil palm plantation, rubber plantation, and low-density secondary lowland forest during satellite imagery interpretation process. Mixed garden land cover is classified by considering several additional information, such as from interviews with landowner and visits to mixed garden boundaries in the field.

After Full Assessment process, land cover characterisation is revised once more by referring to forest inventory data. Final land covers are validated using two data, i.e., forest inventory data and land cover verification from Scoping Study. There were 207 forest inventory spots and 329 land cover verification spots used in the accuracy test process to validate final land covers. In the final land cover reclassification, mixed garden delineation was conducted by referring to polygons analysed using OBIA approach and manually digitised. Following that, ten classes of land cover were obtained (**Table 9**). Based on accuracy test, these final land covers had an overall accuracy of 87.12% with Kappa of 84.7%, which is in line with HCS toolkit's minimum accuracy prerequisite of >80% for final land cover (**Table 22** and **Figure 10**). Therefore, these final classes of land covers can be used in HCS patch analysis process.

Table 22. Final classes of land cover area

Land Cover Class	HCS Cover Class	Area (ha)		
		PT AMS	**PT LGI**	**PT NAS**
Moderate Density Secondary Lowland Forest	Low Density Forest ((*)HKR)	29.09	56.69	-
Low Density Secondary Lowland Forest	Young Regeneration Forest (YRF)	204.39	893.68	2.98
Thickets	Shrub ((*)B)	666.98	1,545.50	84.09
Mixed Plantation	Smallholder (SH)	103.46	44.19	26.14
Rubber Plantation	Plantation Area (AGRI)	4,537.49	4,423.96	156.51
Oil Palm Plantation		4,602.65	4,345.65	2,149.77
Bush	Other	907.87	1,106.69	27.07
Developed land		182.50	255.51	13.83
Barren soil		225.10	242.32	10.69
Water Body		-	92.62	-
Total		**11,459.54**	**13,005.81**	**2,471.09**

Table 23.1: Classification of land cover based on Indonesian National Standards (SNI) and HCS land cover classification

No	Land cover classification*	Definition *)	HCS Land Cover Class
1	Medium-density secondary lowland forest	Forest that grows and develops in dryland habitat taking the form of lowland forest, and has been exposed to human intervention, with density of 41%-70%.	Low to high (LDF, MDF, or HDF), Young Generation Forest (YRF)
2	Low-density secondary lowland forest	Forest that grows and develops in dryland habitat taking the form of lowland forest, and has been exposed to human intervention, with density of 10%-40%.	
3	Shrub and bush	Formation or structure of vegetation that takes the form of groups of shrubs with height ranging from 50 cm to 2 m, and is predominated by woody vegetation, including with very short trees <=5 m. Or:	Shrub (S)

		Dryland on which various heterogeneous and homogeneous natural vegetation already grows with low to high density. Such area is predominated by (natural) short vegetation.	
4	Plantation forest	A vast expanse of land that is cultivated with forest plants, from which the timber products are extracted, and comprising only one homogeneous plant species.	Plantation Forest (PF)
5	Oil palm plantation	A vast expanse of land that is planted with oil palms in regular planting pattern and industrially oriented.	Agricultural Area (AGRI)
6	Rubber plantation	A vast expanse of land that is planted with rubber trees in regular planting pattern, homogeneous, and managed by individuals or companies.	
7	Mixed Garden	Dryland (not rice fields) planted with more than one species of perennial plants, or heterogeneously, whose flowers, fruits, and saps are harvested by non-felling method.	Smallholders (SH)
8	Rice fields	Wetlands planted with rice paddies continuously, twice or thrice in a year depending on the variety of the rice paddies, without any crop rotation.	Others
9	Bush	Land cover that takes the form of natural plants with average heights less than 2 m, but more than 50 cm, some of which are woody while some are not.	
10	Barren soil	Natural barren soil/seminatural: Natural or seminatural uncovered land that is not resulted from human engineering, but a natural process, such as sedimentation process. This class includes open lands in inland and coastal areas. It tends to be unconsolidated. Cultivated barren soil: Barren soil tends to be consolidated, is a result of human engineering and cultivated or used for certain purposes.	
11	Roads and settlement areas	Road network: Constructed area comprising one or more lanes on both its sides that can still be categorised as non-railway transportation infrastructure. These lanes may take form of concrete, asphalt, or hardened and consolidated soil. For areas which are less than 1 mm wide on image, they need to be represented with straight lines, and if they are too small to be seen in an image, data can be obtained from base maps, such as Indonesia Topographic Map (RBI) or other topographic maps. Urban settlement: Manmade land cover taking the form of buildings that are mainly used for dwellings by urban population. Urban settlement buildings are characterised with high building density and made out of permanent/long-lasting materials, such as brick wall, tile/concrete/iron roof. Rural settlement: Manmade land cover in the form of premises for rural population's residence. Rural settlement is characterised with relatively low building density, can be constructed out of not only permanent/long-lasting materials (e.g., concrete wall, roof tile/concrete roof/iron roofing) but also non-permanent materials (e.g., wooden wall and thatched roof), and is associated with agricultural land use, such as rice field, dry rice field, or mixed garden and house yard.	
12	Water body	Any naturally occurring body of water (including natural lake/pond, river/stream, marine waters, and swamp).	

Note: *) SNI 7645-1:2014 Land Cover Classification – Section 1: Small and medium scales
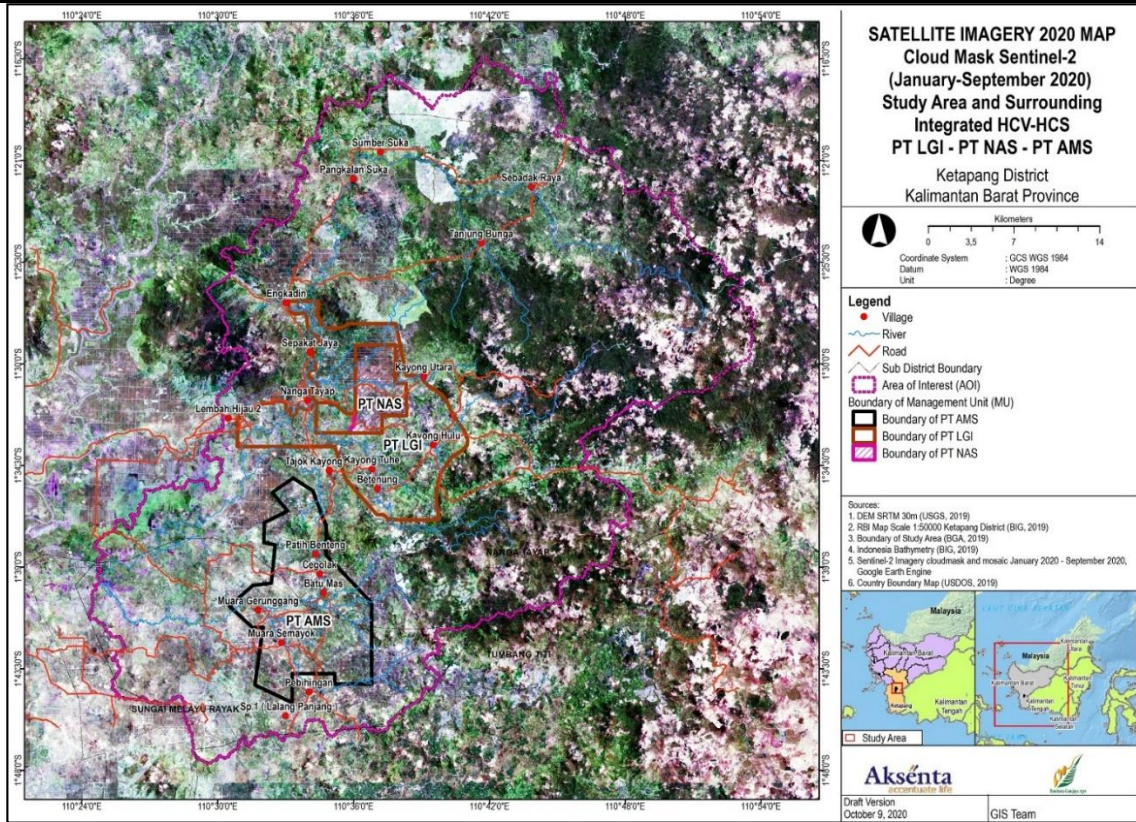
Figure 91. Sentinel-2 satellite image (January-September 2020) in the Assessment area
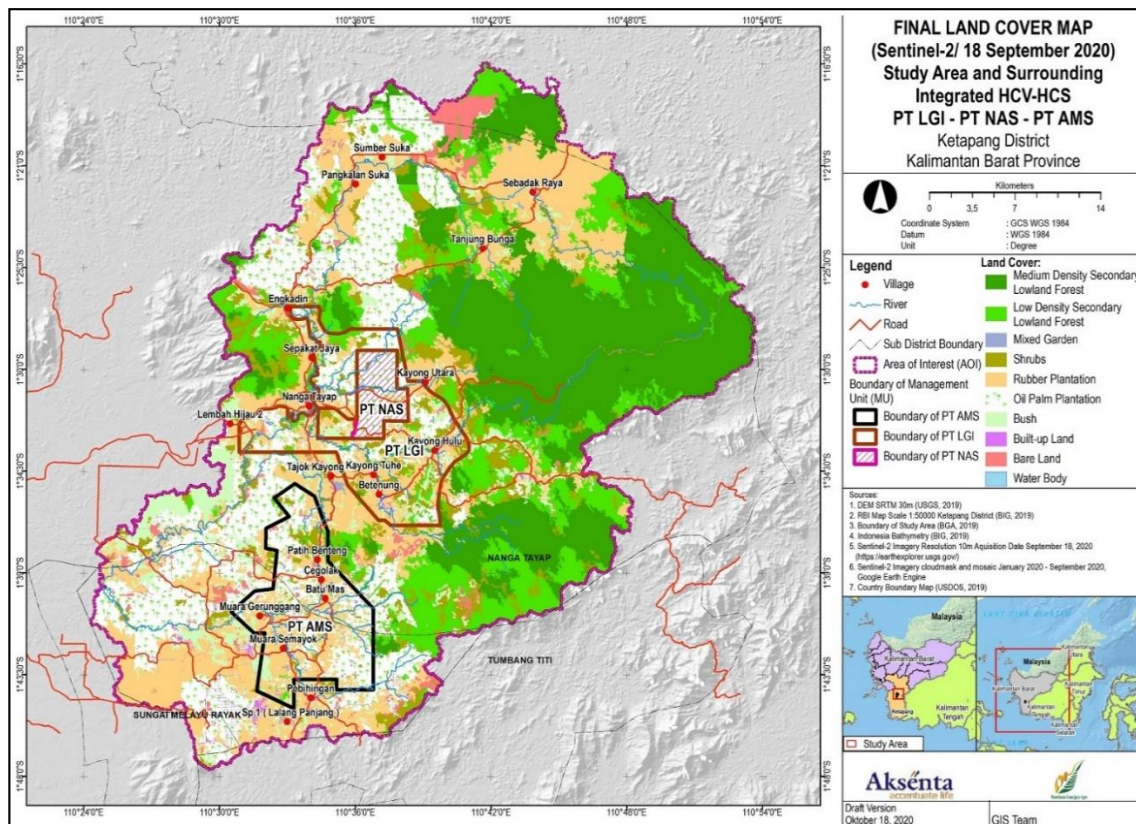

Figure 102. Final land cover map in the Assessment area

Social Aspect: Method and Output

Social Assessment Method

This assessment employs rapid assessment method using qualitative approach towards selected respondents. Information on HCV is subject-specific and only known by certain individuals.

Respondents are selected using snowball sampling (Hendriks *et al.*, 1992) and triangulation method to reduce bias (Olson, 2004). In practice, snowball sampling is conducted by selecting individuals who are aware of and interact with Social HCVs, in particular HCV 5 and 6. In preassessment sampling stage, the respondents sampling is defined together with village representative and the MU. All villages (13 in total) related to AoI has been represented by these respondents.

The number of samples is unrelated to the entire population because it is qualitative sampling. Importantly, HCV 5 and HCV 6 areas can be identified by stakeholders. This method may be biased against the interests of village's administration and companies, but the accuracy of the information can be verified by triangulation method using samples that are not related to village's administration and companies, including member and non-member of cooperatives. Social data are collected through:

1. Participatory mapping

    This activity is conducted within all HCV types (biodiversity, environmental services, and socio-culture). Stakeholders in the Assessment area and its surrounding are engaged, including the Company internals having information of locations within the Assessment area and its surrounding

2. Ground truthing and field data collection

    Objects identified as HCV 4 must be accompanied with the following information: (i) toponyms (a scientific term to describe place, origin, meaning, usage, and typology); (ii) location description; (iii) current status (e.g., type and intensity of use); (iv) threats and potential threats; (v) coordinates; and (vi) documentation in the form of field photographs.

    Ground truthing for HCV 5 and 6 is conducted along with local communities or their representatives once interview, or participatory mapping output indicates the presence of HCVs.

3. In-depth interview

    To collect information on the presence of HCVs elements, purposive interviews and snowball sampling are used, with the following respondent criteria: (i) community members that traditionally use natural resources from the Assessment area; (ii) local community members who culturally interact with lands or natural resources; (iii) local community members with knowledge on historical use of natural resources and lands in the Assessment area.

4. Consultation with the stakeholders

    Consultations take the form of non-formal meetings and goes at each stage of all assessment processes, from scoping study and field survey to reporting process. These are conducted through in-depth interview and dialogue/discussion. The public consultation in the form of formal meeting, with key representatives in attendance.

Secondary data (**Table 24**) are collected during preassessment phase and used in report writing at the Assessment phase.

HCV Types	Data and information types	Data source
HCV 4	▪ Watershed boundary map ▪ Land system map ▪ River network map ▪ Peat Hydrological Unit Map ▪ 30-Metre Digital Elevation Model, SRTM ▪ Sentinel-2 sattelite image, dated 29 December 2019 ▪ Rainfall measurement data ▪ 2009-2019 hotspot data	▪ MoEF (2017) ▪ RePPProt (1990) ▪ Geospatial Information Agency (BIG) (2017) ▪ MoEF (2017) ▪ USGS (www.earthexplorer.usgs.gov) ▪ USGS (www.earthexplorer.usgs.gov) ▪ PT LGI, PT AMS, PT NAS (2011-2019) ▪ NASA (www.firms.modaps.eosdis.nasa.gov)
HCV 5	▪ Map of settlement distribution ▪ River network map ▪ Kabupaten Ketapang dalam Angka tahun 2019 ▪ Kecamatan Nanga Tayap dalam Angka 2019 ▪ Kecamatan Pemahan dalam Angka 2019 ▪ Land Tenure Study: PT LGI, PT AMS, PT NAS ▪ Social Impact Assessment: PT LGI, PT AMS ▪ Transition from Native Forest Rubbers to Hevea Brasiliensis (Euphorbiacea) among Tribal Smallholders in Borneo	▪ Geospatial Information Agency (BIG) (2017) ▪ Geospatial Information Agency (BIG) (2017) ▪ Statistics Ketapang (2019) ▪ Statistics Ketapang (2019) ▪ Statistics Ketapang (2019) ▪ PT LGI, PT AMS, PT NAS ▪ PT LGI, PT AMS ▪ Dove (1994)
HCV 6	▪ Map of settlement distribution ▪ Kabupaten Ketapang dalam Angka tahun 2019 ▪ Kecamatan Nanga Tayap dalam Angka 2019 ▪ Kecamatan Pemahan dalam Angka 2019 ▪ Kewarganegaraan, Suku Bangsa, Agama dan Bahasa Sehari-hari Penduduk Indonesia ▪ World Heritage Sites ▪ Keberagaman Subsuku dan Bahasa Dayak di Kalimantan Barat (Mozaik Dayak) ▪ Archeology of West Kalimantan ▪ Land Tenure Study: PT LGI, PT AMS, PT NAS	▪ Geospatial Information Agency (BIG) (2017) ▪ Statistics Ketapang (2019) ▪ Statistics Ketapang (2019) ▪ Statistics Ketapang (2019) ▪ MoEF (2011) ▪ UNESCO (www.whc.unesco.org) ▪ Bamba et.al. (2008) ▪ Abd. Rahman et al. (2010) ▪ PT LGI

Table 24.2. Type of data and information collected and analysed during social assessment

Hydrology and Soil Analysis Methods

Scopes of hydrology study in HCV assessment includes analysis of flow direction and flow accumulation from surface runoff, stream network analysis, defining boundary of water catchment, steep slope analysis, rainfall amount and distribution (climate), erosion risk analysis, and flood-prone area analysis. This hydrology study combines both secondary and field data.

To perform soil analysis, existing land maps are used, i.e., land map provided by Soil and Agro-climate Research Centre (*Puslitanak*, 1989) and 1987 land system map (RePPProt, 1987 revised in 1990). Based on these secondary data, information of main characteristics of soil includes soil depth, drainage characteristics, texture, soil pH, proportion, landform, and relief. The data indicate soil types and spatial distribution in the AoI. In addition, it also provides soil physical characteristics, which is also important to assess erosion risk level (light, moderate, or heavy).

Output of Field Activities: Interview, Participatory Mapping, and Field Survey

Interviews and discussions are carried out towards 111 respondents, involving seven organizations, i.e., companies, employees, village governments, community leaders, smallholders/fishermen/hunters, housewives, smallholder groups, indigenous leaders, and NGOs (**Table 25**). Participatory mapping is carried out with MU representatives and 13 community representatives. The activities are carried out in respective offices of relevant stakeholders. Field verification is carried out in 173 location points (**Figure 11**).
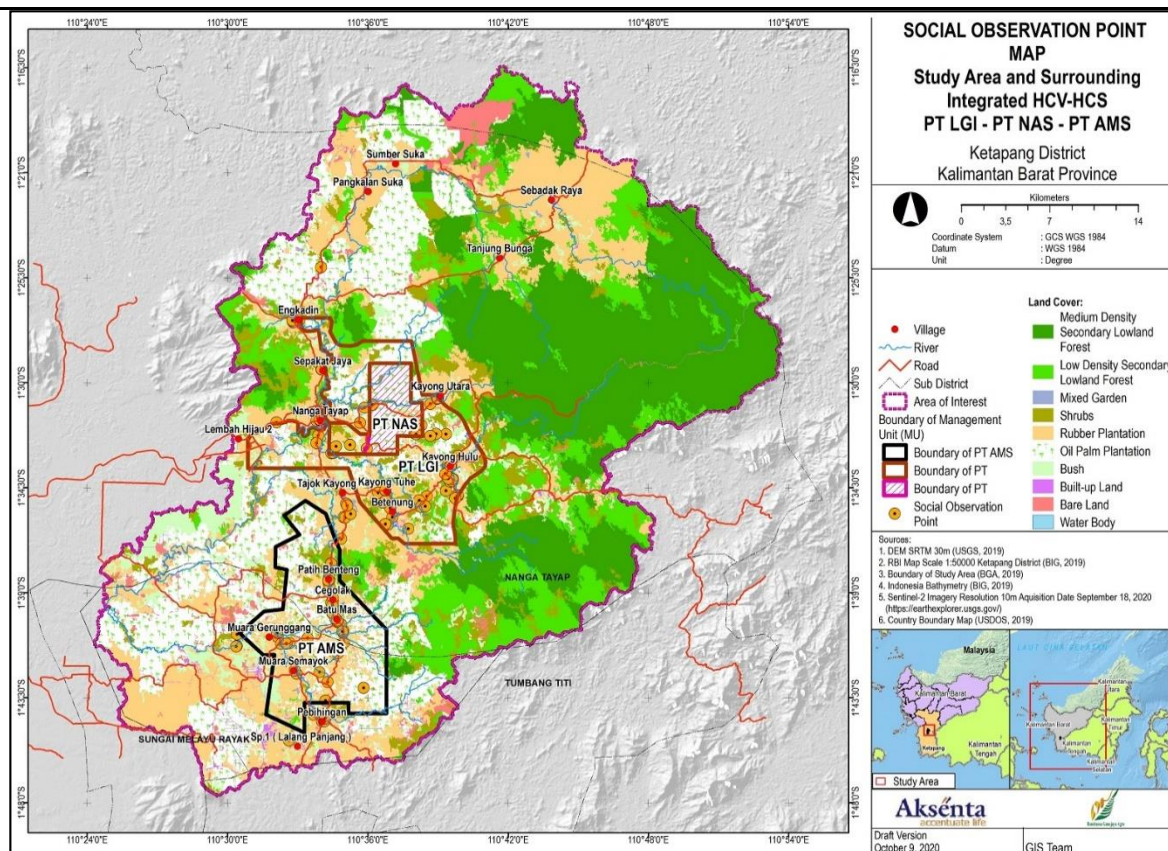
Figure 113. Map of social field activities

Table 253. Summary of interview and discussion outputs during the Assessment

Expert/ Organisation/ Social Group	Name/ Position/ Relevant role	Interaction Type	Comment and/or Recommendation
Community member of Tumbang Kayong Sub-Village, Tayap Village, Tayap Subdistrict	An (M)	Interview	▪ The upstream of River Kayong is located in Menyembah Hills ▪ The surrounding area of River Kayong in Tumbang Sub-Village was flooded for 15 days in early 2020 ▪ In Tumbang Kayong Sub-Village, three sand mining sites are utilised for personal needs
Community member of Betenung Sub-Village	Wita (F)	Interview	▪ Many community members of Betenung Sub-Village catch fish in River Demit ▪ Community's durian farms are commonly located in the hills, which they inherited from their ancestors. The durian trees have been there for decades ▪ Durian season begins in early December to the end of January
Community member of Sungai Beliung Sub-Village, Sepakat Jaya Village	Yusnanto (M)	Interview	▪ Village settlements are located across River Tayap, and none is located around the estuary of River Air Hitam ▪ Beliung Sub-Village community members source their water from Nyuruh Hill of Sebayan Hills ▪ The upstream of River Air Hitam is located in Tanjung Bunga Sub-Village and North Kayong Village ▪ Water sourced from River Air Hitam is only used by community farming around rivers or plantation camp ▪ In rainy season, the downstream of River Air Hitam is often flooded
Community member of Sungai Beliung Sub-Village, Sepakat Jaya Village (FFB Harvester)	Ajibudi (M)	Interview	▪ In Sempawan Hill, there are many durian trees owned by community of Sungai Beliung ▪ No river is flowing from Sempawan Hill
Community member of Segagap Sub-Village Tayap Village	Acah (F)	Interview	▪ The downstream of River Segagap is used by Segagap communitu for bathing and washing ▪ Drinking water in Segagap Sub-Village is sourced from Sengiang Hill

Community member of Engkadin Sub-Village, Sepakat Jaya Village (Traditional leader)	Yekamas (M)	Interview	- The upstream of River Engkadin is located in Mt Patebas that is part of the Lindung Batu Menangis Forest Area - River Engkadin flows year-round. Community of Engkadin Sub-Village uses the river for bathing and washing - There is a belief in Engkadin Sub-Village that River Engkadin must not be polluted/poisoned - In the early 2020, River Engkadin flooded up to 1 m - River Lejeh, a tributary of River Engkadin, is used for drinking water because the water is very clear - River Jelayan serves as boundary between Engkadin and Sungai Beliung Sub-Villages. River Jelayan water is more turbid than River Engkadin - River Terantang (a tributary of River Jelayan) and River Kasai are sources of clean water for Sungai Beliung community - The upstream of River Kasai, which is located in Mt. Patebas (Batu Menangis Hill), has a waterfall called Embun Kasai with a height of 17m.
Community members of Pengukuran Sub-Village, Tajok Kayong: Nursiah (F), Ringgo (M)		Interview	- Pebantan Hill has a shallow solum due to many rocks. This area is important as it serves as water catchment - Many springs can be found at the foot of Pebantan Hill, including Angsahmas, Majai, and Pengagan. - Community of Tebuar Sub-Village, Tajok Kayong Village get their water from River Sawang - Water comes from Angsahmas spring runs into River Segeh, which then flows into River Lokan
Survey/GISTeam Region 3 BGA	Suhendar (M)	Interview	- In 2016/2017, fire outbreak occurred in Pembuluh Hill that was caused by hunters irresponsibly throwing litghted cigarette butts - Pengagan spring has never dried out and is used as source of water (by approximately 60 people) in Pengukuran camp in Sinar Lestari Jaya Estate Division 1 (PT AMS)
Community member of Pengukuran Sub-Village, Ngulok Ipal Village (traditional leader)	Marsianus Simurdi (M)	Interview	- Temelukung Hill, a large hill on the east side of Pengukuran Sub-Village, is supported by Durian Sulung Hill, which is home to many durian trees and serves as a buffer zone - Majai spring in the foot of Durian Sulung Hill flows into River Sanggau, then merges to River Kampelar and River Lokan. The River Sanggau has upstream branches, i.e., River Dohan originating from Durian Sulung Hill and River Pulai originating from Pebantan Hill - Pengukuran Sub-Village main source water is the Keloboran spring. The community also uses Lelomas spring situated on the foot of Pebantan Hill during the dry season - Tebuar community sources their water from River Batu Alu (a tributary of River Tampelar)
Community member of Beriam Sub-Village, Pateh Benteng Village (member of Village Consultative Board ("BPD") member)	Pinus (M)	Interview	- River Semungai is passing through Pateh Banteng Village, which empties into River Gerunggang. Water from Longkong spring in Pebantan Hill flows into River Semungai through River Pondaman Duwon. Water from Site Silingan and Dogi springs (in Durian Sulung Hill) flows into River Semuai - River Podaman Duwon water is used by community of Batu Benteng Sub-Village for bathing and doing laundry - Keburukan spring serves as major source of drinking water for Pateh Benteng and Cegolak Villages communities because it has never dried up, while Torik spring is only used for irrigating rice fields. Keburukan and Torik springs are located in Temelukung Hills - Dogi spring also serves as source of drinking water for Pateh Benteng Village community, but it dries up in dry season
Community member of Beriam Sub-Village, Pateh Benteng Village	Seladung/ Dolar (M), Traditional leader	Interview	- Many durian trees owned by Pateh Benteng community are planted in Temelukung Hills (the trees have been there for decades) - Dam of Keburukan spring has never dried up during extended dry season - The land surrounding Torik spring is owned by Mr. Seladung, on which many durian and mentawa trees have been planted
Community member of Tanjung Bayur Sub-Village, Cegolak Village	Ignatius Sadum (M), Former Sub-Village Head	Interview	- Tanjung Bayur Sub-Village community sources their water from Jelami spring whose water flows into River Batu Bontang, and then flows into River Semungai - Jelami spring is located in Pekikisan Hill

			▪ Tributaries of River Semungai that have good water quality are River Sensoyer and Jeruju ▪ Major river that passes through Cegolak Village is River Kerta (tributary of River Gerunggang). The water catchment of its upstream is located in Temelukung, Bayangan Kaca, Punjung Lingkung Melaras, Sekorun and Tugang Piling Hills ▪ River Kerta passes through the oil palm plantation of PT LAP ▪ Tingkong Cascade is located in Sekorun Hill
Community member of Batumonang Sub-Village, Batu Mas Village	DAD Management (M)	Interview	▪ Springs located in Batu Mas Village are Batu Bolah spring in Batu Bolah Hill and Riam Selandadi spring in Berubayan Hill. ▪ Semayong Swamp has a quite large area, in which the government has plotted Baru rice fields ▪ The upstream of River Semayong is located in Gadang Hill, and passes through River Serempang and River Sindur
Community member of Kayong Mekar Sub-Village, Betenung Village	Monsen (M), Demung Adat Kayong Mekar Sub-Village	Interview	▪ Sandung Tinggi Sub-Village community sources their water from Sebek Kuwayan Hill ▪ Kayong Mekar Sub-Village community sources their water from Lanjeh, Keringkaan, and Lembah Kondang springs ▪ There is seven-level cascade in Periuk Hills, i.e., Sigintang Cascade that is deemed sacred by the community of Sungai Demit Village ▪ Sigintan Cascade is located close to BGA basecamp ▪ Borean Hill is the tallest among Periuk hills
Community member of Kayong Mekar Sub-Village, Betenung Village	Hasmano (M)	Interview	Sacred Location: Sandung Bedaun in Kayong Tinggi, Batu Lubuk Buntal, and Durian Bangkang (Maloi) Sub-Village
Community member of Propat Sub-Village, Batu Bulan Village	Andreas Imat (M) (Demung Adat Propat Sub-Village)	Interview	▪ Many dams located in River Penyokoran and Periuk serve as clean water source of Tanjung Asam and Propat Batu Bulan Sub-Village ▪ River Penyokoran originating from Penyokoran spring is Batu Bulan Village's primary source of water ▪ Duren Seneh spring is located in the area of River Demit ▪ Batu Bulan Village is passed through by Batu Bulan River whose upstream is located in Borean Hill and Mensiu Hill (Periuk Hills). This river empties into River Kayong and has never dry up ▪ The upstream of River Kayong is located in Racun Jolai Hill (in Tanjung Asam Sub-Village), while the upstream of River Demit is in Mt. Berubayan (km 58)
Community member of Tanjung Asam Sub-Village, Batu Bulan Village	Gagah (M), Demung Adat	Interview	▪ The primary source of water for Tanjung Asam Sub-Village the Atu Andow spring, which is located between Batu Punjung and Lebor Api Hill. Water from Atu Andow spring flows into River Kemayoran ▪ Engkabang and Sepening Pansang Hills, to the south of Tanjung Asam Sub-Village settlement area, have many springs ▪ Lake Popan was previously a lowland dammed up in 1979 by the main road of Alas Kesuma Natural Forest Concession. It was then used as a water source for Alas Kesuma nursery, prompting the construction of a water gate to regulate its water level
Community member of North Kayong Village	Neighborhood Unit Head (M)	Interview	▪ Kuntilanak Hill has a shallow solum, rocky surface, and steep slopes. Many fruit trees grow in the foot of the hill, especially Mentawa Bulan ▪ Bukit Kincah is located in division 1 and 2. Many fruit trees (yellow durian) can be found on the hill, as well a spring called Dagoi, that is named after the owner (Mr. Dagoi) ▪ Water catchment of River Segagap Besar originates from Panggungan and Sebutu Hills, where Samsam and Sesuli springs are found, and the upstream of River Segagap Besar is located in Bunga Hill ▪ Water catchment of River Segagap Kecil is located in Bohorang and Binti Hills, where one of the springs, Kondang Lojing, is located. Kondang Lojing and Sindur Ribung springs originating from Riam Begodang Hill are the primary source of water for North Kayong community
Sepakat Jaya Village Government	▪ Ramni (M), Village Head; ▪ Redimansyah (M), Sub-Village Head Sungai Beliung;	Participatory Mapping and Focus Group Discussion	▪ The size of Protected Forest in Lempuding Hill is reduced for the purpose of community cultivation since the forest was designated after the community had cultivated rubber in that area. Many community rubber plantations are located within protected forest area. The boundaries of Lempuding Hill Protected Forest are currently being revised

	▪ Rici Riadi (M), BPD Head; ▪ Yusunanto (M), Neighborhood Unit Head		▪ Menangis Hill (also known as Sungai Nyuruh Hill by Village Head and local community) is an important hill for the community of Sepakat Jaya village because it has a dam with water that is distributed through pipes and serves as water source for the village ▪ Many protected wildlife can still be found in the Menangis and Lempuding Hills ▪ The community's main sources of income are working on oil palm plantations and developing rubber farms, while some remain to farm ▪ Most of families still catch fish for personal consumption. Rivers for fishing include Tayap, Nyuruh, Segagap, and Senggili. Although not every year, Nuba Adat tradition is practiced during a prolonged dry season.
Sepakat Jaya Village Government Official	Edy Amsicom (M), Village Secretary	Field Visit, Interview	▪ Sub-village community sources water from the hills to fulfil their needs for water. Since the clean water system is in poor condition, the community have to use water pump to get clean water ▪ River Kansai is a source of clean water that the community uses for bathing and washing ▪ River Kansai is located close to sub-village burial grounds, Lama Laman Lambat settlement, and Belian Kikipan sacred site ▪ The sacred site complex is located outside the Company concession area
Farmers of Engkadin Sub-Village, Sepakat Jaya Village	Hermen Sepel (M), Farmer, Rubber, and Oil Palm Smallholder	Interview, Field Visit	▪ River Kansai is used for daily purposes ▪ Gathers the fallen fruits during fruit season ▪ Only few people knows the location of Belian Kikipan sacred site; the site and its environment is protected by sub-village community
Pebihingan Village Government	▪ Dodi Kusdianto (M), BPD Chief; ▪ Mohsin Alatas (M), Sub-Village Head Pebihingan I	Participatory Mapping and Focus Group Discussion	▪ Pebihingan is a village having undergone an administrative exclusion, from which new villages were established, i.e., Muara Semayok, Kerta Baru, and Muara Gerunggang ▪ Community have both dug and drilled wells to meet their needs for water. River Pemahan is still used as bathing place for some community members. This river is also used as water reservoir in dry season ▪ It has no sacred and historical sites.
North Kayong Village Government	▪ F. Ahai (M), Village Head Ad-Interim; ▪ Utamin (M), Neighbourhood Unit Head 02; ▪ F. Sekino (M), Administrative Coordinator; ▪ Oma Sakila (M), BPD Member; ▪ Jakaria (M), Village Affairs Coordinator; ▪ Laku (M), Neighbourhood Unit Head	Participatory Mapping and Focus Group Discussion	▪ North Kayong Village was administratively excluded from Betenung Village in 2006, with total area of 64.41 km2 and total population of 174 families (543 people) ▪ Village Boundaries: Segagap Sub-Village (Nanga Tayap Village) in Pendorosan or Derodod Cascade, Kayong Tuhe Village, Penyemborangan (between North Kayong and Kayong Tuhe), Pulai Dangku, Keranji Bayuh, Bentulang is located along the Alas Kesumah road, on left side of the road (to the north) borders with North Kayong Village ▪ In 2012, the Company set GRTT of IDR1.2 million/ha for uncultivated land and IDR3 million/ha at maximum for rubber plantation, and in 2018, rubber plantation was worth IDR10 million/ha. The remaining lands within the Company concession may be relinquished, but it depends on negotiation result. However, some areas may not be relinquished due to its function as source of income (rubber plantation) and farm land (rice and vegetable fields), as well as inheritance. Community rights for cultivation is demonstrated through Statement Letter from the landowner, that is verified by executor unit team consisting of community leaders and acknowledged by village and district heads. Area of village lands within the PT BGA concession is 1,000 ha. ▪ The community owns 800-ha independent oil palm smallholdings managed by a cooperative whose members are community members of Nanga Tayap, Sepakat Jaya, and North Kayong Villages. The establishment of the independent smallholdings was funded by individual businessperson. The village has a Village Treasury-Plantation (Kebun Kas Desa) developed by PT BGA with the total area of 6 ha. ▪ There are not many community members who develop oil palm plantation independently as they have been accustomed to cultivating rubber that does not need extensive maintenance. ▪ If any mining activity takes place within location permit, a standalone negotiation would be conducted. At that time, the 60% land cover is babas (ex-farms) ▪ Some community members are found cultivating in an area within BGA concession that was previously a farm cultivated by five families. For now, it

			- will be left as is, but it can possibly be relinquished as long as it is not considered sacred. - Rivers include Setenggilingan, Titik Kayu Ara, Hulu Segagap, Sebotongan; The drinking water is sourced from Mt. Gumai - CSR activities are provided incidentally based on request, and are yet to be included into program system. Good CSR system would attract community members to relinquish their lands to BGA - Unrealized CSR activities include scholarship, while assistance for non-permanent teachers is provided but not included into the system 60% of community members work for BGA, and 5% are independent smallholders
Community Leader of North Kayong Village	Kadarusno (M), Rubber and Palm Oil Smallholder, Owner of Swallow Nest Farm and Cafe	Participatory Mapping	- The Company held information dissemination on 12 March 2012 at Patih Muter Meeting Hall. Minutes of meeting were well-documented by village government. Mr. Iwan Kusnandar and Mr. EM Hamdani were present as company's representatives. On 15 April 2012, the Company along with community members conducted land clearing with customary tradition known as "Memangul". The planting started in August 2012 - At first, the Company experienced difficulty on land acquisition in this village because an NGO member spreads a rumour that oil palm plantations harm the environment, induce climate change, and deplete water supply, making it difficult to plant other crops on ex-oil palm plantation land. This particular NGO member is an activist of CU (a local financial institution) that has interest with community's agricultural capital venture
North Kayong Traditional Leader	Pinggir (M), Demong	Participatory Mapping	- Locations that must be left undisturbed include Sacred Forests, Tembawang, Pedaasan, ancient burial grounds, and fruit gardens. - Pedasaan is a farm and long-lived settlement that is still inhabited. - Sacred Forests include Pagar Batu, Natai Tengkayas, Keladan Toker, Urawan, Pulai Lakan, Atu Sorak - Ancient burial ground and fruit garden include Keranji, Batu Koling, Batu Hanyut, Kelintang in River Tobang Ribut.
Community Member	- Ato Abadi (M), Farmer; - Jones (M), Farmer; - Supriadi (M), Fisherman	Field Visit	- Respondents show important sites, such as burial grounds, sacred forests, and durian plantations that have been discussed in previous meeting. These sites, along with Tembawang and Padaasan, should not be cleared for palm oil plantation - These sites include Laman Durian Burial Ground, Durian Keranji Plantation, Sacred Forests of Batu Koling, Kelintang, and Kincah Spring which is used in worker housing - Water in this spring dries up during dry season, forcing the workers to use tributaries to source clean water - Laman Durian Burial Ground is a complex of ancient graves located in bamboo forest. These graves are only marked with old tajau (dayak jar) - Worker camp in Kincah is surrounded with durian farm and whoever finds the fallen durian can consume it - In general, community members use fishing rods to catch fish. Few of them use bubu (fish trap) or fish net. The community only sell big fish at a price of IDR25,000-40,000. The fish are sold in Nanga Tayap - Species of fish that are caught include rasbora, lanci, tinfoil barb, beardless barb, hard-lipped barb, pantong, climbing perch, glass catfish, dinema catfish, chitala, bagrid catfish, baung kentang, baung baner, andongan, airbreathing catfish, and sharptooth catfish
North Kayong Village Government	- Nickodimus (M), Village Head; - Refius (M), BPD Head; - Edy Amsicom (M), Village Secretary; - Ratnawati (F), BPD Member; F. Soal (M), Sub-Village Head	Participatory Mapping and Focus Group Discussion	- Hulu Kayong Village was administratively excluded from Betenung Village in 2006, with total area of 122.95 km2 and the total population of 352 families (1,197 people). For a living, the community run rubber plantation of a minimum 1 ha/family as well as work for a wood company of PT Sukajaya Makmur/PT SJM (PT Alas Kesuma group) and oil palm plantation of PT LGI with daily wage of IDR105,000/day (as of now, the minimum daily wage is IDR114,000 according to 2020 Regional Minimum Wage) - Company management agrees not to clear lands in the concession covered with fruit garden (particularly durian plantations inherited from ancestors), ancient burial grounds (in Batu Berani, Semunte, Batu Madung, Lombang Sawah), and water source used by the community - The community sources water from River Anau. Water distribution network originated from Anau Hill is funded by PT SJM, while from Batu Priuk Hill is funded by the village fund

			- PT SJM, which began its operation in this area since 1979, has developed Forest Village Community Training Program (PMDH) providing technical and capital assistance for community's rubber plantation, cultivation for secondary crops, education (construction of vocational high school), plotting Baru rice fields (60 ha), including the irrigation network - Most families' livelihood activities include working for oil palm plantation company, cultivating rubber, and farming rice paddy. The yield of farming are only enough to meet family needs, and if there is a shortage of rice, they can easily buy it from local shop in the village or at Nanga Tayap Market. - Villages expect the company representatives to present in every Multi Stakeholder Consultation Forum for Development Planning (Musrenbang)
Kayong Hulu Community Leader	Endang L	Participatory Mapping	- Dissemination of information on the presence of the company was conducted in 2013, followed by land acquisition measure (GRTT) by Village's Executor Unit Team. Kayau Hulu executor unit team was coordinated by Chief of Sub-Village 1 (F. Soal) and the GRTT was conducted thoroughly (in team), covering land blocks owned by individuals GRTT has two schemes, i.e., true sale (jual putus) and sale with scheme compensation. For true sale, GRTT value is IDR3 million/ha (without scheme smallholding), while GRTT value for sale with scheme compensation is IDR2.8 million/ha. Scheme smallholdings are located in one site and, together with nucleus plantation, planted in 2013. Scheme smallholding members joined Kayong Sekayu Cooperative - PT SJM, which began its operation in this area since 1979, has developed Forest Village Community Training Program (PMDH) providing technical and capital assistance for community's rubber plantation, cultivation for secondary crops, education (construction of vocational high school), opening Baru rice fields (60 ha), including the irrigation network - Village stakeholders are disappointed in PT LGI management as they are often absent in meetings or consultation forums, including musrenbang, so that the aspirations from community members are not accommodated, one of which is unfulfilled social assistance.
Nanga Tayap Village Government	- Hapit F. (M), Village Head; - Evi Susanti (F), Head of Family Prosperity Development (PKK); - Aswin (M), Mapping Officer	Participatory Mapping and Focus Group Discussion	- Nanga Tayap Village is a Government Administrative Centre of Nanga Tayap Subdistrict with the total area of 86.02 km2. Total population of the village is 1,486 families (4,838 people), with livelihood activities include rubber and rice farming (30%), working for private companies (40%), trading (25%), and others (workers, etc.). The religions practiced by the community include Islam (75%), Catholicism (20%), and others (Protestantism and Buddhism) - Few burial grounds are considered as historical burial sites of the village founders, i.e., Gelanggang, Uyuk Kuwek, and Uyuk Agung. The burial ground visitors were used to scatter the yellowed rice and coins in the area - Matters concerning customary traditions are governed by MABM Management. - Important rivers crossing the village areas include River Segagap and Senggilingan that empty into River Tayap. Some community members use the rivers for doing laundry and bathing, while majority of them have already used wells for their daily needs. - The village has private forest with total area of 70 ha which is registered in individual names. The timber products are sold by the respective landowners to CV Sahabat, a company producing wood veneer and furniture. - Company conducted information dissemination in July 2012, which was attended by village heads and demong adat (customary leaders) and many community leaders of Nanga Tayap Subdistrict. Nanga Tayap Community Members at that time rejected the company presence because rumour has it that palm oil plantation may harm the environment. Company continues information dissemination to sub-villages for gaining support from community members through approach from sub-village heads and neighbourhood unit head (RT) so that the local community would relinquish their lands and engage in partnerships. - Land acquisition is carried out by executor unit team, and negotiation for GRTT value is conducted directly with landowners. Land clearing is carried out once community members have no objection to GRTT process. No lands containing sacred burial grounds and important water sources in plantation

			• area is relinquished to the Company. Unrelinquished lands mainly are productive rubber plantations. • Head of PKK Movement Team states that, at the moment, PKK Nanga Tayap Village has prepared land bank for a total of 1.5 ha for development of PKK garden and rubbish management program. Land preparation is assisted by PT Sinar Mas (Nanga Tayap Estate), while procurement for rubbish processing machine is assisted through CSR program of PT BGA • The village has conducted mapping for the issuance of Statement of Land Ownership (SKT). At the moment, SKT issuance has experienced difficulty as the the Company's HGU boundaries are unknown.
Housewife of Nanga Tayap Village	Yuliara (F)	Interview	• Rather than farming, many housewives work in wood sawmill and plywood companies. • Household needs are met by purchase. • Some community members catch fish in rivers every day for their own consumption.
• Farmer, Nanga Tayap Village, Tambang Kayong Sub-Village	• Mus Mulyadi (M), Paddy rice farmer • Head of the Farmers Group; • Tarmizi (M), Livestock & Rice Farmer	Interview, Field Visit	• Rice harvest is going well and able to fulfil family consumption. Land clearing for rice field is conducted through slashing, burning, then dibbling. After that, the paddy rice is rested until its harvesting period. • A water irrigation system is now being built to irrigate rice fields because they are typically deprived of water during the dry season. The irrigation system is expected to expand the rice field area to a total of 10 ha. Irrigation water is supplied from River Kayong. • Despite the fact that cow farming is thriving, but rice fields are troubled by rodent and bird pests, resulting in harvest failure. During dry season, no water available to irrigate rice fields.
Batu Mas Village Government	• Kukong (M), Village Secretary; • L. Hevi Kurniawan (M), BPD Head; • B. Elisa (F), Kaur • Marya Yati (F), PKK; • H. Amco (M), Administrative Coordinator; • Venansius Jumaidi (M), Sub-Village Head; • Agustinus (M), Sub-Village Head; • Adrianus (M), BPD Member	Participatory Mapping and Focus Group Discussion	• Batu Mas Village, once a part of Muara Gerunggang Village, was administratively excluded based on the Local Regulation of Ketapang District No. 12/2009, the total area is 29 km2, with a population of 368 families (1,237 people), the majority are Catholics (80%), Muslims (10%), Protestants (5%), and Buddhist (5%). The community work as rubber farmers or workers for palm oil plantation companies (PT AMS and PT BGA). • Information dissemination was conducted in 2012, and since there were pros and cons among the community, the Village Head asked for more time to consolidate with the community before deciding to accept the Company's presence in the village. Rejection from the community came after rumours circulated about how palm oil plantations are harmful to the environment. • Land acquisition was conducted by the Executor Unit Team of Batu Mas Village using a global scheme, there was no coercion towards people who were unwilling to relinquish their lands. People can relinquish their lands through direct sales or by participating in a partnership scheme. The Company offered a 80:20 partnership scheme. Partnership was made with a Partnership Agreement between the Company and Karya Gerunggang Bersatu Cooperative as the representative for scheme smallholders. • Karya Gerunggang Bersatu Cooperative is made up of community members from four villages (Batu Mas, Cegolak, Pateh Benteng and Tajuk Kayong), with a total of 284 members, including 31 founders; the established scheme smallholding covers 575,17 ha. Partnership documents between the management of PT AMS with the Cooperative had been signed in 2018, however, it is currently under revision due to changes in some parts. • The community sources their water from drilled and dug wells. In 2015, wells were drilled in five sub-villages, but only one of them, in Batu Berani, is currently functioning. • Batu Mas Village community tightly holds on to local customary tradition in their daily life. Except for bamboo plants, village customs prohibit community (and companies) from carelessly cutting trees, particularly durian trees, areca palms, langsat trees, cempedak trees, pekawai trees, and satar trees. • Company assistance for the community through CSR program, such as the drilling of wells in 5 sub-villages, grants for elementary school and kindergarten teachers, construction of firebreaks, funds for traditional ceremonies, operational assistance for the Heads of Villages, Heads of Sub-Villages, and Indigenous Leaders.

Pateh Benteng Village Government	- Martinus (M), Village Head; - Sutijo (M), Village Secretary; - Martha Kana, SPd (F), PKK Head; - Matius (M), PRC; M. Suhanadi (M), Welfare Coordinator; - Laura Tri Juli R (F), Administrative Coordinator; - Hana Kartina (F), PKK; - Abednego (M), Village Treasurer	Participatory Mapping and Focus Group Discussion	- Pateh Benteng Village was originally called Batu Benteng sub-village, before it became administratively excluded from Muara Gerunggang Village based on the Local Regulation of Ketapang District No. 12/2009 about the Exclusion of Muara Gerunggang Village, however, village boundaries have not been finalised. - Total area of the village is 36 km2, with 96 families (339 people) residing in the village, who mainly work as rubber farmers and palm oil smallholders, and the majority are Catholics. - In 2011, the Village Head was invited by the Ketapang District Head to discuss invesment plans of a oil palm plantation company in the area of Nanga Tayap and Pemahan Sub-Districts. In the discussion, it was discovered that some residential areas in Pateh Benteng Village (Batu Benteng sub-village at the time) was included in the Location Permit. - In 2013, the Company disclosed the plans for the development of palm oil plantation. During the dissemination event, the Village Head gave 4 conditions, the first was for the land acquisition process (GRTT) to be done accurately (regarding ownership, location and size), the second was for the Company to provide working opportunities for local communities, the third was for the Company to clarifiy the partnership scheme, and the fourth was to not turn the agricultural land permit into mining permit without making new agreement with the local community. - During the land acquisition process, there was a conflict where one of the officials from Tajuk Kayong Village (Sumarsono) handed over 118 Ha of land owned by the community of Pateh Benteng Village to the Company without consent from the owners. In the local traditional terms, it is called "Mencuruk pelompang, melangkah gawang" or silently robbing people of their rights. This case was solved using the local customs and it was decided that Mr. Sudarsono was fined with 8 Tajau (Dayak porcelain jars). - The Company was deemed to fail in complying with the terms of the agreement, especially regarding land acquisition process. Some of the community including the Village Head claimed that their lands were handed over to the Company by third parties without their consents, even though most of the community members held the land ceritficate. - The Village Head claimed to not have signed any MoU of land relinquishment from the community to the Company including any documents related to the development of partnership plantations. To put GRTT compensation in order, renewal of the inventory of community lands that had been handed over to the Company was requested. - The community was accused of stealing oil palm from the Company plantions, the case is still being processed by the police. The community harvested from Company plantations as a form of protest against the lack of adequate response over complaints regarding community lands that were cultivated by the Company without GRTT.
Housewife	Maria Ruba (F)	Interview	- The community still rely on rubber farms and rice fields. Few of them own swallow nest farms. - The community sources their water from wells and rivers. - Yield of the rice fields is utilised for own usage. - Elders still use bamboo to weave into house furnitures, especially paddy processing tools. Rattan is starting to be difficult to find. - The majority of families own motorcycles.
Muara Gerunggang Village Government	- Achmad Yani (M), Head of Village; - Rudi Hartono (M), Head of Sub-Village 1; - Nasikun (M), Head of Sub-Village	Participatory Mapping and Focus Group Discussion	- Muara Gerunggang Village was assigned definitive village status in 1971, after being administratively excluded from Pehibingan Village (formerly part of Tumbang Titi Sub-District). In the past, this area was known as "Gerunggang Enam Sekayu" which included the Sub-Villages of Batu Mas, Sungai Kerta, Batu Berani, Selupu (Cegolak), Tanjung Bayo, and Batu Benteng (Pateh Benteng). - Boundaries between the village and Cegolak Village post-exclusion in 2009 is considered to be overlapping, even though Cegolak Village had accepted the Decision of the Head of Ketapang District No. PEM 01/4 - D/1979 on 25 April 1979 regarding Village Boundaries in Lv. II Regions of Ketapang as a clear reference. The Village Government already have an indicative map from participatory mapping, while definitive mapping will be discussed at district level.

			▪ The village area is 204 km2, with 201 families (736 people) and most of them work as farmers with rubber, rice paddies, and fruits (jengkol, petai) as main commodities, all of the population are Muslims. ▪ Nearly all families own rubber farms that are commonly managed traditionally without intensive care. Paddies are produced in dryland fields and rice fields, with the area of the rice fields is 30 Ha. ▪ The company conducted information dissemination in 2011 disclosing development plans of the palm oil plantation, but at the time, the boundaries of Company working area were still tentative. The villagers currently prioritise information on the boundaries of Company's HGU. ▪ Complaints from the community after the palm oil plantation operates is about how some of the streams became clogged by trees that were knocked down during land clearing, and therefore making the water spills into roads and floods the community plantations. ▪ The community needs detailed information about HCV, particularly regarding river banks. ▪ Sacred burial ground around River Keramat is located on the land owned by Masni, outside the HGU area of PT BGA. The burial ground is considered sacred as it is the first grave that was found in Muara Gerunggang, the burial ground is located on the side of River Keramat. Based on the location of the burial ground, it is estimated that it is a burial ground of a Malay Muslim.
Farmer	▪ Adi (M), Cultivator, Rubber Farmer	Field Visits	▪ Rubber prices are still low at around IDR6,000, so it is not profitable to hire workers. ▪ The community struggles to get land certificates due to unknown boundaries of Company's HGU. ▪ Many community members still use the river for sanitation, while others rely on rain water for clean water. During rainy season, the roads and rice fields are often flooded.
▪ Muara Semayok Village Government	▪ Suryani (M), Pancuran Mudik Sub-Village Head; ▪ Jaka Irwanto (M), Welfare Coordinator; ▪ Lily Yulita (F), Planning Coordinator; ▪ Herlia Veramia (F), Semayok Sub-Village Head	Participatory Mapping and Focus Group Discussion	▪ Muara Semayok Village was established after the exclusion of Pebihingan Village in August 2013. In 2016, the Village Head was held by Sub-District Government staff, and in 2017 by a definitive Village Head. Total area of the village is 17,03 km2, with 126 families (362 people) in population, the majority are Muslims. The majority of the people work as farmers who rely on rubber tapping and fruit harvests for their livelihoods ▪ The Company conducted information dissemination in January 2013 when Muara Semayok Village was still a Sub-Village of Pebihingan Village. The community's land acquisition (GRTT) process involved an Executor Unit Team, with the Head of Pancuran Mudik Sub-Village appointed as the Coordinator. The lands relinquished to the Company are mostly half of the lands owned by the community and usually located behind the land that is not relinquished. Such condition, according to the Village Secretary, has rendered some locations inaccessible, and unable to be built to this day. ▪ Scheme plantation are managed by Pemahan Bersatu Cooperative which includes communities from the Villages of Muara Semayok, Muara Gerunggang, Pebihingan and Gunung Mas. Development of nucleus and scheme plantations started in 2014, according to the Sub-Village Head, the development of scheme plantation is not optimal and the revenue is not enough to cover monthly installments to the Bank, however, the Company continues to provide IDR200.000 per month per Ha to members of the Cooperative as a loan that will be calculated once harvest returns to normal. ▪ Some of the village area is part of the Durian Hill protection area, the lower parts are cultivated by the community with various fruit plants (durian, petai, jengkol, cempedak).
Cegolak Village Government	▪ Markus Jumaidi (M), Village Head; ▪ F Toto H. Adi (M), Financial Coordinator	Participatory Mapping and Focus Group Discussion	▪ Cegolak Village was formerly the Selopu Sub-Village before being administratively separated from Muara Gerunggang Village; the village has a total area of 28 km2, and is resided by 137 families (481 people).The community members are mainly rubber farmers and oil palm smallholders, and they are mostly Catholics (83%) and Muslims (12%), with Protestants and Buddhists making up the rest. ▪ Village boundaries are considered clear and village officials already have a participatory map in accordance with Local Regulation of Ketapang District No. 12/2009 on the Exclusion of Muara Gerunggang Village and the Decision

			of the Head of Ketapang District No. PEM 01/4-D/1979 on 25 April 1979 regarding Village Boundaries in Lv. II Regions of Ketapang.
			▪ Areas of the village lands relinquished to the Company are ± 860 Ha and ± 600 Ha of it had been planted with oil palm. Private lands that are left and will not be relinquished to the Company are productive durian plantations and rubber farms.
			▪ The Village Government believed that PT BGA had not obtained legalisation from Ketapang District EIA Commission for its EIA documents, which hindered village officials from monitoring environmental management efforts from the Company.
			▪ The social environment around PT BGA is considered better than other companies considering that the management of PT BGA gave a more flexible working time for their workers to join traditional ceremonies in their villages.
			▪ There are various sacred sites around the village, including Lubang Bedurek, Seduaye, Hyang madi, Aye Nyambong, Tunjung batukarang, Perindangan, Bukit Tabe bulu, Sungai Isoyer, Batu Bontang, Unjung Ungkong, Mayang Kacil, Batu Rangga Tantang, and Sungai Seladan
Kayong Tuhe Village Government	Tomisius (M), Village Head	Participatory Mapping and Focus Group Discussion	▪ The Lubang Guhe water source (also called Kompas Bernyanyi) is seepage water from Bukit Sengkuayan, which is located on the land owned by Latu, the water reservoir was made through the PNPM program before Kayong Tuhe Village. At the lower lands there are rice fields with technical irrigation that was built by the Government of Ketapang District. The technical irrigation does not work since it was built lower than the location of rice fields. During the Assessment, the rice fields are not planted. ▪ The community mostly depend on rubber farms and rice fields for their livelihoods. ▪ The villagers cleared the field at a sloping terrain near the rice fields using slash and burn technique. ▪ The Penumalan water source is seepage water that is collected with a water tank and then distributed to the village. It is located near shrubs and mature rubber farm owned by the family of the Head of Village. ▪ The old burial ground is north of the highway and it is difficult to locate. Laman Tuhe is south of Tiver Demit and it is difficult to identify.
Kayong Tuhe Community Leaders	Astaga (M), Farmer, Former Head of Sekembar Sub-Village	Interview	▪ Riam Kelilitan Traditional House was built before village administrative exclusion occurred. The name of Riam Kelilitan is used as the name of a Traditional House. ▪ The name is used as a remembrance to a cascade located around Bunga Hills, which is considered a sacred and historical place.
Tajuk Kayong Village Government	▪ Yama S. (M), Village Head; ▪ Meri (F), Administrative Coordinator; ▪ Sumarsono (M), Head of Sub-Village 1; ▪ Laspia Herlina (F), General Planning Coordinator	Participatory Mapping and Focus Group Discussion	▪ Tajuk Kayong Village was administratively excluded from Desa Betenung, with an area of 108,23 km2. It borders Nanga Tayap Village to the north; Betenung Village to the east; Pateh Benteng Village to the south; and Siantau Raya Villga to the west. The boundaries between villages are collectively agreed to based on the Decision of the Head of Ketapang District No. PEM 01/4- D/1979 on 25 April 1979. ▪ The village has 319 families (1.054 people) in population, and the majority are Catholics (80%), Protestants (14%), Muslims (5%), and Buddhists (1%). The people mainly work as farmers who manage their own lands (62%), farm workers (28%), traders (7%), and civil servants (3%). ▪ The company conducted information dissemination in April 2012, disclosing plans for the development of oil palm plantation and offering partnership cooperation. In order to obtain community lands, the Company was assisted by the Executive Unit of Tajuk Kayong Village, headed by Mr. Sudarsono. GRTT compensation is done in a global compensation scheme, where identification, measurement and payment of GRTT is done through groups. The GRTT process left a problem where a land of 118 Ha is disputed between Tajuk Kayong Village and Pateh Benteng Village. ▪ Land clearing process was carried out with special attention paid to sacred places and water sources that the community use for their daily needs. ▪ Social aid given by the Company that has tangible impact for the community is the newly made football pitch.
Betenung Village Government	▪ Rusnadi (M), Village Head;	Participatory Mapping and Focus	▪ Betenung is an old village, originally known as Batu Betenung, which was said is built found in 1416. Betenung Village was assigned administrative village based on the Decision of the Governor of West Kalimantan No.

	▪ Herkulanus Astra (M), Village Secretary; ▪ Marsianus (M) BPD Head; ▪ Sirawati (F) Secretary of BPD; ▪ Ica Lestari (F) Sungai Demit Sub-Village Head; ▪ Bernadies Dwie (F), Betenung Sub-Village Head	Group Discussion	535/1986. Total area of the village is 99,11 km2, in December 2019, the village had 580 families (2.668 people) in population. ▪ The Company need to support the community in fire prevention. ▪ Betenung Village borders Kayong Tuhe Village to the north, Batu Mas Village to the south, Cegolak Village to the west and Kayong Hulu Village to the east. ▪ Most of the village (90%) is a production forest area, with a flat to rolling topography (around 10-500 masl), there are two important rivers, Boyangan and Seganas, that empty into River Demit. ▪ There are three consessions of palm oil companies operating in this area, namely PT BGA (432 Ha), PT Lestari Adi Perkasa (132 Ha), and PT Sinar Mas (268 Ha, failed to open), as well as one Industrial Plantation Forest company that operates inside Production Forest area, which is PT Wahana Hijau Pesaguan (420 Ha). Total area of community rubber farm is 1.000 Ha. ▪ The main source of income are: rubber tapping (197 families), trading (48 people), working in the private sector (201 people), and working as civil servants (18 people). ▪ CSR program from PT BGA to the people of Betenung came in the form of fish seeds, free healthcare, scholarships, operational costs for the Village Head, Sub-Village Head and Indigenous Community Leaders, as well as an opportunity to work in the Company plantation. Currently there are more than 50 people of Betenung who work in PT BGA plantation.
Community Leader	Laga (M) Community Leader		▪ Area of community land relinquished to PT BGA is 432 ha, located in S. Demit Sub-Village. The handover was done since 2012 through a global scheme on behalf of 52 families, in which each families received GRTT compensation amounted to IDR9.300.000,-.
Indigenous Leaders	▪ Yanto (M), Indigenous Judge (Demong Adat); ▪ Y. Hermansyah (M), Indigenous Official		▪ The indegenous people of Dayak Kayong hold tight to their local customary tradition. Some locations that are considered traditionally sacred include Batu Mensiu, Batu Otel, Riam Segintang, De Nampar, Riam Penguangan, Gemiluh, Batu Pulir Bago, and Rade Piar. Burial grounds considered sacred are located in Pasaran Sesingkar, Durian Tekalong and Priuk Bukit. The majority are Catholics (80%), Protestants (15%) and Muslims (5%). ▪ Traditional ceremonies include Pincak Combong Jerami (Nebas), usually held in June, followed by Nugal (Buka Pebohong), and then consuming Baru rice harvests between February and March, Semangat padi (taking paddies to the barn/Jurong). ▪ There is also a ceremony for fruit season called Senggayung or Merobohan Gangsing; The Nuba Adat is only held on long dry season, usually in August. ▪ Plants that are used in traditional ceremonies include: Tuba roots, Marau (a type of rattan), Yeyamut (a type of lily), bamboo, Combong (weed). There is also Sensabang (red wood), Temiang (a type of bamboo), Salah Sugarcane, Areca nut, Hehidup (leaves from a type of wood), Rusi (a type of shurbs), Segulang (wood from a type of tree). The plants can be found in bawas or house yards. ▪ Traditional ceremonies usually also use chicken eggs, chicken, pigs, coconut oil, and Tepung Tawar (ground rice and turmeric). ▪ A Demong and/or Shaman usually have restrictions (Punti) to not eat porcupines, monitor lizards, muntjacs, bear, spiny eels, airbreathing catfish, beardless barbs, redtail catfish, white mango (Kemangas), kolik, and jengkol, three-leaved yam. ▪ Hornbills are Duate messengers. ▪ Sacred sites located near residential areas are Sandung Tinggi and Sandung Bedowen. In Sandung Tinggi, only the Kaya Tale people's bodies can be placed in the ossuary (sanding), while Kayong people are not allowed. ▪ In Sandung Bedowen, only those who came from Central Kalimantan, called Bangkang Peholang can be placed in the sandung.

FPIC status

Assessment of FPIC status given by local community on the presence of PT AMS showed varying qualities. FPIC quality refers to the quality of the decision taken by local community in response to the presence of the Companies. Furthermore, the FPIC

quality in question is the quality of consent or the decision to agree freely, based on adequate information provided by the Company.

Assessment or examination of FPIC status of the three Companies was carried out using methods of Document Review, Interview, Participatory Mapping, FGD, and Field Visits. Such assessment was conducted with or without representatives from the Company, so that information collected would be most objective.

Output of the assessment showed that the decision to accept PT AMS in their location as part of PT BGA was made relatively free. The respondents, both village community members and officials, appeared to be free and not under coercion when expressing their stance and information about the Companies. During the Assessment, there were no signs of coercion in the interaction with respondents.

Information about the presence of the Companies was disclosed prior the development of plantation. However, the Companies did not use names of the companies holding the permits, instead using PT BGA. The presence of PT AMS as entities was only known to the Head of Villages and their officers who were in office when the permit was granted.

Land acquisition was done using a closed approach; disclosure was done in small groups from one house to another by an Executor Unit Team. Land compensation is paid to a group leader who represent the landowners.

In terms of information dissemination, it can be concluded that information provided to the community and village officers was inadequate. The most important concern is the identity of the Companies and the permit location, particularly when the HGU was granted. Even so, some of the villagers also informed that the company had conducted information dissemination since 2011.

Therefore, it can be concluded that freedom in the plantation development, the Companies did not restrict freedom, nor did any form of coercion towards parties related to their plantation development process. Such is considered to fulfill the freedom aspect in FPIC.

HCV 4

HCV 4 is identified to be present in the Assessment area (**Table 26**). HCV 4 areas found include lands with steep slopes (hill/hills), rivers and riparian zones, and wetlands (lakes and swamps). The number of HCV4 UM area location is 56 (Figure 12-13). Total area of HCV 4 is 3.600,06 Ha.

Table 26. Situations that qualify as HCV 4

HCV 4 Requirements	Findings
Management of extreme water flows, including vegetated riparian buffer zones or intact floodplains	✓
Maintenance of downstream flow regimes	✓
Maintenance of water quality characteristics	✓
Protection of soils, aquifers	✗
Clean water supply, i.e. where the local community rely on rivers and natural springs for drinking, or where natural ecosystems play an important role in stabilising steep slopes. The two values are often occurring simultaneously and the areas providing the critical services (water supply and erosion control) may be partially or completely intersected	✓
Protection against winds, and the regulation of humidity, rainfall and other climatic elements.	✓
Natural Ecosystems Play an Important Role in Stabilising Steep Slopes	✓
Pollination services, e.g. exclusive pollination for subsistent food crops provided by native bees for small-scale farmers in Kenya highlands, or for commercial Durian plantations by bats in Southeast Asia. In both cases, pollination agents depend on	✓

the presence of suitable forest habitats and cannot survive in landscapes that are purely for agricultural activities		
Forests, wetlands, and other ecosystems providing a barrier zone that protects against destructive fires, that may threaten the community, infrastructures, and other HCV.	✓	
Groundwater recharge zone	✓	
Grasslands area providing a buffer zone from floods or erosions	✗	

Note: ✓ = found; ✗ = not found

Management of extreme water flows, including vegetated riparian buffer zones or intact floodplains

Field indicators in the MU concessions showing the presence of situations related to management of extreme water flows and intact floodplains buffers are the presence of 32 rivers and 25 hill/hills. The presence of rivers is crucial as primary drainages particularly during extreme rain. The presence of sloped lands (hill/valley) with natural vegetations plays a role in reducing the speed of surface run-off when concentration of rainwater in the field increases.

Protection of soils and aquifers

The types of soil in the MU concessions are mineral and alluvial soils, there is no peat or marginal soil that requires special protection in its natural condition. Soil textures is classified as medium (sandy loam to sandy clay loam), according to soil hydrological groups, is classified as group C with slow infiltration rate. In this condition, its role as a groundwater recharging area that protects aquifer surface is relatively low.

Maintenance of downstream flow regimes

The water catchments are mostly 25 small rivers around the MU concessions. These small rivers never dry up even during a long dry season. Whether they get flooded or not depends on the situation in the large rivers (i.e. Rivers Tayap, Kayong, Segagap, Demit, Pemahan and Gerunggang). If those large rivers get flooded, the upstreams of the smaller rivers are clogged, so that the water level increases. Large hill/hills that are fully inside MU concessions are Sempawan Hill, Keranji Hills, Periuk Hills, Pebantan Hill and Durian Sulung Hill. Land cover condition is still good especially in the lands with steep slopes (more than 25% slope). The natural condition of the land cover also plays a role in maintaining the river flow regime, namely by increasing water infiltration in the soil and reducing surface run-off that contributes to the decrease of peak discharge of those rivers.

Maintenance of water quality characteristics

Generally, the condition of riparian zones in the rivers around the MU concessions is relatively well. Around 75.8% riparian zone around PT LGI is vegetated well. There has been no massive land clearing for palm oil plantation or other uses (built lands). Community rubber farms around the river had experienced natural succession due to aging, so the function of riparian zone as a natural filter has been restored.

The approach to determine the width of riparian area's buffer to maintain the water quality from pollutants is based on the function of riparian zone (Gumbert et. al., 2009). The buffer width to filter pollutants is around 6-50 m from the riverbanks. The buffer width to buffer floods intersects with the buffer width to filter pollutants. The buffer width for each river in the MU concessions is around 10-100 m from the riverbank for small rivers, and 100m for large rivers.

Provision of clean water

Rivers in the MUs area that are considered can provide clean water include Rivers Tayap, Kayong, Kemayoan, Segagap, Demit, Semuai, Gerunggang, and Pemahan. These rivers have an abundance of water (and continues to flow during long dry season)

with good quality. Aside from rivers, source of drinking water also found in springs in Pebantan Hill, Durian Sulung Hill, Periuk Hills and Keranji Hills.

Protection against winds, and the regulation of humidity, rainfall, and other climatic elements.

Most of the morphology in the Management Unit are rolling to hilly areas, wind speed is around normal rates. Therefore, there is no areas found serving as wind break or wind shelter in the field. The presence of shrub vegetation and forests in the riparian zone is crucial in maintaining the microclimate. The vegetative cover has a dense leaf canopy that reduces solar radiation reaching soil surface. The presence of vegetation also improves surface resistance against wind movement. This will cause the potential for evapotranspiration from riparian ecosystem to be low, so that it can maintain soil to stay moist from the surface to the layers below.

Natural ecosystems play an important role in stabilising steep slopes

Land cover with shrubs to forests that are in good condition plays a role in stabilising steep slopes by protecting them against erosion and landslides. Sloped lands in the MU concessions generally have land covers that are in good condition, there has been no massive land clearing.

Pollination Services

Through discussion with the villagers and field surveys, in the hill/hills there are many fruit plantations owned by the community around MU concessions (i.e., durian and mentawa plantations). During fruit season, durian is always abundant (usually happening in the end of the year or the start of new year). This shows that lands with natural vegetation plays a role as a good habitat for pollinating agents.

Forests, wetlands, and other ecosystems providing a barrier zone that protects against destructive fires

Riverbeds with significant width to act as natural firebreaks to avoid fire or protect against fire in other locations exist in MU concessions, namely in River Tayap and Kayong in the downstream (in the MU concessions). River Tayap is up to 25 m wide, and River Kayong is up to 40 m wide. The water body never runs out of water.
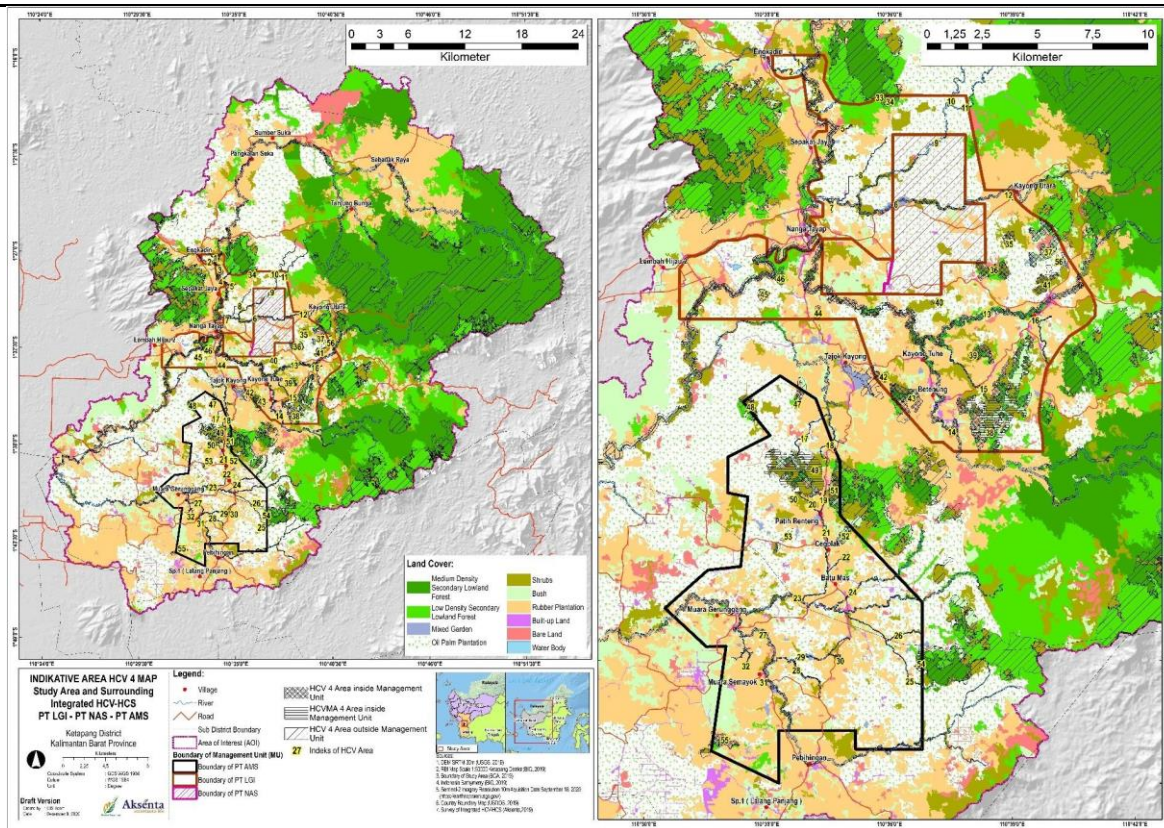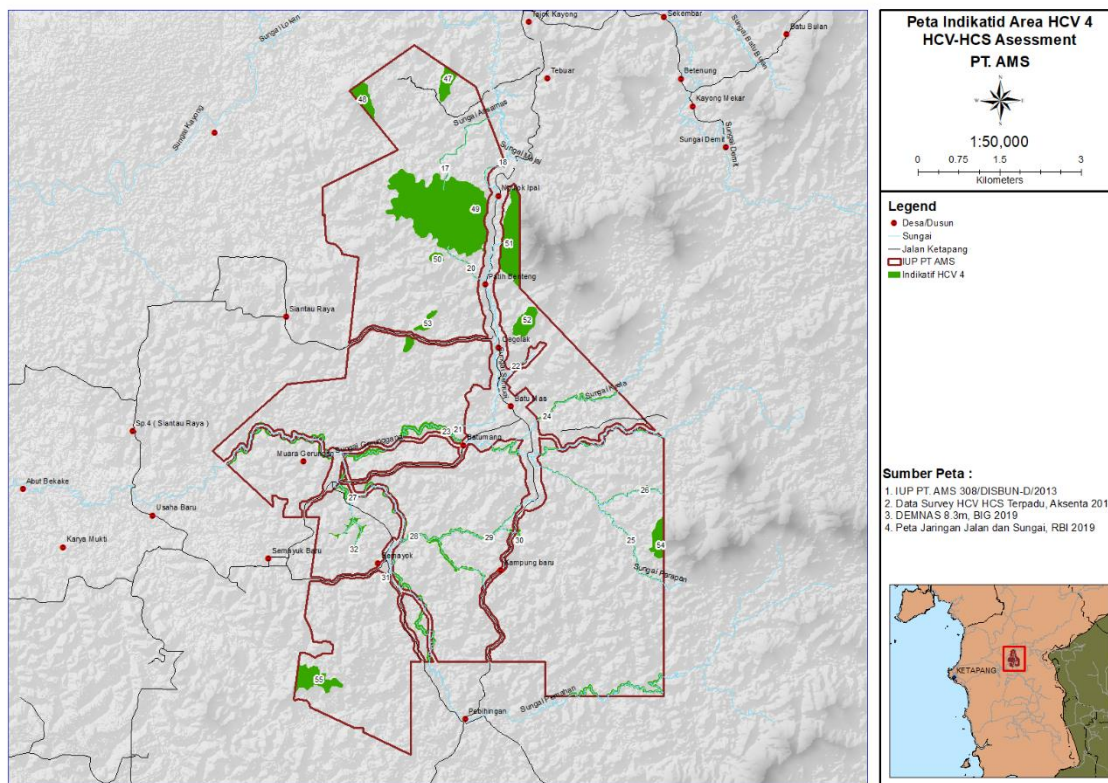
Figure 124. Map of HCV 4 in the AoI

Figure 135. Map of indicative HCV 4 in PT AMS

HCV 5

Indication of HCV 5 presence is met with the presence of rice fields, fruit plantations, water sources, rivers as sources of water and fish (Table 27). Total area of HCV 5 in the Assessment area is 1,673.69 ha with location distribution displayed in Figure 14-15.

Table 27. Indication of HCV 5 presence in the Assessment area

HCV 5	Findings
Fundamental sites and resources to meet the basic needs of the local community or the indigenous community (e.g. source of livelihood, healthcare, nutrition, water), that are identified through engagement with the community or indigenous peoples	Present: There is a river used by the local community for fish farming and fishing, and rice fields to supply the community with carbohydrates, and fruit plantations as a source of livelihood. Potential: - Absent: -
Situations that qualify as HCV 5	**Indication in the Assessment area**
Hunting and trapping grounds (for the game meat, skin and feather)	Absent: Recreative and opportunistic hunting activities, basically any kinds of animals that are edible are hunted, no dedicated hunting or trapping areas.
Non-timber forest products (NTFP) such as nuts, berries, mushrooms, medicinal plants, rattan	Present: Most used NTFPs are fruits and petais during its season. Medicinal plants are easily collected from house gardens and yards, medicinal practice is dominantly modern medicine. There is a Village Clinic (Poskesdes) in each village, and Community Health Clinics (Puskesmas) in Nanga Tayap and Pemahan Sub-Districts.
Fuel for household activities such as cooking, lighting, and heating	Absent: - The majority population is used to Liquid Petroleum Gas (LPG), while some still uses firewood from their yards for specific purposes. Electricity network from the State Electricity Company (PLN) has reached almost all of the villages.
Fish (as the main source of protein) and other freshwater species used by the local community	Present: Some of the villagers who live near riverbeds depend on fishing
Building materials (poles, straw, wood)	Absent: Some houses still use wood as a frame before using wire construction and mixture of cement and sand for the walls. The majority of houses use tin or tile roofs. Building materials are easily obtained in the local markets. Woods are bought in markets or from neighbours who still have many trees in their yards and from forest areas beyond Company permits.
Fodder for livestock and seasonal grazing	Absent: There are no permanent or nomadic herdsmen. Fodder is obtained from house yards and markets.
Water source necessary for drinking water and sanitation	Present: Most families have dug or drilled wells with water tanks. A few of them still use the river as a source for clean water and sanitation. Some families have utilised water sources and channelled them to houses. There are also rivers that are essential as a source for rice field irrigation.
Items which are bartered in exchange for other essential goods, or sold for cash which is then used to buy essentials or to pay for school fees	Absent: Community is already capable of accumulating wealth and earn income from working in companies, farming rubber, and palm oil.

River as a source of water and fish

Some river segments in the fields are directly utilised as sources of clean water. A small number of community members such as in Villages of Kayong Tuhe, Kayong Hulu, and Sepakat Jaya have built a clean water network sourced from seepage water that are either collected or direcly channeled to houses.

Apart from being a means of sanitation and a source of water, most of the community members get their livelihoods from fishing in the river. Fish is obtained by netting, fishing, installing traps or using *tabing* (a type of net). Fish is a main source of daily protein that can be easily found. Fishing for personal consumption is a regular afternoon activity.

Rice fields

Rice fields that also become a source of livelihood for local community are established in various ways. There are rice fields established by burning the land, or by using heavy duty farm equipment from the Government. Location of rice fields are still the same since they depend on the irrigation system or water availability.

Although it is mostly easy to buy rice, not everyone can afford it. Considering rice field are a main source of livelihood and no change in their locations, the rice field area can be determined as HCV 5 area. Irrigation network and rivers that become water sources are also determined as HCVMA.

Fruit gardens

In Pehibingan and Muara Gerunggang Villages, the community still rely on harvests from the Durian Hill. This location produces durian, petai, jengkol and cempedak. Forest product that has a good price is petai. AOI is relatively close to Pontianak and Ketapang, so the harvest can be sent to those cities and become an important extra income for the local community. For the community, fruit trees are traditionally forbidden to be cut.
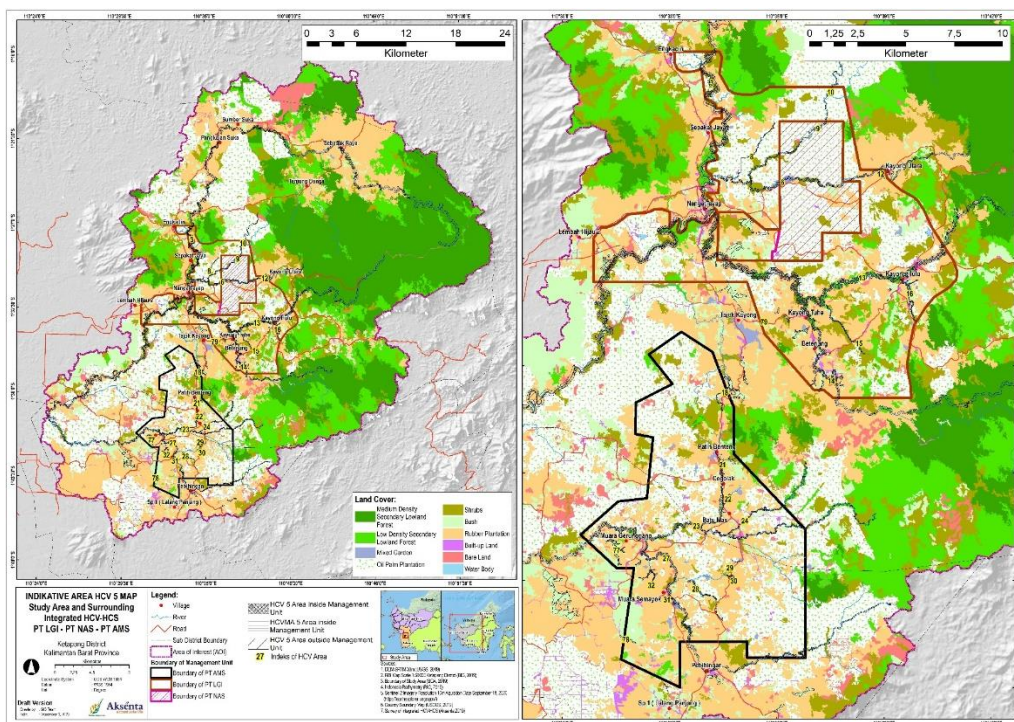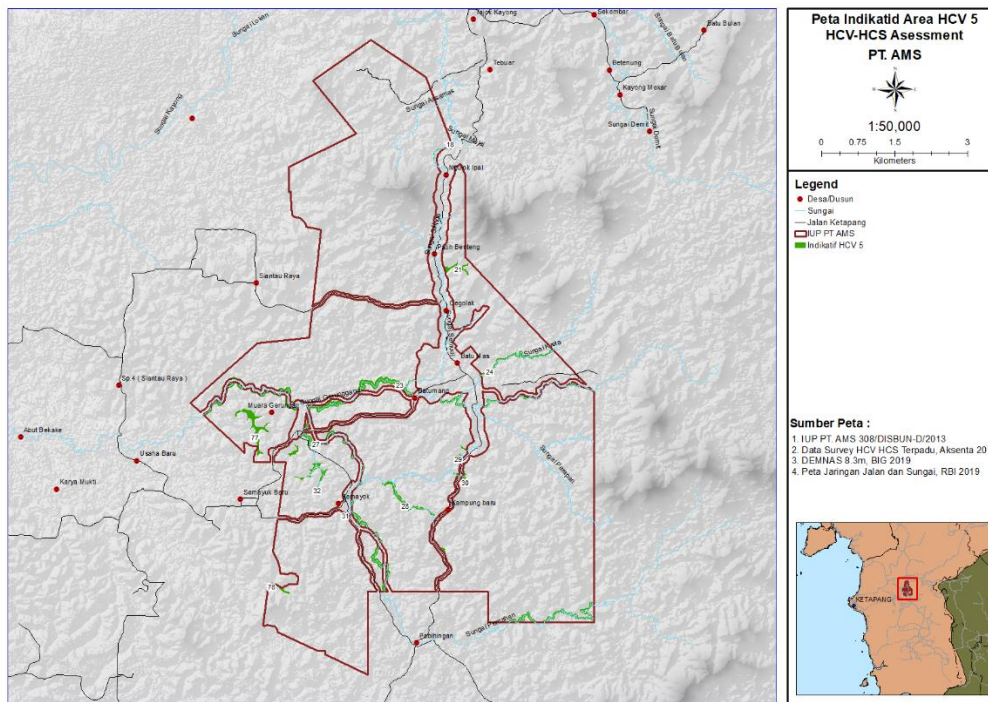

Figure 14. Map of HCV 5 Areas in the AoI

Figure 15. Map of Indicative HCV 5 Areas in the area of PT AMS

HCV 6

Based on the assessment that has been carried out, there have been identified situations in AoI that may potentially qualify as HCV 6 (**Table 28**). See **Figure 16-17** for HCV 6 area distribution.

Table 284. Indication of HCV 6 presence in the assessment area

HCV 6	Finding
Sites, resources, habitats and landscapes of global or national cultural, archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities or indigenous peoples, identified through engagement with these local communities or indigenous peoples.	**Present:** There are burial grounds and sites containing important historical and cultural values that play significant roles to local communities and indigenous peoples, as well as plant resources used in traditional ceremonies, and animal resources with totemic values. **Potential:** - **Absent:** -
Situations that qualify as HCV 6	**Indication in the Assessment area**
Sites recognised as having high cultural value within national policy and legislation.	**Absent.** There is an Ancient Kutai Site in East Kutai District, which has been assigned by on Minister Decree No. PM.29/PW.007/MKP/2008. The AoI is not concerned with this site.
Sites with official designation by national government and/or an international agency like UNESCO.	**Absent.** Sangkulirang-Mangkalihat karst area is only listed under UNESCO Tentative List and is located in East Kalimantan.

Sites containing recognised and important historical or cultural values, even if they remain unprotected under legislation.	**Present.** Uyuk Agung's Grave in Nanga Tayap Village and Sacred Grave in Muara Gerunggang Village.
Religious or sacred sites, burial grounds or sites at which traditional ceremonies important to local or indigenous peoples take place.	**Present.** There are burial grounds in each villages, and religious or sacred sites are found in Betenung and Engkadin Villages.
Plant or animal resources with totemic values or used in traditional ceremonies.	**Present.** Plant resources used in traditional ceremonies and animal with totemic values.

Sites containing recognised and important historical or cultural values, even if they remain unprotected under legislation

Sites within the AoI included in this category are Uyuk Agung's Grave in Nanga Tayap Village and Sacred Grave in Muara Gerunggang Village. Uyuk Agung's Grave is the grave of the founder of Nanga Tayap Village. In Muara Gerunggang Village, the grave that is considered sacred is known as the Sacred Grave, where it has been said that those buried there were the first to settle in Muara Gerunggang Village.

For Dayak peoples, in addition to old burial grounds, sites with histrorical values include *Pedaasan* (old settlement that is still inhabited) and *Tembawang* (old settlement that is no longer inhabited) or old fruit gardens. *Pedaasan Seriding* is considered important within the AoI. Fruit trees are respected by Dayak peoples, especially by Kayong people, so that according to their traditions, the trees are cut only after the traditional ceremonies are being held.

Religious or sacred sites or sites at which traditional ceremonies important to local or indigenous peoples take place

Sites belong to this category are found in Betenung and Sepakat Jaya Villages. In Betenung Village, there are Sandung Tinggi and Sandung Bedowen, while Belian Kikipan site is found in Sepakat Jaya Village. Belian Kikipan is located within the AoI, but outside the MU.

Burial grounds that are important to local or indigenous peoples

There are burial grounds in each village within AoI that are important to indigenous peoples. Four sub-tribes within AoI respect and acknowledge the importance of the burial grounds. Village burial grounds of Malay and Dayak peoples, which designated as HCV 6 area, include public burial ground and sacred graves.

Plant or animal resources with totemic values or used in traditional ceremonies

Tuba roots and yellow rice are used for *Nubak Adat* tradition of Malay peoples, especially within the AoI. Yellow rice is also used in ceremony of pilgrimage to the graves. Plant and animal are associated with Dayak peoples' culture, especially Kayong and Gerunggang peoples. In Betenung Village, plants are used for traditional ceremonies, i.e., tuba roots, *marau* (rattan), *yeyamut* (budget grass), bamboo, *combong* (grass), *sensabang* (red wood), *temiang* (bamboo), sugar cane, *tebu salah* (sugar cane), areca nut, *hehidup* (leaves of wood species), *rusi* (a type of shrub) and *segulang* (wood). These plant species are usually planted in the yard to be easily obtained.

Concerning animal with totemic values, *tingang* bird (hornbill) is considered to have these values, because the bird is believed to be a messenger from *Duate* (God). Public cemetery of Dayak Kayong, who respects their traditions, are also decorated with Flying Dragong statues. In addition, Dayak Kayong's *Dukon* has a taboo (*punti*) of eating certain animals such as hedgehog, monitor lizard, deer, bear, *Tebalang* fish, *Konjing*, catfish, *Temperas*, baung/*Tongek*, *Kemangas* and *Colic*. They are also not allowed to eat *Joreng* (Jengkol) and Gadung.
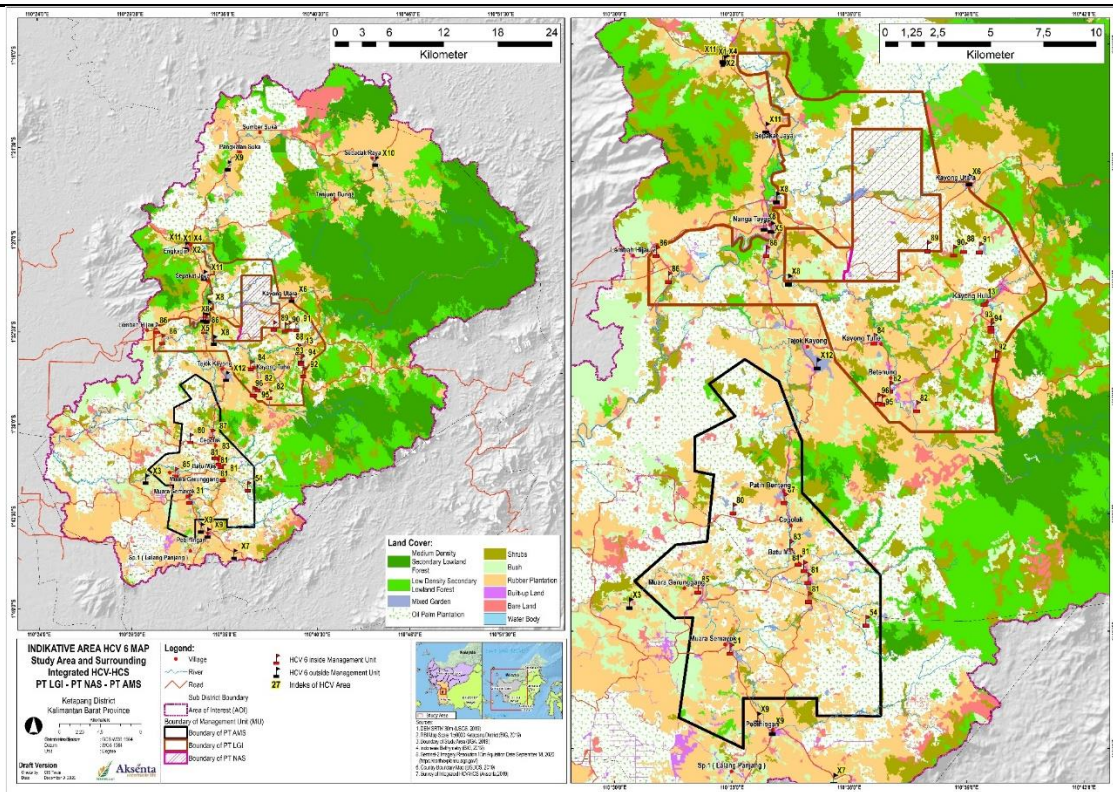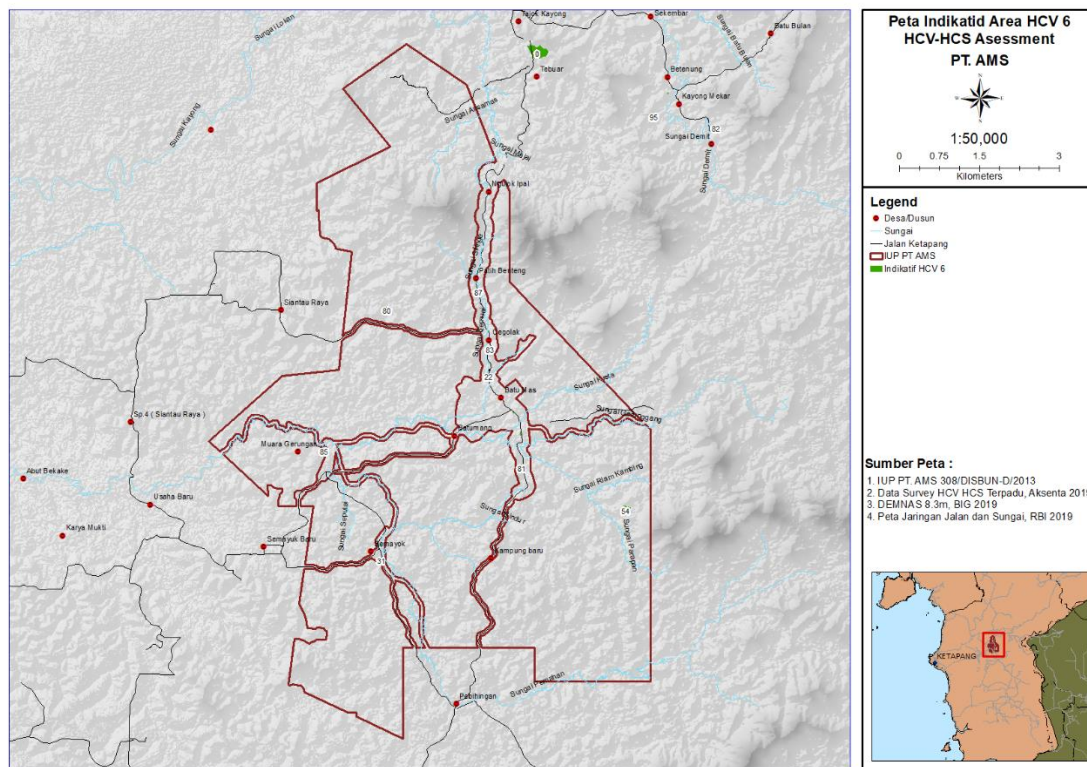
Figure 16. Map of HCV 6 Area in the AoI

Figure 17. Map of Indicative HCV 6 Area in the area of PT AMS

Community areas and sources of future livelihood

Based on participatory mapping that has been carried out, an overview of land use mapping by the community is obtained. Mixed rubber plantation is the primary land use, in addition to mixed fruit gardens and rice fields. In addition, the freshwater fisheries sub-sector is still carried out on a small scale. Along with the presence of plantation companies, the livelihoods of local communities are quite guaranteed by the presence of these economic activities.

Community lands for settlement are mostly located in Nanga Tayap, Pebihingan and Kayong Hulu Villages. To improve food security, the Central and Regional Governments assist farmer groups in developing rice fields. Community are engaged as land owners and managers. There are no technical irrigations in most of community rice fields, and therefore most of them can only be harvested once a year. Annual farming activities are still carried out traditionally using the slash-and-burn technique. Most of the former fields within the AoI are not cultivated and only serve as reserve land.

The availability of future sources of livelihood can be estimated based on the availability of rice as staple food. The national average per capita rice consumption in 2017 is 117.58 kg per capita per year. The production of milled dry grain from irrigated rice fields is then expected to be 5.08 tonnes per hectares while being harvested twice per year, assuming the grain is converted to rice by 64.02%. Total population in villages related to company concessions is 17,763, so that the total demand for rice is 2,089 tonnes or 3,262 tonnes of grain per year. Consequently, rice fields require larger area of more than 642 ha. Sources of community livelihood in the future is moderately secured with the presence of these community lands. However, in HCS Toolkit Module 2, it is stated that the total area to be allocated for the food security is 0.5 ha per person. With this indicative number, the total area to be allocated food security in MU-related villages is 8,881 ha. The reserve land covers only 9% of the total area of the MU-related villages.

Based on the calculation, the availability of land for sources of community livelihood in the future is quite secured. Local community can rely on food crop farming for their sources of livelihood, as well as alternative additional income from working in the local company (plantation or forestry) or from palm oil and rubber commodities.

Environmental Aspect: Method and Output

Environmental assessment method

Secondary data (Table 29) was collected since pre-assessment stage to final report preparation stage.

Table 29. Types of data and information collected and analysed on the environmental assessment field

Category	Types of data and information	Sources of data
HCV 1	- Map of forest area and conservation area - Sentinel-2 satellite image (dated 26 July 2019) - IUCN Red List - Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES") Appendices (valid as of 1 January 2017) - List of protected flora and fauna species - SKJB Bird Fieldguide - List of Bird Species in Indonesia - Fieldguide: Mammals of Borneo - Phillipps' Field Guide to the Mammals of Borneo and their ecology - Fieldguide Snake of Borneo - Pengenalan Jenis Tumbuhan Kalimantan - Kura-kura dan buaya Indonesia dan Papua Nugini - IBA; EBA; KBA Maps - Ramsar - Panduan Survei Sarang Orangutan	- MoEF (2014) - USGS (www.earthexplorer.usgs.gov) - IUCN (www.iucnredlist.org) - CITES (2017) - Minister of Environment and Forestry Regulation No. 106/2018 - MacKinnon et al., 2010 - Sukmantoro et al., 2006 - Payne et al., 2000 - Phillipps & Phillipps, 2016 - Stuebing & Inger, 1999 - Ferry Slik (asianplant.net) - Iskandar, 2000 - BirdLife International (www.birdlife.org) - Ramsar (www.ramsar.org) - Atmoko & Rifqi, 2012
HCV 2	- Map of conservation area - Sentinel-2 satellite image (dated 26 July 2019) - Intact Forest Landscape (IFL) map	- MoEF (2014) - USGS (www.earthexplorer.usgs.gov) - IFL (www.intactforests.org)
HCV 3	Sentinel-2 satellite image (dated 26 July 2019)	- USGS (www.earthexplorer.usgs.gov)

| | Land system map Map of Borneo ecoregion | - RePPProt, 1990 - Olson et al, 2001 (www.worldwildlife.org) | |
| Forest inventorying and carbon stock estimation | - HCS Approach Toolkit Version 2 - Monograph: Allometric Models for Estimating Tree Biomass at Various Forest Ecosystem Types in Indonesia - Sentinel-2A satellite image, dated 26 July 2019 - Guide to Use of Allometric Model for Estimating Forest Biomass and Carbon Stock in Indonesia | - HCSA Steering Group, 2017 - Krisnawati et al., 2012 USGS (www.earthexplorer.usgs.gov) - Regulation of Head of Forestry Research and Development Agency No. P.01/VIII-P3KR/2012 | |

Forest inventory and biomass carbon stock assessment

Botanical survey to identify dominant tree species and carbon stock assessment (forest inventory) is carried out in the same data collection process. Data is collected on the circle plot based on HCS Toolkit version 2. Circular plot design of 500 m² (r= 12.61 m; for DBH >15 cm) with sub-plot of 100 m² (r= 5.64 m; DBH 5-14.9 cm). Biomass variables of each plot and sub-plot (e.g., DBH, tree height, and vegetation species name) are measured.

Number of samples to measure biomass is set using experimental design method taking into account the Above Ground Biomass (AGB) carbon amount standard deviation variables in each land cover (*equation 1*). Standard deviation value is taken from various sources (Table 30). Number of required samples for land cover and carbon stock analysis of each land cover is set by taking into account data from desktop study (Table 18). Distribution of samples of land cover verification is carried out purposively.

$$N = \frac{t^2 \times s^2}{E^2}$$ (*equation 1*)

Note:

N = number of samples

t = t-value from Student t test table for 90% confidence interval

s = estimated standard deviation based on existing data sets of similar forest types

E = standard error as a percentage of the estimated mean value

Table 30. Carbon value reference

Land cover	Carbon average (ton-C/ha)	Standard Deviation (ton-C/ha)*	Reference
Medium density secondary lowland forest	177.82	31.66	Dharmawan *et al.* (2020)
Low density secondary lowland forest	103.59	52.79	Rochmayanto *et al.* (2014)
Thickets	30.25±3	14.4	Agus *et al.* (2013)

Table 31. Number of required samples for land cover and carbon stock surveys

Indication of initial land cover	t value	Standard Deviation (ton-C/ha)*	Variance (s2)	E*	Number of Literature Plots*	Number of Minimum Plots**	Number of Realization Plots**
Medium density secondary lowland forest	1.65	31.66	1002.4	17.782	9	38	42
Low-density secondary lowland forest	1.65	52.79	2786.8	10.359	71	56	72
Thickets	1.65	14.4	207.4	3.325	51	88	93
Total					130	182	207

*See table 31
**Minimum sample required in advice note

Vegetation inventory data is collected using combination of several sampling methods. The combined method is meant to improve data accuracy and make sure that plots are distributed in the entire area. Vegetation inventory plots are distributed purposively, on random and systematic bases. Random placing of plots is a more comprehensive and statistically robust

approach. As for systematic plot distribution, this is used to maximise the number of plots to measure. Random placing is used in relatively small size (polygons) areas and with difficult field conditions, while systematic placing is used in areas relatively big (polygons) using transect line with regular distance.

Biomass carbon calculation method

Biomass carbon calculation is carried out using fraction of carbon to biomass value of 0.47 (IPCC, 2006). Biomass is calculated using DBH and tree species data of stand inventory. DBH and tree species data are converted into biomass value through allometric equation, describing the relationship between biomass and tree's DBH as a calculated variable.

Allometric model to calculate biomass refers to the compilation of these models from various research in Indonesia, i.e., Guide to Use of Allometric Model for Estimating Forest Biomass and Carbon Stock in Indonesia (Regulation of Head of Forestry Research and Development Agency No. P.01/VIII-P3KR/2012) and is specific based on tree taxonomy described in the reference.

Statistical test

Statistical test is performed to identify the significant differences of carbon stock average in every land cover class. It consists of one-way analysis of variance (one-way ANOVA) and Scheffe test.

HCV 1 Survey: Wildlife and Plant

Field data collection focuses on inventorying high-level wildlife (for three groups: mammal, bird, and reptile) and plant species. Once the species inventorying data is collected, each species is given its conservation status based on IUCN Red List, endemic distribution, CITES, and national protection.

pecies presence is identified through the following: (i) direct encounter; (ii) sound; and (iii) footprint or mark they leave: footprint on soil, scratches on tree trunks, feces, nests, remains of body parts (e.g., outer skin, scales, feathers, loose hair, skull, horns, fangs, or other recognisable body parts); and (iv) verifiable information from interview. Other data include qualitative condition of natural vegetation land cover that includes vegetation structure (vegetation stand stratification), succession stages (primary, secondary, and climax), and vegetation stand quality (intact, relatively intact, slightly disturbed, disturbed, degraded, and severely degraded).

Field data is collected through survey method:

i) Observation in potential areas along transect, i.e., remaining natural vegetation cover which mostly located in the hills and riparian areas. Observation route is combined with plot placing where interesting object is found at the location, distance between observation plot is 150-200 m depending on field conditions. Some of the routes are existing footpath and others are new ones.

ii) Exploration is an opportunistic data collection, taking note the presence of all wildlife and plant species. The observation is carried out along the survey route, and field verification through land routes (plantation roads);

iii) Interview is conducted with local communities regarding information on the existence of important biodiversity species, the presence of remaining forests or shrubs, and interactions between communities in their use.

Plant inventorying data of biodiversity HCV team is complemented by inventorying data collected by the Forest Inventory team.

HCV 2 Assessment: Wide Natural Landscape

HCV 2 is identified through spatial analysis and field observation. The former is performed to identify the position of the Assessment area against the surrounding wide natural landscapes. The data is collected by preparing land cover map that contains information including IFL, conservation area, and potential habitats of wide-ranging species. The land cover data is then ground-truthed through visual observation method. Field observation is carried out to collect the following information:

(i) the presence of wide natural ecosystem landscape; (ii) level of anthropogenic activities in the natural landscape; (iii) level of connectivity between two or more areas that may potentially become part of the wide landscape or habitat to wide-ranging species; and (iv) the presence of natural ecosystems with small area but providing key functions to landscape such as connectivity and buffering. If any natural ecosystem in the AoI is found becoming part of the wide natural landscape, the area in question will be considered an HCV 2 area.

HCV 3 Assessment: Rare and Threatened Ecosystem

HCV 3 is identified through a combination between spatial analysis and field observation methods. Spatial analysis method is conducted through application of precautionary approach, referring to HCV Toolkit for Indonesia (Consortium for Revision of the HCV Toolkit for Indonesia, 2008). This approach is applied through: (i) mapping of ecosystem types in the entire AoI based on land system map and field observation; (ii) determination of threatened and/or rare ecosystem types; (iii) overlay of map of threatened and/or rare ecosystem type and map of the remaining natural vegetation produced from land cover interpretation combined with the forest inventory team's field observation and analysis. The final output of the analysis is naturally vegetated areas on threatened and/or rare ecosystems containing HCV 3.

Field activity output: Interview and field survey

Overall, environmental field survey is carried out in 147 observation spots for biodiversity survey, 161 spots for environmental service survey, and 207 forest inventorying plots. Number of survey spots include 13 villages within the MU (**Figure 18**). In addition to observation spots, biodiversity survey data is collected on 12 transects with lengths varying from 500 to 1.5 km spread over locations with natural vegetation cover such as secondary forest in the hills, including Sempawan Hill (2 transects), Riam Batu Forest (1), Lobang Macan Hill (1), Sengkuwayan Hill (1), hills of River Demit (1), Periuk Hill (1), Sulung Hill (1), Pebantan Hill (2), Tunjung Tamiang Hill (1), and Batu Bolah Hill (1).
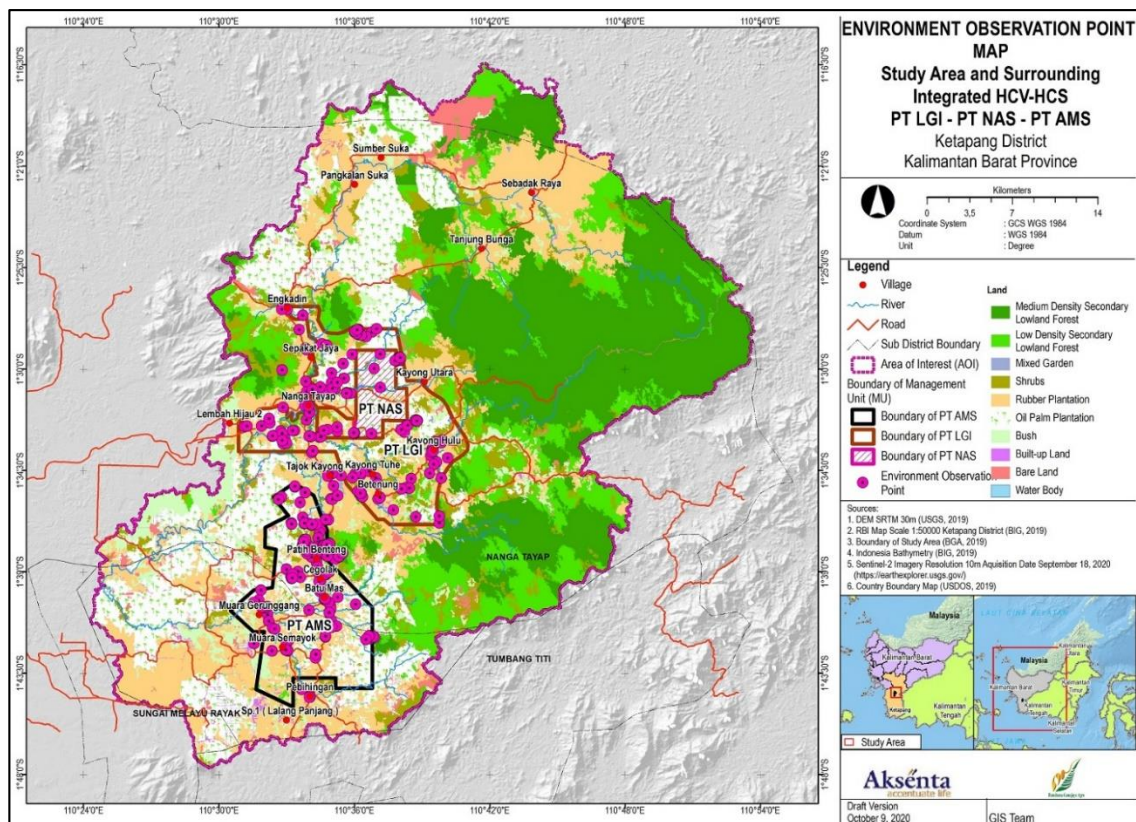

Figure 18. Map of environmental data collection locations distribution

Interview and discussion during full environmental Assessment are focused to gather information on landscape changes and the presence of RTE species. The informants are from the MU and local communities who have understanding on the Assessment area. The major output of the interview indicates that for more than 15 years, orangutans have not been found in the Assessment area. Other information includes the remaining degraded forest in the Assessment area, especially at the top and slope of hill. See **Table 32** for more detailed output.

Table 32. Summary of interview during field data collection

Expert/Organisation/ Social Group	Name	Type of Interaction	Concern and/or Recommendation
MU: GIS staff for nothern part of MU (LGI-NAS)	Sunli, Suryadi, Jumali, Ardi (all of them are male)	Interview and Discussion	• They have not seen any orangutan. Based on their information, the last time they met orangutan in the Assessment area was before the opening of oil palm plantation. • In the last decade, wildlife or animals have become increasingly rare because almost all species are hunted, whether for sale or consumption. Wildlife hunting is a common thing, almost all species are consumed by certain communities. In addition, this is also resulted from areas converted into plantations. • Common rice paddy snake and common striped snake are also rarely found. • The existing animals include long-tailed macaque (Macaca fascicularis) and southern pig-tailed macaque (Macaca nemestrina), as well as probably Bornean white-bearded gibbon (Hylobates albibarbis). • Crocodiles are found from River Kayong to Siantau Village. • No intact forests remain, only destructed forests are found at the top or on hills with steep slopes. • There are still quite a lot of fish, especially in big rivers, e.g., seluang fish (Rasbora), lanci, tinfoil barb (Barbonymus schwanenfeldii), beardless barb (Cyclocheilichthys apogon), waanders's hard-lipped barb (Osteochilus waandersii), malayan leaf fish (Pristolepis fasciata), climbing perch (Anabas testudineus), ghost catfish (Kryptopterus vitreolus), indian knife fish (Chitala chitala), large riverine catfish (Hemibagrus gracilis), baong kentang, baong baner, hampala barb (Hampala macrolepidota), and catfish (Clariidae) • There has been thickets clearing in the northeastern part of the MU for timber company roads
Mendauk community	Martin (M) & Yadi (M)	Interview	• No big animals found in Pancuran Hill and its surroundings. In the past, Bornean white-bearded gibbon's voices were heard frequently around the village, but they are rarely heard recently. Their voices can only be heard from the direction of protection forest hills to the north of the sub-village. • Few years ago, many pangolins were caught for sale, so that they are currently rare and difficult to find. No orangutans found in Pancuran Hill and its surroundings.
MU: GIS staff for southern part of MU (AMS)	Anton (M) & Dona (M)	Discussion	• Big animals are already rarely found, this is likely caused by reduced forest areas and intensive hunting. • Almost all animals are being hunted, particularly for consumption and sale. • Big animals still exist are deer, antelope, bear, clouded leopard. • To the south, their main habitats are in the hills of Sulung and the hills to the east and southeast. • Referring to previous HCV Assessment of conservation area, some forests and shrubs in the hills were not cleared during the opening of oil palm plantation. • In the southern area of the MU, on flat areas and at the feet of hills that are yet opened for palm oil, most ot the areas are mixed-rubber plantation and fruit plantation (particulary durian).

Gerunggang Village community members	Zainal (M) & Saifudin (M)	Interview	• Zainal has been living in River Gerunggang area since 25 years ago, and used to be a woodworker in PT Alas when the company was in its prime. Now there are no woods around the location, but fruit trees such as durian, satar, etc. • Zainal started rice farming on dry land around River Gerunggang a few years ago, but he has rice fields in other places which has been harvested several times. Every day, he safeguards the rice fields by taking turns with his cousin whose rice field is located adjacent to his. After being planted with rice for several seasons, they might be replaced by oil palm which seems more profittable. • Two months ago, there were hunters from outside the village taking Bornean white-bearded gibbon (Hylobates albibarbis) in thicket areas (outside the MU). Currently, everyone is prohibited from hunting this gibbon, because it almost does not damage plants, in contrast to pig and southern pig-tailed macaque that disturb rice plants. • Saifudin is building irrigation structures for rice field, in the southern part of the village. • Almost all areas that are yet to be converted into oil palm plantation are mixed rubber plantation.
Pateh Benteng Village community members	Imun (M), Fransiskus (M), & Dona's mother (F)	Interview	• Several old durian plantations in Pebantan Hill should not be cut down referring to customary rules. • River Longkom flows from this hill. • Large animals are rarely found, except deer and muntjac. • Unique durians (i..e., Doman) are found in Pebantan Hill, in addition to kemantan fruit (Mangifera torquenda), a typical fruit of Borneo. • There are shrubs and forests at the top of the hills in the eastern part of village settelement. Bears are also found there.
Betenung village officials	Hengky Turnado (M) & Herkulanus Komedi (M)	Discussion	• People still use plants, especially for traditional medicine. Some of them are whiteflower albizia's (Albizia saponaria) roots for soap with red sap, asam samping, reddish-yellow leaves, and red and broad leaves; bay leaf (Laurus nobilis) to soften meat, sweet bamboo (*Gigantochloa atter*), pumpkin peel for coolers such as refrigerators; blutur young leaves as vegetables; and saninten (*Castanopsis argentea*) for food as well as *kenajai* for making traditional gun toys' bullets. • Some of the best wood species to use are meranti, *nyatoh*, *lengkuham* (red meranti), *kempas* wood (red meranti), *mambon* (yellow meranti), *benuah*, *engkabang*, *bengkirai*, *penage* (white meranti), *meruwayan* (yellow meranti, sandy powder). • Large woods are already rare, the remaining can only be found in Sengkuwayan Hill. The hill is the meeting point of three villages, where nobody manage it because the area is steep and far from the village. Animals such as muntjac, bear, deer, mouse deer, pangolin, hedgehog, Bornean white-bearded gibbon, hornbill, and kangaroo. • Few months ago, we went there with the community members to put out the fire. This hill is also called a taboo land, which means it should not be damaged. There is *lintar* stone or lightning inscription (but we did not found it during the survey).
Nanga Tayap Village community members	Andri (M) & his mother (F)	Interview	• In River Kayong, crocodiles sometimes come to the surface. Crocodile with a long snout, i.e., false gharial (Tomistoma schlegelii), last appeared on a downstream area near Siantau Village. • Water often stagnates on the banks of the river, even inundating the oil palm planted by company. • In holiday, we usually do trawl fishing with family members. We found many catfish, as well as softshell turtles. Usually there are monkeys around the river banks.

Tajok Kayong Village community members	Senpri	Interview	• Increased hunting • Southern pig-tailed macaque, monkey • Wild pigs are extremely rare to find • Bornean white-bearded gibbons' voices are often heard from the direction of Sulung Hill and the adjacent hill
Plantation employees	Viktor, Timan, Erik & Doni (all M)	Interview	• Many people still hunt wildlife species. • Bornean white-bearded gibbon, southern pig-tailed macaque, and bear are found in Sempawan and Lempuding Hills. • Some community members already aware of hunting prohibition of protected animals/wildlife. • In Sempawan Hill, there are farming and logging activities. Trees to cut down are mostly meranti and ironwood.

Overall, as many as 562 biodiversity species are recorded including 117 wildlife species and 445 plant species (**Table 33** and **Table 34**). The output indicates that the presence of important-valued species includes RTE species, endemic, listed under CITES, and protected by Indonesian laws.

Table 33. Total biodiversity species in the Assessment area by group and status

Group	Total Species	Endemic	IUCN			CITES		Law
			CR	EN	VU	App I	App II	
Mammal	25	2	1	2	7	2	9	10
Bird	75	2	0	0	2	0	9	12
Reptile	17	0	0	0	3	1	7	1
Plant	445	11	9	3	19	0	1	0
Total	562	15	10	5	29	3	26	23

Note: IUCN Criteria: CR=Critically Endangered; EN=Endangered; VU=Vulnerable. CITES Criteria: Appendix I; Appendix II. Law= Protection based on Minister of Environment and Forestry Regulation No. 106/2018

Table 34. List of important species in the Assessment area

No.	Scientific Name	Indonesian Name	Status				Note
			Distribution	IUCN	CITES	Law	
Mammal							
1	*Macaca fascicularis*	Monyet ekor-panjang	<>	VU	II	-	Direct
2	*Macaca nemestrina*	Beruk	<	VU	II	-	Direct
3	*Trachypithecus cristatus*	Lutung kelabu	<	VU	II	+	Information
4	*Hylobates albibarbis*	Kelampiaw	E	EN	I	+	Direct
5	*Helarctos malayanus*	Beruang madu	<	VU	II	+	Footprint
6	*Aonyx cinereus*	Sero ambrang	<	VU	II	-	Information
7	*Neofelis diardi borneensis*	Macan dahan	E	EN	I	+	Information
8	*Prionailurus bengalensis*	Kucing kuwuk	<	LC	II	+	Direct
9	*Sus barbatus*	Babi janggut	<	VU	nl	-	Footprint
10	*Tragulus kanchil*	Pelanduk kancil	<	DD	nl	+	Information
11	*Tragulus napu*	Pelanduk napu	<	LC	nl	+	Information
12	*Rusa unicolor*	Rusa	<	VU	nl	+	Footprint
13	*Muntiacus muntjak*	Kijang	<	LC	nl	+	Direct
14	*Manis javanica*	Trenggiling	<>	CR	II	+	Information
15	*Ratufa affinis*	Jelarang bilalang	<	NT	II	-	Direct
16	*Ratufa bicolor*	Jelarang hitam	<	NT	II	-	Direct
Bird							
1	*Elanus caeruleus*	Elang tikus	<	LC	II	+	Direct
2	*Spilornis cheela*	Elang-ular	<	LC	II	+	Direct

3	*Nisaetus cirrhatus*	Elang brontok	<	LC	II	+	Direct	
4	*Ictinaetus malayensis*	Elang hitam	<	LC	II	+	Direct	
5	*Microhierax fringillarius*	Alap-alap capung	<	LC	II	+	Direct	
6	*Loriculus galgulus*	Serindit melayu	<	NT	II	+	Direct	
7	*Harpactes whiteheadi*	Luntur kalimantan	E	NT	nl	+	Direct	
8	*Buceros rhinoceros*	Rangkong badak	<	NT	II	+	Direct	
9	*Anthracoceros curvirostris*	Kangkareng perut-putih	<	LC	II	+	Direct	
10	*Anthracoceros malayanus*	Kangkareng hitam	<	VU	II	+	Direct	
11	*Megalaima rafflesii*	Takur tutut	<	NT	nl	+	Direct	
12	*Lonchura fuscans*	Bondol kalimantan	E	LC	nl	-	Direct	
13	*Acridotheres javanicus*	Kerak kerbau	<	VU	nl	-	Direct	
14	*Gracula religiosa*	Tiong emas	<	LC	nl	+	Direct	
Reptile								
1	*Tomistoma schlegelii*	Buaya sinyulong	<	VU	I	+	Information	
2	*Python reticulatus*	Ular sanca	<>	LC	II	-	Information	
3	*Python curtus*	Ular sawah	<	LC	II	-	Information	
4	*Varanus salvator*	Biawak	<>	LC	II	-	Direct	
5	*Naja sumatrana*	Ular sendok	<	LC	II	-	Information	
6	*Ophiophagus hannah*	Ular kobra	<	LC	II	-	Information	
7	*Amyda cartilaginea*	Labi-labi	<	VU	II	-	Information	
8	*Cuora amboinensis*	Kura katup	-	VU	II	-	Information	
Plant								
1	*Ryparosa kostermansii*	Berukun	E	NA	-	-	Direct	
2	*Combretocarpus rotundatus*	Perepat	<	VU	-	-	Direct	
3	*Dyera costulata*	Jelutung	<	VU	-	-	Direct	
4	*Kibatalia villosa*	Empangal	<	VU	-	-	Direct	
5	*Ellipanthus beccarii*	Baseluang	E	VU	-	-	Direct	
6	*Dillenia borneensis*	Simpur	E	VU	-	-	Direct	
7	*Anisoptera laevis*	Mersawa,kawang	<	VU	-	-	Direct	
8	*Dipterocarpus gracilis*	Pohon madu, sawang	<	VU	-	-	Direct	
9	*Hopea ferruginea*		<	CR	-	-	Direct	
10	*Shorea almon*	Meranti merah	<	CR	-	-	Direct	
11	*Shorea dasyphylla*	Meranti putih, sawang	<	EN	-	-	Direct	
12	*Shorea gibbosa*	Tengkuyung	<	CR	-	-	Direct	
13	*Shorea guiso*	Majau	<	VU	-	-	Direct	
14	*Shorea laevis*	Bangkirai, benua	<	VU	-	-	Direct	
15	*Shorea lamellata*	Pakit	<	CR	-	-	Direct	
16	*Shorea macrophylla*	Engkabang, kawang	E	LC	-	-	Direct	
17	*Shorea palembanica*	Majau, lengkuham	<	CR	-	-	Direct	
18	*Shorea pauciflora*	Lahung	<	EN	-	-	Direct	
19	*Shorea platycarpa*	Meranti	<	CR	-	-	Direct	
20	*Shorea rotundifolia*	-	E	CR	-	-	Direct	
21	*Shorea seminis*	Belebakan	<	CR	-	-	Direct	
22	*Shorea stenoptera*	Tengkawang	E	NT	-	-	Direct	
23	*Shorea teysmanniana*	Meranti bunga	<	EN	-	-	Direct	
24	*Sindora wallichii*	Sindur	<	VU	-	-	Direct	
25	*Cantylea corniculata*	Dedaru	<	VU	-	-	Direct	
26	*Eusideroxylon zwageri*	Ulin	<	VU	-	-	Direct	
27	*Durio acutifolius*	Durian burong, tingang	<	VU	-	-	Direct	
28	*Durio dulcis*	Kusik	E	VU	-	-	Direct	

29	*Durio kutejensis*	Pekawai oranye	E	VU	-	-	Direct
30	*Durio oxyleanus*	Keratongan	E	NA	-	-	Direct
31	*Artocarpus anisophyllus*	Mentawa	<	VU	-	-	Direct
32	*Knema latericia*	Kumpang arang	<	VU	-	-	Direct
33	*Baccaurea angulata*	Asam kelade	E	NA	-	-	Direct
34	*Baccaurea odoratissima*	Mata kelik	<	VU	-	-	Direct
35	*Aquilaria malacensis*	Gaharu, betenung	<	CR	II	-	Direct
36	*Gonystylus consanguineus*	Bedara	E	VU	-	-	Direct

Note: E: Endemic to Borneo; <: also distributed in the western part of the island; >: also distributed in the eastern part of the island.
CR: Critically Endangered; EN: Endangered; VU: Vulnerable; LC:Least Concern; NA: no data available; CITES= I: Appendix I; Appendix II. Appendix II; nl: not listed; Law: Minister of Environment and Forestry Regulation No. 106/2018;

HCS Classification and Carbon Assessment

a. Strata description

Table 35. Strata description of vegetation cover

HCS Land Cover Class	Land Cover Class		Description	Photo
Potential HCS Class				
High-Density Forest (HKT)	-		*Not found.*	-
Medium-Density Forest (HKS)	-		*Not found.*	-
Low-Density Forest (HKR)	Medium-density secondary lowland forest		Natural forest with closed to open canopy, varying from low to medium density forest. Inventory data indicates the presence of trees with diameter of >30 cm dominated by climax species.	
Young Regeneration Forest (HRM)	Low-density secondary lowland forest		Severely disturbed forest or otherwise forest areas that are in the regeneration process towards their original structure. The diameter distribution is dominated by trees with DBH of 10-30 cm and with pioneer species frequency lower than that of HK1.	
Non-HCS Class				

				Description	Image
Shrub (B)	Thicket			Lands that were once a forest that has been cleared not so long ago. Dominated by short shrubs with limited canopy cover. They include areas with tall grasses as well as distributed ferns and pioneer tree species.	
Agriculture (AGRI)	Rubber plantation			Homogeneous plantation planted with rubbers. To date, rubber plantations still cover most of PT LGI dan PT AMS areas. Old homogeneous rubber plantations are often found in the Assesment area and its surroundings.	
	Oil palm plantation			Homogeneous plantation planted with oil palm. PT LGI, PT AMS, and PT NAS are currently dominated by this plants. However, not all oil palms are owned by the MU companies. Another company used to operate in the MU (i.e., Benua Indah) handed over its plantation ownership to community members.	
Smallholder (SH)	Mixed garden			Areas planted with fruit trees, perrenial plants, and sap plants. The mixed gardens found are dominated by fruit trees, including durian, *kratungan*, *lahung*, *mentawa*, and *cempedak*. One of the mixed gardens is still maintained for its cultural heritage value.	

	Barren soil		Barren soils found take form of areas that previously were gold mining sites, and that designated to be cleared for farm.	
Barren soil (LT)	Bush		The bushes in the Assessment area are those potentially found in ex-farm and burned areas, dominated by *Imperata cylindrica*.	
Others	Road and settlement		-	
	Water body		Water bodies are found in the form of water body banks and lakes.	

b. Estimated area of vegetation stratification

Table 36. Classification of HCS area in the Assessment area

HCS Land Cover Class	Land Cover Class	Area (ha)	% of total Assessment area
Potential HCS Class			
High-Density Forest (HKT)	-	-	-
Medium-Density Forest (HKS)	-	-	-
Low-Density Forest (HKR)	Medium-density secondary lowland forest	85.79	0.32

Young Regeneration Forest (HRM)	Medium-density secondary lowland forest	1,105.25	4.10
Subtotal		**1,191.04**	**4.42**
Non-HCS Class			
Shrub (B)	Thicket	2,302.45	8.55
Plantation Area (AGRI)	Rubber plantation	9,182.71	34.09
	Oil palm plantation	11,265.95	41.82
Smallholder (SH)	Mixed garden	174.28	0.65
Barren soil	Barren soil/bush	2,271.87	8.43
Others	Road and settlement area	456.49	1.69
	Waterbody	92.63	0.34
Subtotal		**25,746.40**	**95.58**
Total		**26,937.44**	**100**

c. Vegetation stratification map
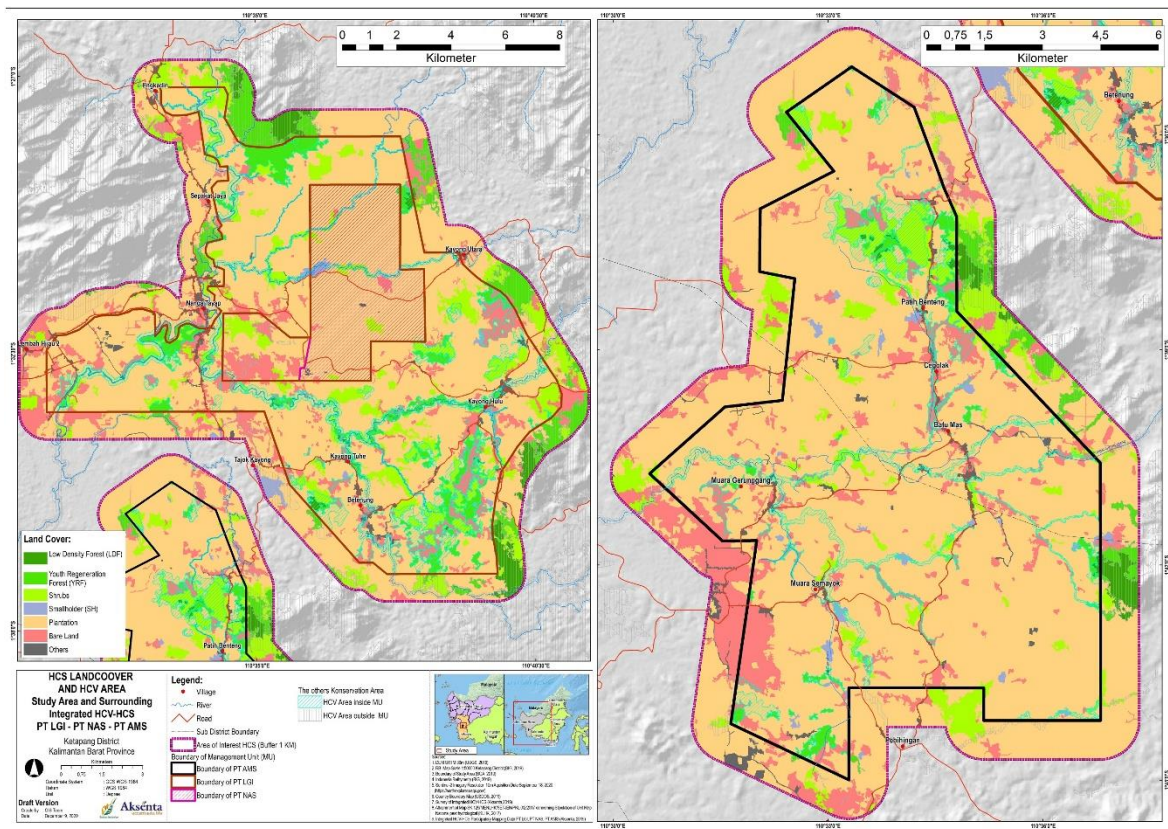
Figure 19. Map of stratification vegetation (HCS class) in assessment area

d. **Estimated carbon stock of vegetation stratification**

Table 37. Estimated carbon stock per land cover classification

HCS Land Cover Classification	Area (ha)	Number of Plot	Carbon stock average (Tonne-C/ha)	Standard error of the mean	Confidence limits (90%)		Total Carbon Stock (kilotonne-C)
					Lower	Upper	
HCS potential land cover class							

High-Density Forest (HKT)	-	-	-	-	-	-	-
Medium-Density Forest (HKS)	-	-	-	-	-	-	-
Low-Density Forest (HKR)	85.79	42	102.70	2.46	101.0	104.8	8.81
Young Regeneration Forest (HRM)	1,105.25	72	52.71	1.88	51.4	53.9	58.26
Non-HCS potential land cover class							
Shrub (B)	2,302.45	93	24.56	1.65	23.44	25.7	56.55
Plantation Area (AGRI)	20,448.67	-	-	-	-	-	-
Smallholder (SH)	174.28	-	-	-	-	-	-
Barren Soil (LT)	2,271.87	-	-	-	-	-	-
Others	549.12	-	-	-	-	-	-

e. Statistic analysis of carbon stock

Table 38. Anova test for HKR, HRM and B

Source	SS	df	MS	F	P-value	F_90%CL	Significance
Between Groups	177,343.2	2.0	88,671.6	311.5	2.19×10^{-70}	3.04	Significant
Error	46,439.6	204.0	227.6		-	-	-
Total	223,782.8	206.0	1,086.3				-

Table 395. Scheffe analysis for HKR, HRM and B

Variable	N	SS	Avg
HKR	42	33,918.78	102.70
HRM	72	9,458.47	52.71
B	93	3062.37	24.56
SSE		46,439.62	
MSE		227.65	
p		0.05	
k-1		3.00	
N		207.00	
F		3.04	
Pair Wise Difference (Absolute values)			
Type	HKR	HRM	B
HKR	-	49.98	78.14
HRM		-	28.15
B	-	-	-
Scheffe Comparison Values			
Type	HKR	HRM	B
HKR	-	7.22	6.92
HRM			5.84
B	-	-	-
Significant Differences			
Type	HKR	HRM	B
HKR	-	Significant	Significant
HRM		-	Significant
B	-	-	-

Anova test and scheffe analysis are conducted to find difference significance level between carbon stock value in each land cover class. These analyses are implemented on Low-Density Forest (HKR), Young Regeneration Forest (HRM) and Thicket (B) land cover classes at confidence level of 95% (α = 0.05). Carbon stock value in each class is considered significant if P value < α

in Anova test and average value gap between land covers (Absolute values) ≥ scheffe value. Anova output (**Table 38**) and Scheffe analysis (**Table 39**) show signficant differences in the three land cover classes.

HCV 1

The MU concessions are located in cultivation landscape. Most of MU concessions is combination of oil palm and rubber plantations. Other than both plantations, other cultivation land covers (farms, fruit garden, and rice fields) are also found. However, natural vegetation covers in the form of scattered fragments without good connectivity are also found in the MU concessions. Most of these natural vegetation covers are located on lands difficult to clear for cultivation, e.g., on hilltops and very steep slopes (Sempawan Hill, Sulung Hill, and Batu Belah Hill).

Based on field survey, the presence of important species which indicates HCV 1 important species, including Sunda pangolin (*Manis javanica*), white-bearded gibbon (*Hylobates albibarbis*), Bornean clouded leopard (*Neofelis diardi borneensis*), sun bear (*Helarctos malayanus*); and various types of shoreas (from Dipterocarpaceae family) in terrestrial habitat, as well as false gharial (*Tomistoma schlegelii*), Asiatic soft-shelled turtle (*Amyda cartilaginea*), and Asian small-clawed otter (*Aonyx cinereus*) in aquatic habitat.

Table 40. Indication of HCV 1 presence in the MU concessions and AoI

HCV 1	Finding
Concentrations of biodiversity including endemic species, and rare, threatened or endangered (RTE) species, that are significant at global, regional or national levels	Present: Population of RTE and/or endemic species, including Sunda pangolin, white-bearded gibbon, sun bear, false gharial, various types of shorea, Borneo champor, and Borneo ironwood. Potential: - Absent: -
Situation that qualify as HCV 1	**Indication in the Assessment area**
A high overall species richness, diversity or uniqueness	Absent. Most of the Assessment area is oil palm plantation. Actual condition shows only several locations are likely allow the presence of fairly good biodiversity, i.e., natural vegetation areas on tophills. However, almost all natural vegetation patches are not connected to natural vegetation outside the area.
Population of multiple endemic or RTE species	Present. RTE and endemic species include Bornean white-bearded gibbon, Bornean clouded leopard, and *Shorea rotundifolia*; endemic species include whitehead's trogon, dusky munia, and *Shorea macrophylla*; RTE species include Sunda pangolin, sun bear, and Borneo ironwood.
Great abundance of important population or endemic or RTE species	Absent. Endemic and/or RTE species are recorded in small population.
Small populations of individual endemic or RTE species, in case where the national, regional or global survival of that species is critically dependent on the area in question	Absent. Almost all RTE species in the Assessment area has significantly bigger population in other areas, particularly in conservation areas.
Sites with significant RTE species richness	Present. Secondary forest in Sempawan Hill (and Lempuding Hill) is a habitat for several RTE species from Dipterocarpaceae family.
Particularly important genetic variants, subspecies or varieties.	Absent. In the Assessment area, presence of endemic Bornean clouded leopard (*Neofelis diardi borneensis*) cubs population are recorded, but they have fairly wide distribution, covering Malaysian Borneo and Brunei Darussalam.

RTE species recorded in the Assessment area include 46 species, consisting of 10 species bearing Critically Endangered (CR) status (one fauna dan nine floras), five species having Endangered (EN) status (two faunas and three floras), and 31 have Vulnerable (VU) status (12 fauna dan 19 flora). Wildlife species with CR status is Sunda pangolin (*Manis javanica*). Plant species with CR status include agarwood (*Aquilaria malacensis*), bengkiray (*Hopea ferruginea*), red shorea (*Shorea almon*), and shorea (*S. platycarpa*). Furthermore, wildlife species with ED status include Bornean white-bearded gibbon (*Hylobates albibarbis*) and Bornean clouded leopard (*Neofelis diardi borneensis*). Three plant species with ED status are white shorea (*Shorea dasyphylla*), red lauan (*S. pauciflora*), and *meranti bunga* (*S. teysmanniana*). These species with high conservation category are found in the remaining forest habitat.

Based on field data, 16 endemic species are recorded, consisting of two mammals, two bird, and 12 plant species. Endemic mammal species include Bornean white-bearded gibbon (*Hylobates albibarbis*) and Bornean clouded leopard sub-species

(*Neofelis diardi borneensis*). Endemic birds include whitehead's trogon (*Harpactes whiteheadi*) and dusky munia (*Lonchura fuscans*).

Total protected species in the Assessment area are 23 species, consisting of 10 mammals, 12 bird, and one reptile species. No plant species with protected status are found in the Assessment area.

Based on the presence of species with RTE, endemic, or other important status in the Assessment area, HCV 1 has been declared as present. HCV 1 area in the Assessment area include several natural vegetation covers, i.e., secondary forest and river as habitat to important species (**Figure 20-21**). Secondary forest natural vegetation covers usually constitute small fragments distributed on hilltop and slopes of hills in MU. Several HCV 1 fragments are small but usually connected to HCV areas outside the MU. Therefore, HCV status are still given to the small areas. However, some fragments of vegetation cover of secondary forest are too small and not connected to HCV area, and the fragment is not considered as HCV. HCV areas are designed to provide green corridor as connectivity between habitats. Potential corridor in the MU includes river and non-forest land cover which connect between two forest fragments with HCV values. Thickets connecting the HCV forest fragments with a quite large HCV area outside the Assessment area is proposed as an HCV Management Area (**"HCVMA"**), such as thickets between ID 49 and 18 connected to ID 51, as well as thickets connecting ID 15, 38, 61, and 63 with a quite large forest cover to the east and southeast of the MU. Meanwhile, other thickets are not considered as HCVMA because they do not have components that meet HCV criteria and do not connect several fragments of HCV with forest areas outside the MU.
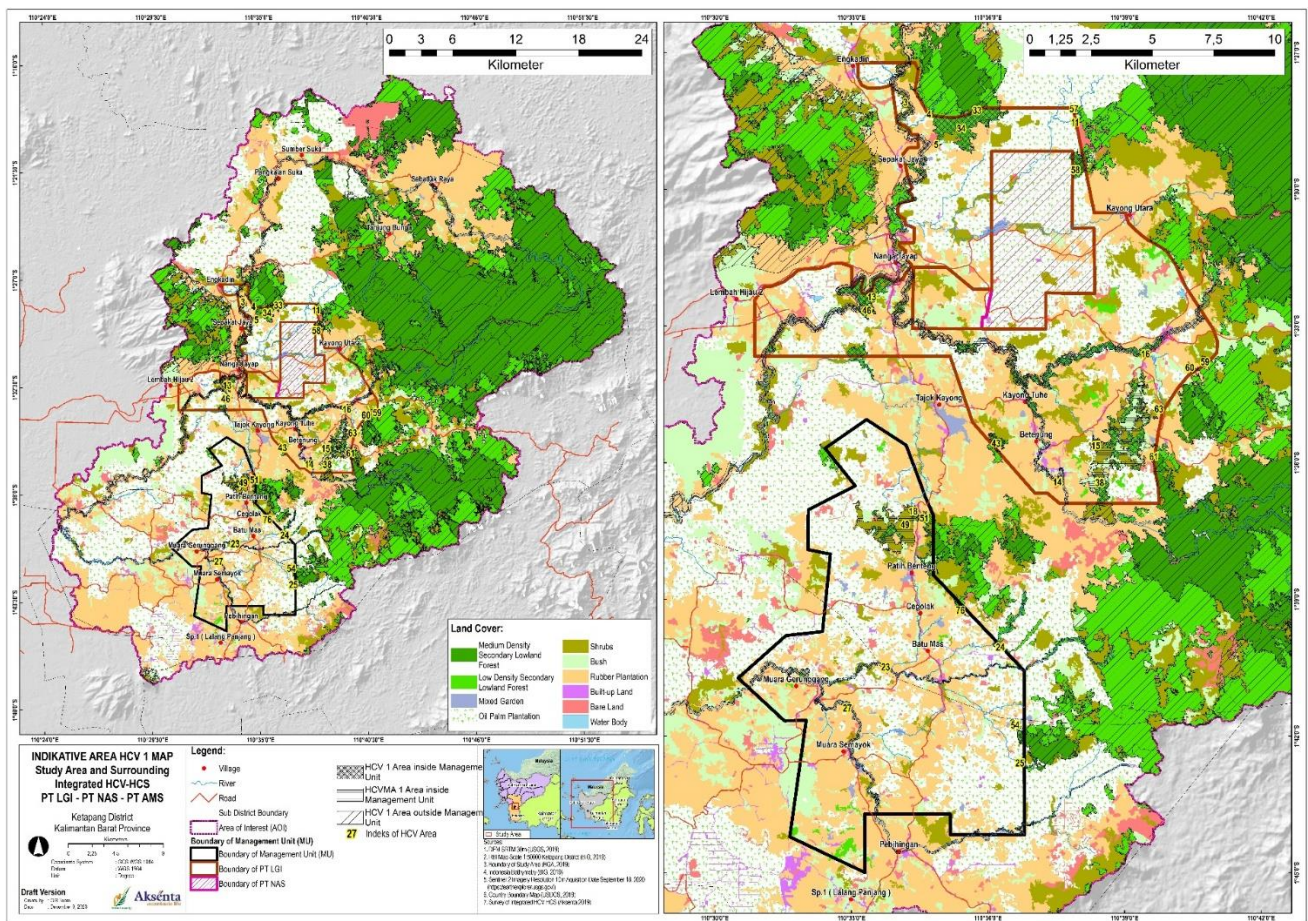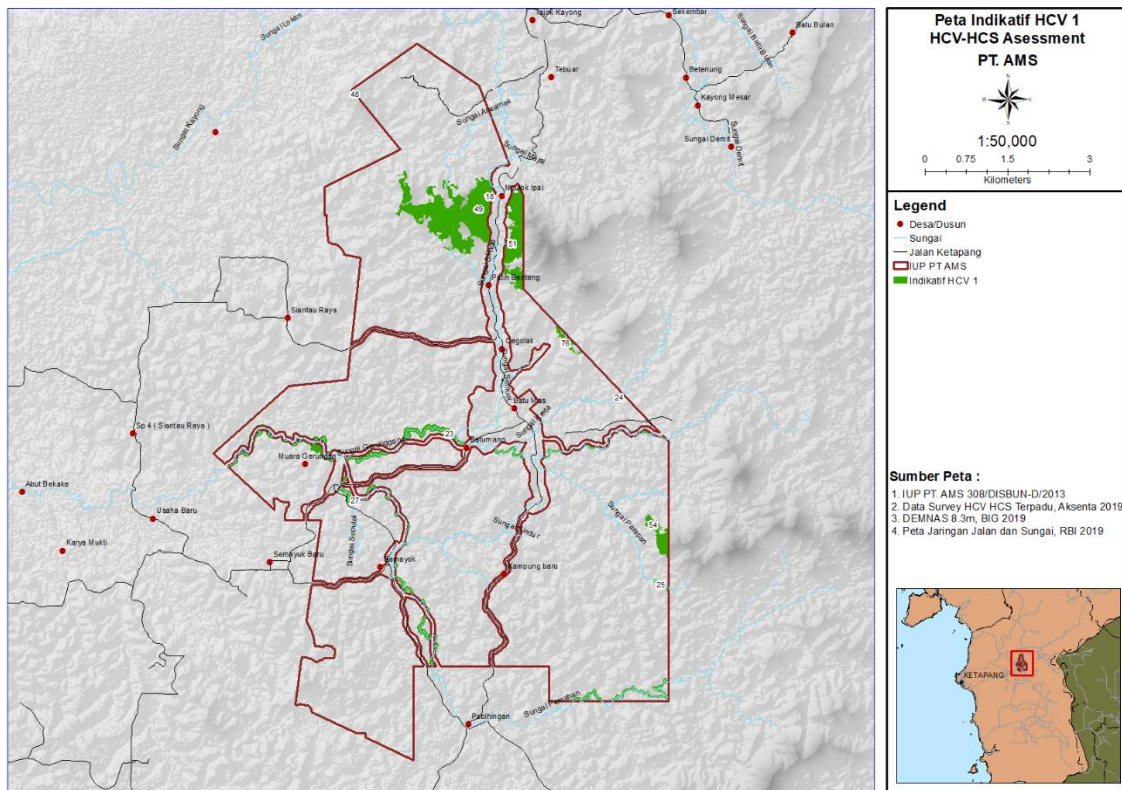

Figure 20. Map of HCV 1 Area in the AoI

Figure 21. Map of Indicative HCV 1 Area in PT AMS

HCV 2

The assessment shows that no situations that qualify as HCV 2 are found (**Table 41**).

Table 41. Indication of HCV 2 presence in MU concessions and AoI

HCV 2	Finding
Large landscape-level ecosystems and ecosystem mosaics that are significant at global, regional or national levels, and that contain viable populations of the great majority of the naturally occurring species in natural patterns of distribution and abundance.	Present: - Potential: - Absent: No intact forest landscapes are found around the Assessment area. Protection, production and limited production forests are found within the AoI. Timber extraction occurred in these forests and several parts of them were converted into industrial plantation forest. Therefore, they are not considered as intact forest areas. Moreover, two highways (known as Trans- Kalimantan Road) are also found in the AoI.
Situation that qualify as HCV 2	**Indication in assessment area**
Large areas (e.g., > 50,000 ha), that are relatively far from human settlement, road or other access.	Absent. Some parts of the Assessment are cultivation lands surrounded by settlements, other developed areas, and highways. There are fairly large protection forests in the AoI.
Smaller areas that provide key landscape functions such as connectivity and buffering	Absent. No intact natural landscapes having connectivity.
Large areas that are more natural and intact than most other such areas	Absent. No areas that are more natural or intact than the surrounding areas. The remaining secondary forests in the MU are small and have fairly good access. Therefore, they

		are easy to be encroached. Logging activities are found with medium intensity.	

Actual condition shows that the Assessment areas mostly are cultivation lands dominated by rubber and oil palm plantations. The MU concessions are located outside and far from Intact Forest Landscape (**"IFL"**), at least for the past 20 periods. Currently, the nearest IFL is 81 km away to the northeast of the MU concessions. The MU and the nearest IFL fragment are separated by various land covers and land uses taking form of cultivation lands, both rubber and oil palm plantations. Both plantations have significantly wide areas. This results in no ecological connectivity between the Assessment area and IFL. Furthermore, there are two Trans-Kalimantan highways passing through the AoI.

HCV 3

The assessment for defining ecosystem type and field verification referring to land system map (RePPProt, 1990) indicate that there are two threatened ecosystem types: mixed dipterocarp forests on sedimentary and on metamorphic rocks. Based on map interpretation and field observation in the Assessment area, natural vegetation covers are still found in the form of secondary forest (or low-density dryland forest in HCS forest class).

Mixed dipterocarp forest ecosystem on metamorphic rocks is the type of ecosystem dominating MU and wider landscapes. Actual condition shows that in several parts, particularly in hills, natural vegetation covers are still found in this type of ecosystem, such as in low-density secondary forests in Sempawan and Riam Batu Hills. Another type of ecosystem is mixed dipterocarp forest ecosystem on sedimentary rock. In the MU concessions, the existing natural vegetation cover is in the form of low-density secondary forest, e.g., on the top of Sulung Hill.

Analysis using precautionary approach (HCV Toolkit Indonesia, 2008) shows that the presence of the remaining natural vegetation covers in threatened ecosystem type and mixed dipterocarp forests on metamorphic and sedimentary rocks, meet the indication for HCV 3 (Table 42). Areas identified as HCV 3 in the MU and wider landscape are found in two ecosystem types. First, mixed dipterocarp forests ecosystem on metamorphic rocks, found in several natural vegetation fragments (secondary forests) on hills, e.g., Sempawan, Pebantan, and Batu Belah Hills. Second, mixed dipterocarp forest ecosystem on sedimentary rocks, found in secondary forest, e.g., Sulung Hill and hills of River Demit. See **Figure 22-23** for distribution of HCV 3 areas.

Table 42. Identification of HCV 3 in mixed dipterocarp forest ecosystems on metamorphic rocks in the AoI using precautionary approach

Question	Answer	Directive	Criteria
3.1 Are there one or more ecosystems categorised as endangered or rare in Table 8.3.1 or 8.3.2, located (i) in the MU concessions, or (ii) outside the MU concessions but potentially will be affected by the MU use plan?	Yes	HCV 3 are potentially present in or around assessment area; continue to 3.2	Mixed dipterocarp ecosystems on metamorphic rocks in Bulit Pandan (BPD), Honja (HJA), Pakulanai (PLN), Rangkanau (RGK), and Telawi (TWI) land systems
	No	-	-
3.2 Do the ecosystems contain vegetation on peatland?	Yes	-	-
	No	Continue to 3.4	Non-organic mineral soil layer
3.4 Have the ecosystems experienced drastic land cover change and met the criteria of 'non-productive land' based on Ministry of Forestry Decree No. 21/Kpts-II/2001	Yes	-	-
	No	HCV 3 are located in the MU concessions and wider landscape	Number of woody natural vegetation biomass is more than 5 m³/ha (see *Forest Inventory*). Several natural vegetation fragments in the MU concessions (low density secondary forest) &

			in wider landscape (medium and low secondary forests). In addition, thicket areas connected to wide secondary forest blocks outside the MU concessions are considered HCV areas

Table 43. Identification of HCV 3 in mixed dipterocarp forests ecosystems on sedimentary rocks in the AoI using precautionary approach

| Question	Answer	Directive	Criteria
3.1 Are one or more ecosystems categorised as endangered or rare in Table 8.3.1 or 8.3.2 located (i) in the MU concessions or (ii) outside the MU concessions but potentially will be affected by the MU use plan?	Yes	HCV 3 is potentially present in or around the Assessment area; continue to 3.2	Mixed dipterocarp ecosystems on sedimentary rocks in Bawin (BWN), Lohai (LHI), and Maput (MPT) land systems
	No	-	-
3.2 Do the ecosystems contain vegetation on peatland?	Yes	-	-
	No	Continue to 3.4	Non-organic mineral soil layer
3.4 Have the ecosystems experienced drastic land cover change, thus met the criteria of 'non-productive land' based on Ministry of Forestry Decree No. 21/Kpts-II/2001	Yes	-	-
	No	HCV 3 are located in the MU concessions and wider landscape	Number of woody natural vegetation biomass is more than 5 m^3/ha (see *Forest Inventory*).). Several natural vegetation fragments in the MU concessions (low density secondary forest) & in wider landscape (medium and low-density secondary forests). In addition, thicket areas connected to wide secondary forest blocks outside MU concessions are considered HCV areas
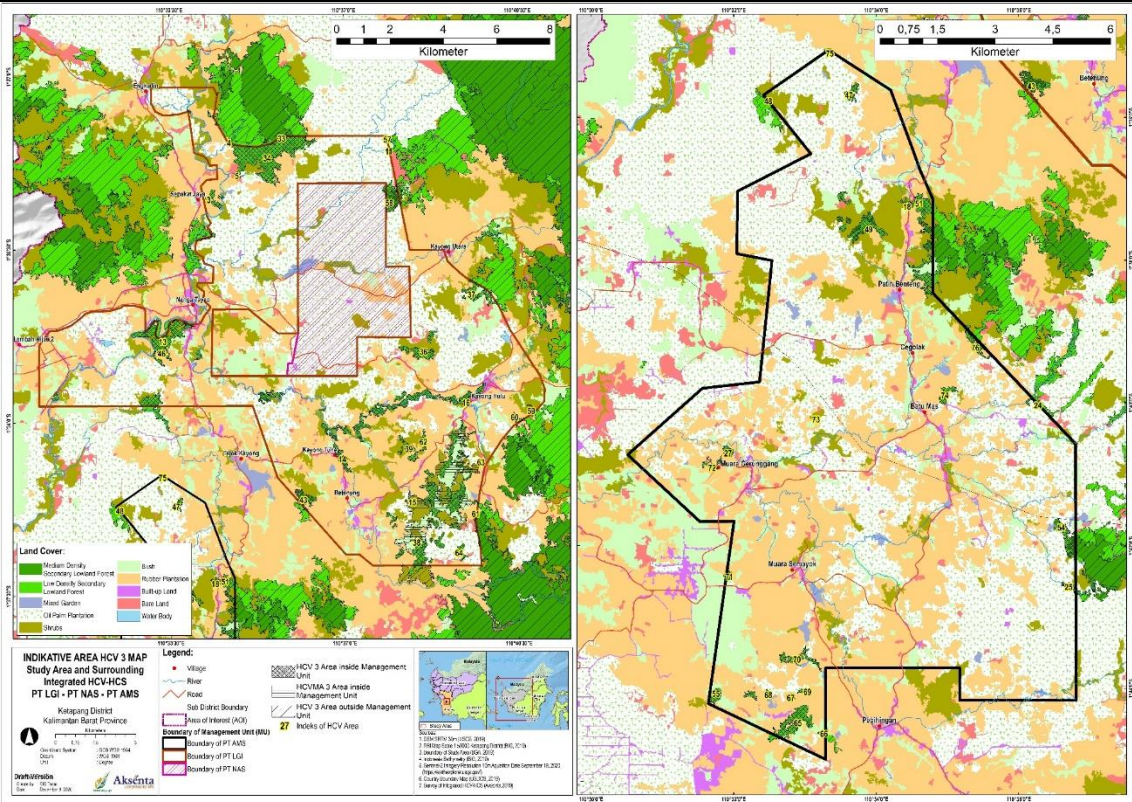
Figure 22. Map of HCV 3 in the AoI
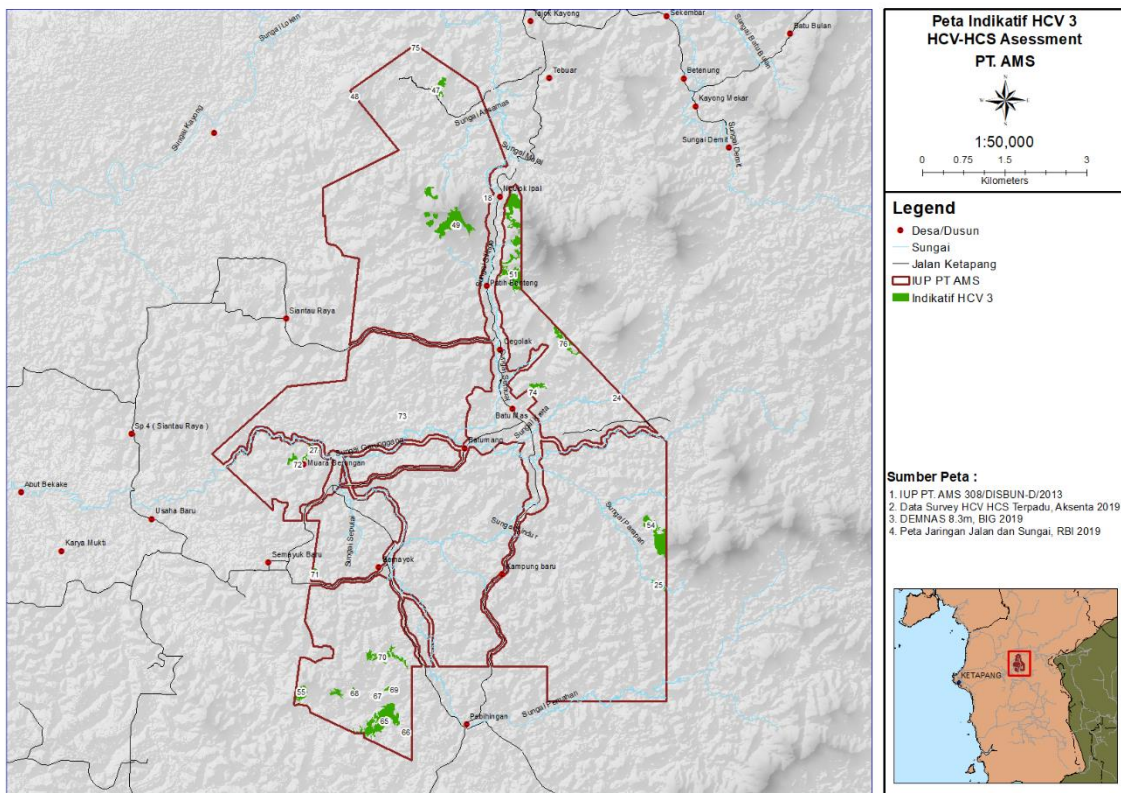
Figure 23. Map of Indicative HCV 3 in PT AMS

Peat

There are three sources of information to find the presence of peatland in AoI area; map of soil and land unit (Puslitanak, 1989), map of land system (RePPProt, 1990), and map of peatland published by BBSDLP in 2011 (Ritung *et al.*, 2011).

1. Based on map of soil and land unit, soil type in the AoI is mineral soil. Based on USDA classification, the existing soil types belong to Oxisols, Ultisols and Inceptisols orders. Peatland belongs to Histosol order. This shows that no peatlands are found in the AoI.

2. Based on land system map, there are nine land system types in the AoI, i.e., Bawin (BWN), Bukit Pandan (BPD), Honja (HJA), Lohai (LHI), Maput (MPT), Pakalunai (PLN), Rangankau (RGK), Sebangau (SBG), and Telawi (TWI). All of these land systems does not contain peat rocks or minerals. The land systems' lithology consists of granite, andesite, sandstone and old alluvium rocks. Land system types indicating the presence of peatland are GBT, MDW, KHY, and BRH. This indicates that no peatlands are found in the AoI.

3. Based on map of peatland published by BBSDLP, there are no peatlands around the AoI. The nearest peatland is approximately 22-23 km away to the west of the MU concessions. A Peatland is around 4.3 km closer to the estuary of River Kayong. The peatland is located near the estuary of River Pawan. The Government has designated the peatland as Rivers Pawan-Tolak Peatland Hydrological Unit (**"PHU"**) and Rivers Pawan-Kepulu PHU.

Based on the above information, there are no peatlands in the Assessment area.

Patch Analysis

Proposed conservation areas in the MU concessions include HCV and HCS areas. HCV area types found in the MU concessions include HCV 1, 3, 4, 5, and 6. However, no peat areas present in the MU concessions. Riparian areas identified as HCV areas, meet HCV 1, 4, and 5 criteria. Conservation areas that constitute forest-covered areas are identified as HCV 1 and 3. Forest hill areas are identified as HCV 1, 3, and 4. A forested hill area is also defined as HCV 5. Mixed garden areas with sacred value is also defined as HCV 6. Total HCV areas is 4,514.38 ha. In addition, there are community lands of 535.47 ha.

Patch Analysis Decision Tree (PADT) is implemented on 88 forest patches with potential HCS value. These forest patches are located in land cover classes of medium density secondary lowland forest and low-density secondary lowland forest. Total area of the forest patches is 1,186.84 ha. The largest patch (patch ID L1) of 228.27 ha is the only High Priority Patch. Nine forest patches meet the Medium Priority Patch category. The other 78 patches are categorised as Low Priority Patch.

Almost all the analysis phases implemented conclude that patch analysis phases relevant to forested areas' condition in the Assessment area are Phases 1, 2, 3, 4, 5, 7, 8, 11, and 12. Separation process of Medium Priority Patch (**"MPP"**) and Low Priority Patch (**"LPP"**) in Phase 6 are not conducted since all MPP and LPP have been designated as indicative conservation area since they are connected to HCV areas. Therefore, three MPP patches and 76 LPP patches are designated as High Priority Patches. Pre-RBA and RBA (Rapid Biodiversity Assessment) processes in stage 9 and 10 were not carried out as well, since no other MPP is found within the Assessment area. In addition, all forested areas have been field-visited in HCV area assessment process. "Give and Take" activity in Phase 13 is not carried out since there is no other HCS area outside the HCV area. Therefore, give and take process cannot be carried out. The integration of conservation area and landuse resulting in the identification of conservation area of 4,514.38 ha with potential development area of 21,887.59 ha. See **Figure 24** for map of integration of conservation area.

Table 44. Integration of conservation area and potential development area

No	Description	Area (ha)*
1	Assessment area	26,937.44
2	HCV Areas (1-6)	4,514.38
3	HCS Conservation Area*	1,186.84
4	Peatland	0
	Subtotal of conservation area	4,514.38
5	Community land	535.47
6	Potential development area	21,887.59
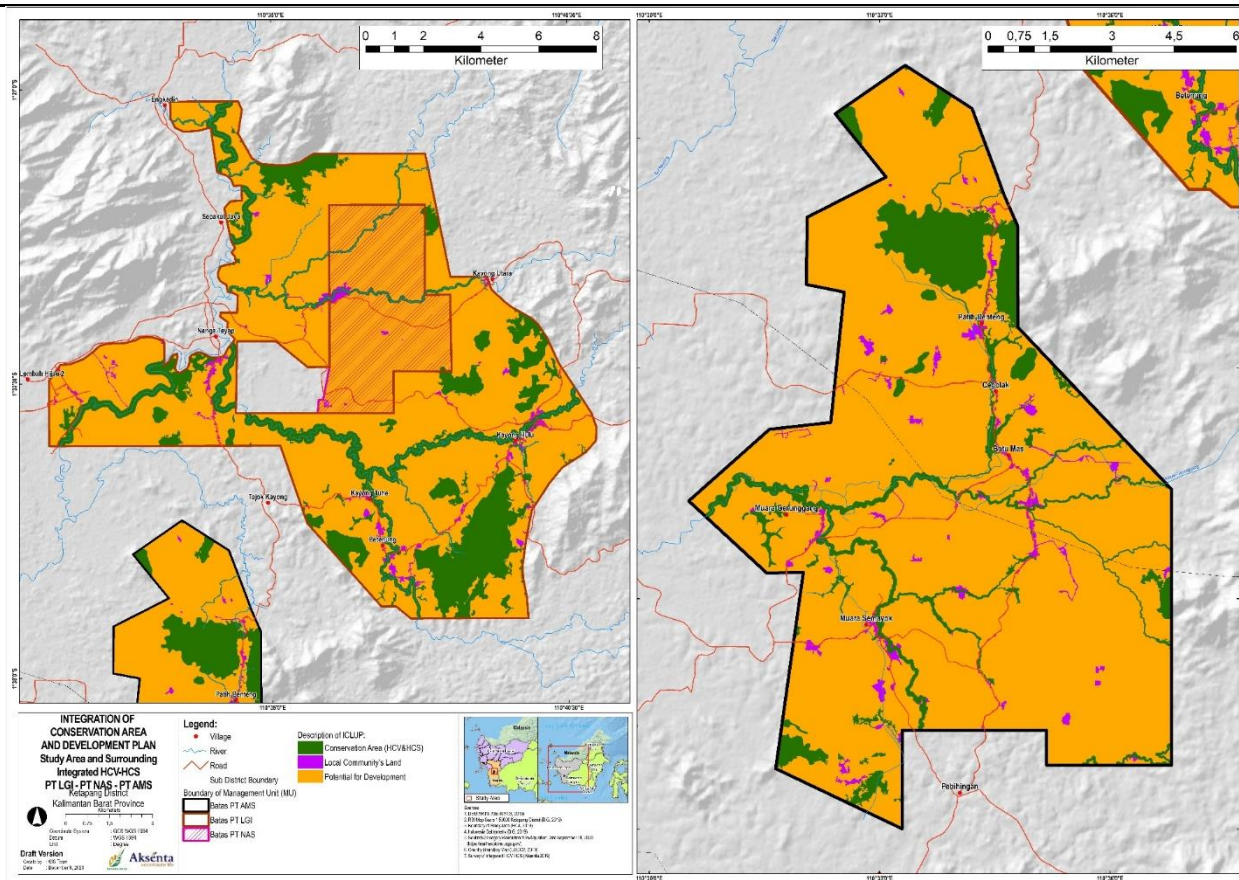
Figure 24. Map of integration of conservation area and potential development area in the MU concessions

Conclusion on the HCV Indicative of PT Agro Manunggal Sawitndo

Within the scope of the PT AMS Plantation Business Permit, the identified HCV area is 1,120.88. This conservation area is an integrated HCV-HCS.

Table 45. Land Cover Classification on the Indicative HCV-HCS Area of PT AMS

Land Cover	Area (ha)
Secondary Forest	220.33
Agroforestry	13.89
Built-up Area	1.54
Bare land	6.72
Rubber Plantation	216.08
Oil Palm	184.33
Bushes	44.79
Shrubs	433.20
Total	**1,120.88**
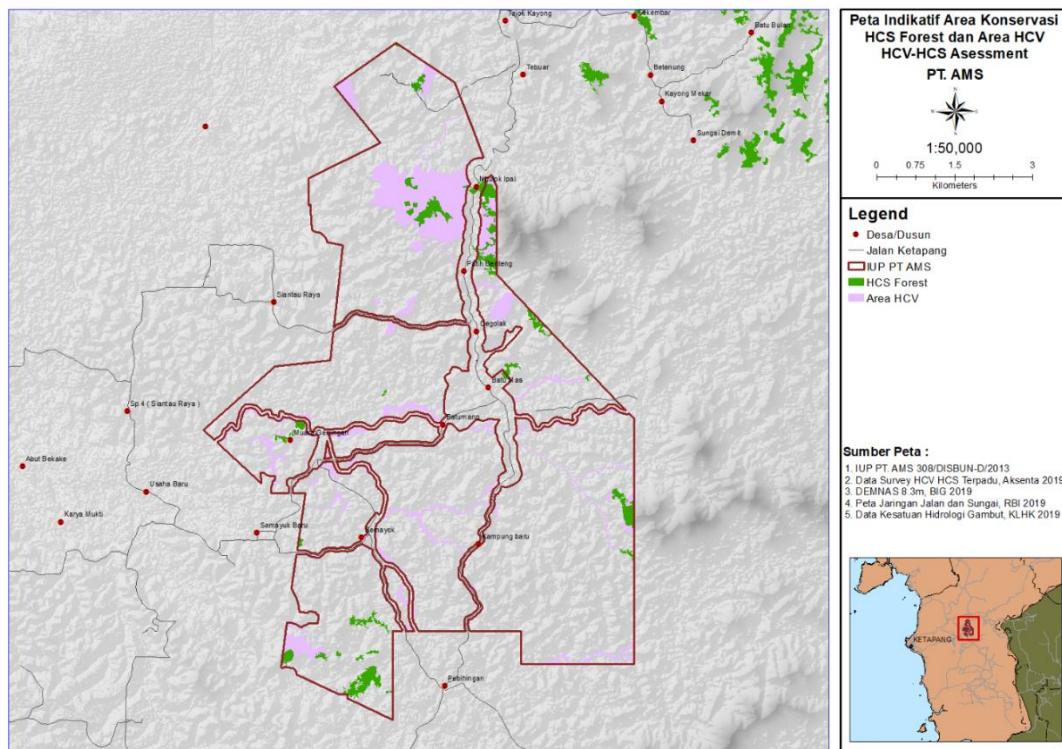
Figure 25. Map of Indicative HCV-HCS Area in PT AMS

Signature	![signature]
Name	Idung Risdiyanto
Position	Team Leader of Integrated HCV-HCS Assessment

Section 5: FPIC

In FPIC Activities, the company uses several methodologies as follows:

- Document Review;

- Interviews;

- Participatory Mapping;

- FGDs and Field Visits.

For the first step, the company formed a Survey Team, this team consisted of company staff who handled social management, conflict management, agronomy, GIS, environmental planning, and other related divisions. In FPIC activities and other socialization activities, the company's survey team will be assisted by the Satlak Team (public relation team) was formed by the village government, whose function is to become a liaison between the company and the local community/community.

Document Review/ Desk Study

Document review activities include:

- Identification of villages, hamlets that will be affected by the company's operations, as well as the existence of customary community rights.

- Preparation of materials and methods of socialization to the community

- Overview of community development/ CSR program planning

- Study of local tenure system and mapping of local tenure systems

- Procedures for implementing participatory mapping

Participatory Mapping

Participatory mapping was carried out in each village, followed by searching for information from participatory mapping through interviews and field visits.

Participatory mapping was carried out jointly by the Company's Survey Team, local communities, and Satlak Team, ensuring that the representatives of the subject of tenure rights were met. Participatory mapping is expected to cover:

- Indicative boundaries of villages/hamlets/villages within the company's concession;

- Areas of designation and use by the community (gardens, rice fields, fields, non-timber forest product areas, cultural sites, sacred areas, village forest areas/other customary rights, land reserves, springs, and settlements; and

- Main access locations along with supporting infrastructure

So that the description of the land category in the location of the company's permit will be obtained.

Participatory mapping was carried out in the six villages that were the assessment areas.

Focus Group Discussion

The socialization and FGD were carried out by considering the following:

- Adjustment of the language and media used to the conditions of society and the community

- Information on personnel who will be responsible for community complaints and aspirations

- Explanation of the company's objectives and operational areas. Location and purpose of allocation of conservation areas/other protected areas within the company area, if any

- Procedures for handling conflicts and complaints

- Availability of time to think/consider options for the community

- Freedom to obtain information/assistance from other parties, and free from any form of intimidation, especially in processes that require negotiation, building agreements, deliberation to reach consensus and decision making.

Based on the existing recordings, the socialization related to the operations of PT AMS was carried out in in Nanga Tayap Sub-district office, which was held on July, 18th 2012 by representatives management of PT AMS and attended by TP3K Ketapang, Taskforce Team Sub-district of Nanga Tayap (Muspika, Head of Unit Pelayanan Terpadu Desa, Head of Majejlis Adat Budaya Melayu, and Head ofo Dewan Adat Dayak), Head of Nanga Tayap Sub-distrct, Pemahan Sub-district, Head of Village(s), Head of Badan Pemberdayaan Desa, Head of Hamlet(s), and community representatives from: Tajok Kayong, Cegolak, Pateh Benteng, Batu Mas, Muara Gerunggang, Pebihingan, and Semayok Lama. . The material presented includes plans for oil palm plantation development, partnership plantation patterns and technical requirements and land legality that can be built for plantations as well as support and agreement on the value of GRTT compensation.

Through the company's PR officer, PT AMS has also prepared participatory maps of land ownership and boundaries in certain villages. Participatory mapping with communities aims to look at Customary Land, land rights, land boundaries, and land use patterns. At the time of land release, the Company collaborated with the Satlak Desa Team for the processes of measuring, measuring and leveraging the land. From this process, community spatial data is generated in the form of maps, which will then become the basis for land compensation (GRTT).

As for now, PT AMS has obtained a land area of 4,647.55 ha of GRTT, with 3,466 persils (landowner) spread over 7 villages. Of these, 3,740 ha have obtained HGU certificates based on the Decree of the Head of BPN No 89/HGU/KEM-ATR/BPN/2017 dated 21 August 2017.

The area that has been planted up to June 2022 is 3,589.82 ha.

To support the company's operations, PT AMS has recruited workers for several types of work, with more than 90% workers are come from the local community. The number of workers until June 2022 was recorded at 483 people, all of them are permanent workers.

Section 6: Soil and topography

This soil type mapping survey activity was carried out by an internal team from Bumitama (parent company of PT AMS), consisting of surveyors and GIS experts, as follows:

Table 46. Assessment Team

No.	Name	Expertise
1.	Husri Batubara	Team Leader, Research Dept.
		Surveyor, Soil Survey, Morphological Identification and Soil Classification
2.	Ardian S. Tambunan	Team Member, Research Dept.
		Surveyor
3.	Aldi	Team Member, GIS Dept.,
		Map Delineation

This activity was carried out in April - May 2022, which is divided into three stages, namely:

i.   Preparation; implemented in early April 2022

ii. Field survey; This activity is divided into two parts, namely; inhouse training for the GIS team and PT AMS on land survey procedures; and Survey implementation. The field survey was carried out in mid-April 2022.

iii. Analysis and preparation of reports; analysis of the results of the survey and documenting it in a report on the results of activities accompanied by maps related to land. Held in the first week of May 2022

Methodology

Land survey and mapping activities in PT AMS area uses SNI 8473:2018 on semi-detailed soil surveys and mapping at a scale of 1:50,000 as a guideline. Of all the stages and methods in the guideline, there are several sections that are adapted to the objectives of this activity. For example, regarding the interpretation of landforms using existing previous data, namely maps of land systems at a scale of 1:250,000. Soil type data also follows the soil type approach in the surrounding area that has been carried out in previous surveys.

Supporting materials and data include:

- Indonesian Geospatial Information Agency (BIG) digital base map of 1:50,000 scale published by the Geospatial Information Agency (BIG);
- 30 m resolution digital elevation model (DEM) maps from SRTM, topographic digital contour maps, or from other sources;
- Landsat remote sensing/satellite image;

- Digital geological maps with a scale of 1:100,000 - 1:250,000 published by the Geological Research and Development Center (Puslitbang);
- 1:250,000 scale land system map published by the Geospatial Information Agency (BIG)
- Map of existing land use from previous studies; and
- Climatic data from the nearest weather station.

Land Unit Analysis

A land unit is defined as a stretch of land that has uniform or similar characteristics in terms of landform, lithology/parent material and relief/slope, which can be delineated and depicted on a map. This analysis aims to compile a map of land unit analysis as a basis for planning field observations and compiling a map of soil types.

Land unit analysis is differentiated based on landform unit, source rock unit, and relief/slope unit which can be performed simultaneously. This activity does not create a new land map unit, but uses the existing one, namely the 1:250,000 scale RePPPort land system map as a reference. The land system map attributes used to describe land units are variables that affect the process of soil formation and determine soil properties, and can be used as a basis for distinguishing soil map units and/or soil types. The analyzes in this stage consist of analysis of lithology, landform, relief/slope, and actual land use. Preparation of Field Observation Plan Map Planned maps of soil observations in the field are prepared by taking into account the diversity of land units, observation techniques, transect systems, accessibility (easy to reach) and available time. Semi-detailed soil mapping requires 1 observation point for every 250-500 m with a maximum interval of 1 km between pilot lines/transects. The combination of the two transect systems becomes a working map for field observations. In addition, as a consideration of the difficulty level of access in the field, the work map is overlaid with satellite images that can describe land use and cover.
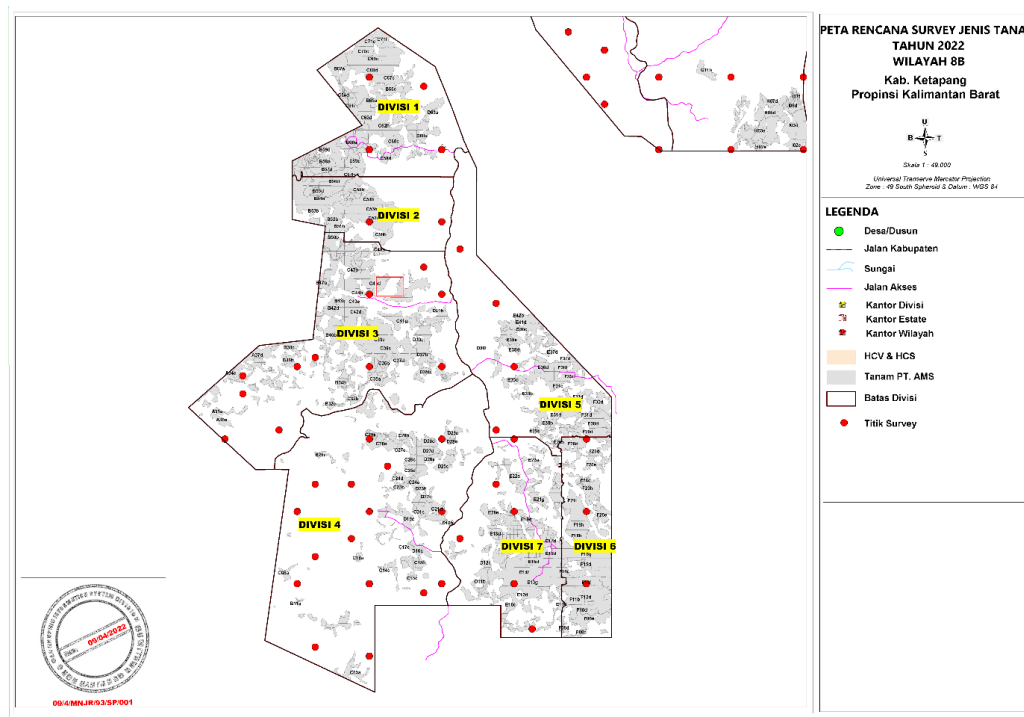
Figure 26. Map of Land Survey Plan in PT AMS

Land unit observation

Observation of land units is a field verification activity against the land unit analysis map. The important parts examined include the delineation of land units and their suitability with field conditions related to landform elements, parent material, and relief/slope, as well as other information, such as land use and vegetation. Field verification is carried out mainly on

representative land units that have a fairly wide distribution. Observations are made at each planned point by paying attention to:

i.   Observation of soil properties and their distribution in the field,

ii. The appearance of changes in the micro-relief of the land surface in flat areas, while for sloping areas, taking into account the slope, position and shape of the slopes. If there are representative land units that are difficult to visit due to low accessibility, data extrapolation can be carried out based on the similarity of land unit characteristics or from the approach of land survey results in adjacent areas. The results of this land unit observation are hereinafter referred to as a soil type map

Description of the cross section/soil profile

The methods used to describe the cross-section of each land unit at a scale of 1:50,000 (soil group/subgroup) include:

i.   Soil drilling, carried out as deep as 100 cm in mineral soi,

ii. Minipit digging, making minipits as deep as 50 cm with a length and width of 50 x 50 cm,

iii. Observation of the soil in the minipit was followed by drilling to a depth of 100 cm. The description of the soil profile can also be done from a cross section of the soil profile that has been exposed at the edge of the road or the edge of the cliff.

Determination of land classification and mapping

Soil classification is determined in the field and can then be corrected with laboratory analysis data. The soil classification used in this activity is the USDA Soil Taxonomy system (Soil Survey Staff, 2014) up to the subgroup level (semi-detailed map scale). Field maps are prepared based on observations of land units and soil units from observations of drilling, minipit and profiles. During field observations, corrections are made to land units, both to delineation and naming land units according to field conditions (ground truth). The map legend created in this activity is adapted to its purpose, to identifying soil types.

Land Units and Biophysical Environmental Conditions

The land unit in this study uses pre-existing data and maps, especially the 1990 RePPPort land system map. The map has presented land unit elements consisting of landform, lithology/parent material and relief/slope at the scale of the review soil (1 : 250,000). Land units from this land system are used as material to be verified in the field, so that this activity can produce soil map units (SPT) and soil type maps on a semi-detailed scale (1:50,000).

The concession area of PT AMS is divided into four land systems, namely land systems, namely Honja, Lohai, Pakalunai, and Rangankau land systems. Each land system has landform, lithology and slope/relief variables (Table 47). According to the land system map (Figure 27), the soil types in most of the study areas are Tropudults, Paleudults and Trophumults.

Table 47. The land system within the concession area of PT AMS

Land System	Landform	Parent Material/Lithology	Relief	Soil Great Group	Area	
					(Ha)	(%)
Bulit Pandan	Mountains	Gneiss phyllite quartsize; schist andesite basalt	>60	Dystropepts; Tropodults; Paleuduts	84.18	0.8
Honja	Plains	Andesite, basalt, granodiorite; schist; granite	15-25	Tropudults, Paleudults, Tropohumults	8,630.08	82.9
Lohai	Hills	Sandstone	>60	Tropudults; Dystropepts	960.47	9.2
Rangankau	Plains	Granite andesite basalt schist; alluvium, recent riverine (fresh)	0-8	Paleudults; Tropaquepts; Tropudults	739.42	7.1

	Total (Ha)	10,414.14	100
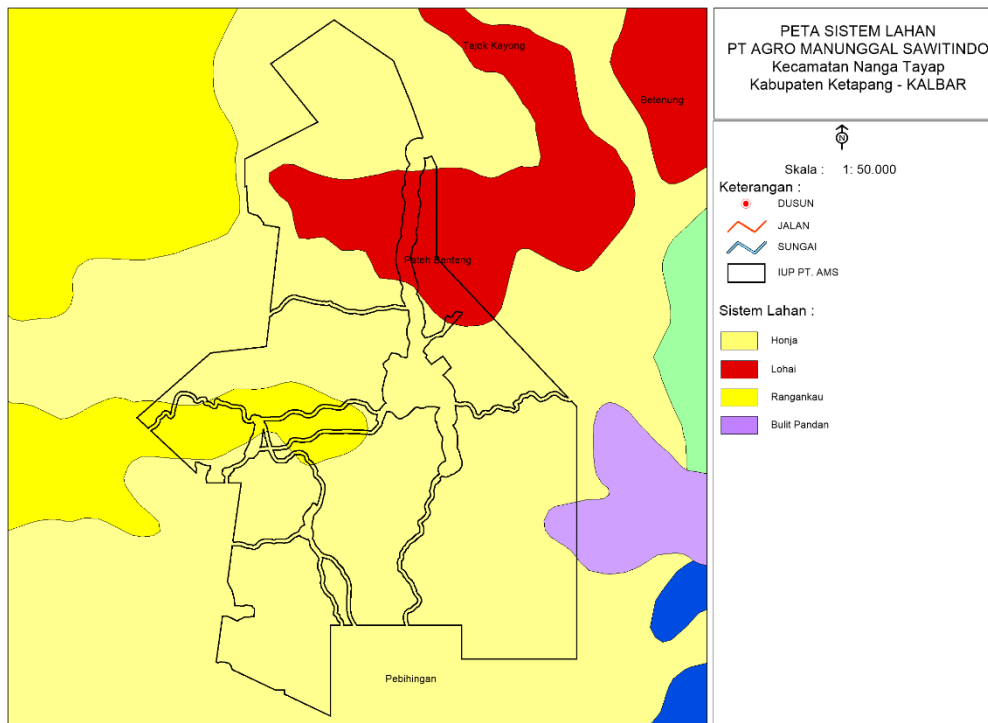
Figure 27. Map of Land System within the concession area of PT AMS

The concession area of PT AMS located in a tropical climate region. The annual rainfall pattern is equatorial with an average rainfall of 3,000 mm/year with 150 rainy days. The peak of rain occurs in January - March and October - December, while the dry period is in June - August. In the context of watersheds (DAS), PT AMS is in Pemahan Watershed.

The topography of the concession area of PT AMS mostly has elevations of about 1-100 meters above sea level with slopes of around 0-8%. The land cover conditions at the time of the survey were mostly oil palm plantations and smallholder rubber plantations.
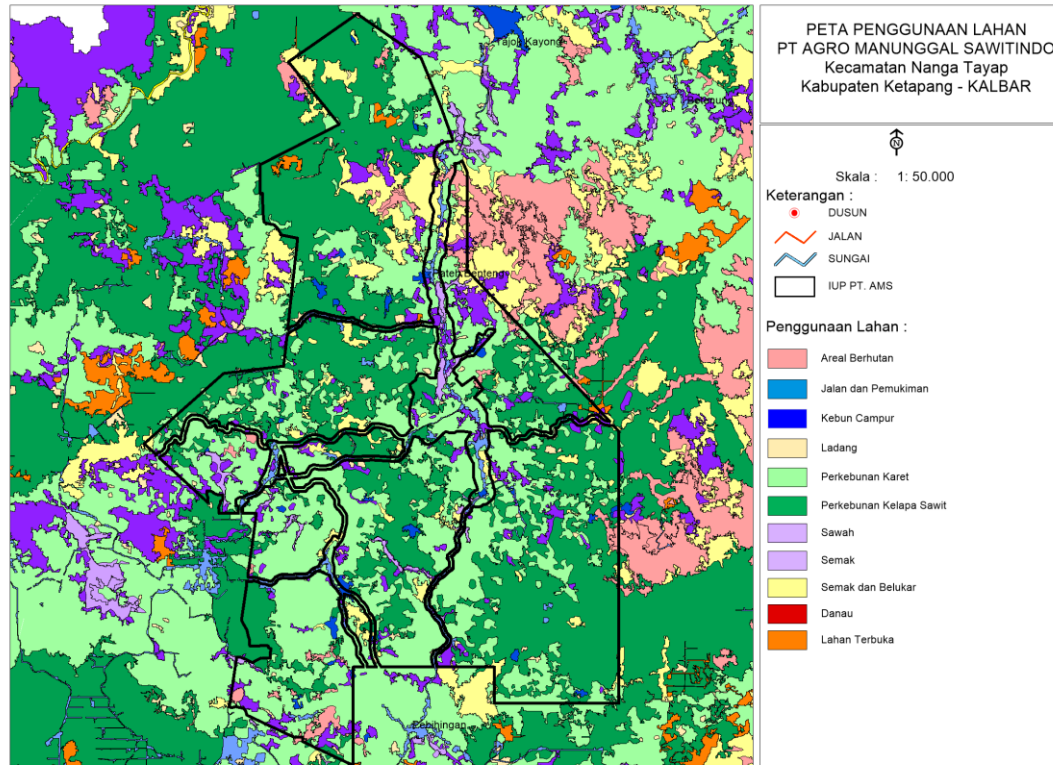
Figure 28. Map of Land use within the concession area of PT AMS

Soil Characteristics and Classification

Land Map Unit Analysis and verification of land unit observations resulted in 4 soil map units (SPT). Each SPT is formed from a different landform and lithology/parent material.

Table 48. The legend of the land map unit in the PT AMS concession area

SPT	Land Unit	Proportion	Relief	Area	
				Ha	%
SPT-1	*Typic Paleudults;* deep solum, good drainage, loamy texture, acid	D	Flat (0-8%)	6,646.09	63.8
SPT-2	*Typis Dystrudepts;* deep solum, good drainage, sandy loam texture, acid	M	Hilly (15-25)	3,090.93	29.7
SPT-3	*Typic Udifluvents;* deep solum, medium drainage, loamy texture, sour	T	Flat (0-8%)	454.41	4.4
SPT-4	*Typic Plinthudults;* deep solum, medium drainage, loamy texture, sour	T	Flat (0-8%)	222.72	2.1
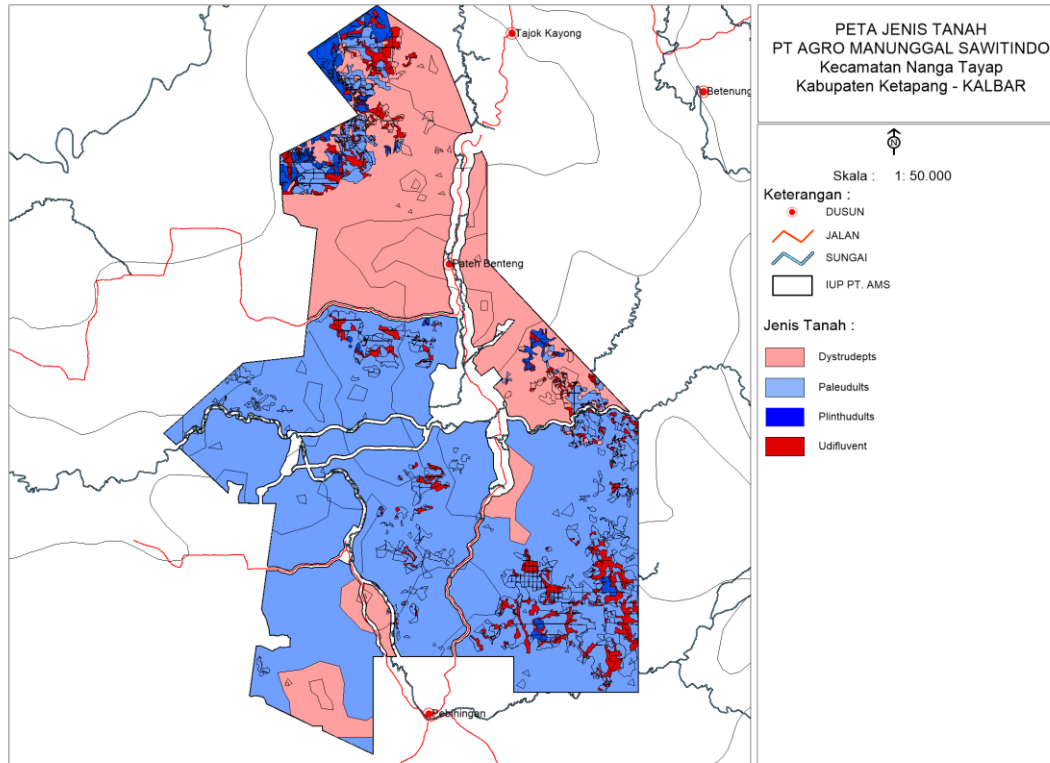
Figure 29. Map of Soil Types within concession area of PT AMS

Description of the cross section/soil profile

Representative soil profiles are described and represent each soil unit (soil group/subgroup). This profile is important for determining and classifying soil types. The data and information presented in the description of the soil profile are field observation data. The following is a description of each SPT and soil type.

Dystrudepts			
Parent Material	:	Clay	
Characteristic Horizon	:	Kambik	
USDA Soil Type	:	*Typic Dystrudepts*	
Vegetation	:	Secondary Forest	
Physiography	:	Flat – Wavy	
Slope	:	Flat (0-8%)	
Drainage Class	:	Good	

Layer Symbol	Layer Depth (cm)	Description
A	0-25	Chocolate (7.5 YR 5/4); sandy loam; weak; loose; many fine and medium roots; many micros and meso pores; clear boundary
Bw1	25-65	Sorrel (5 YR 6/8); sandy loam; somewhat firm, lumpy round; many fine and medium roots; micro and meso pores are few; not clear boundaries
Bw2	> 65	Sorrel (5 YR 6/8); sandy loam; somewhat firm, lumpy round; few fine and medium roots; micro and meso pores are few; not clear boundaries

Paleudults		
Characteristic Horizon	:	Argillic
USDA Soil Type	:	*Typic Paleudults*
Vegetation	:	Oil Palm
Physiography	:	Hilly
Slope	:	Sloping (8-15 %)
Drainage Class	:	Good

Layer Symbol	Layer Depth (cm)	Description
A	0-6	Chocolate (7.5 YR 4/3); dusty clay; loose, fine and medium many roots; many micro and meso pores; clear boundary
A/B	6-26	Sorrel (5 YR 6/8); dusty clay loam; somewhat firm, angular lumps; loose; fine roots a little and a little more; micro and meso pores are few; not clear boundaries
Bw1	26-63	Sorrel (5 YR 6/8); dusty clay loam; firm, angular lumps; fine roots a little and a lot; micro and meso pores are few; not clear boundaries
Bw2	63-110	Yellowish Red (5 YR 5/8); dusty clay loam; somewhat firm, angular lumps; few fine and medium roots; micro and meso pores are few; not clear boundaries
Bt	>110	Yellowish Red (5 YR 5/8); clayey clay; firm, angular lumps; few fine and medium roots; micro and meso pores are few; not clear boundaries

Udifluvents		
Parent Material	:	Alluvial
Characteristic Horizon	:	-
USDA Soil Type	:	*Typic Udifluvents*
Vegetation	:	Oil Palm
Physiography	:	Lowland
Slope	:	Flat (0-8%)
Drainage Class	:	Moderate

Layer Symbol	Layer Depth (cm)	Description
A1	0-30	Yellow-Brown (10 YR 6/6); dusty clay; slightly loose, fine and medium many roots; many micro and meso pores; not clear boundaries
A2	30-100	Very Pale Chocolate (10 YR 7/4); dusty clay; slightly friable; few fine and medium roots; micro and meso pores are few; unclear boundary
A3	>100	Light Gray (10 YR 7/2); dusty clay; slightly friable; fine and medium roots a little ; micro pores and few meso; unclear boundary

Plinthudults		
Parent Material	:	Alluvial
Characteristic Horizon	:	Argillic
USDA Soil Type	:	*Typic Plinthudults*
Vegetation	:	Oil Palm
Physiography	:	Low land
Slope	:	Flat (0-8%)
Drainage Class	:	Moderate

Layer Symbol	Layer Depth (cm)	Description
A	0-15	Chocolate (10 YR 4/3); dusty clay; slightly loose, fine and medium many roots; many micro and meso pores; not clear boundaries
AB	15-40	Chocolate (10 YR 5/3)); dusty clay; slightly loose, fine and moderate roots a bit much; quite a lot of micro and meso pores; clear boundary
Bw	40-70	Very Pale Chocolate (10 YR 8/3); sandy loam; firm, angular lumps; few fine and medium roots; micro and meso pores are few; unclear boundary
Bt	>70	Sorrel (7.5 YR 8/6); clayey clay; glei ; firm; angular lumps ; fine and medium roots a little ; micro pores and few meso; unclear boundary

Classification and Mapping of Soil Types

Soil type mapping provides information on soil types up to the subgroup level. The results of the analysis and field observations show that there are 4 types of soil at the subgroup level. Typic Dystrudepts, Typic Paleudults, Typic Udifluvents, and Typic Plinthudults subgroups. This difference is more due to the parent material making up the soil and the environment forming soil pedogenesis.

Table 49. The area according to the type of land in PT AMS

Soil Types	Area	
	Ha	%
Typic Paleudults	6,646.1	63.8
Typic Dystrudepts	3,090.9	29.7
Typic Udifluvents	454.4	4.4
Typic Plinthudults	222.7	2.1

The following is an explanation of each type of soil and its classification:

a. *Inceptisols*, are soils that have begun to develop further than Entisols. The profile has weak clay and iron alumino oxide horizons (cambic horizons) and has not developed much so that most of these soils are quite fertile. At the subgroup level, it is classified as Typic Dystrudepts. This land is mostly in undulating to hilly areas. The vegetation on this land varies from oil palm plantations, bamboo forests, as well as primary and secondary forests. In some locations, lateritic content was found at depths >80 cm.

b. *Ultisols*, are soils that undergo further development which is characterized by a significant increase in clay content (>20%) with increasing depth so that an acidic clay accumulation horizon (argillic) is formed in the lower layer (argillic). At the sub-group level, it is classified into:
   i. **Typic Paleudults**, this land is mostly in flat to undulating areas. The vegetation on this land varies from oil palm plantations, bamboo forests, as well as primary and secondary forests
   ii. **Typic Plinthudults**, this land is in the lowlands. In the lower layer >70 cm there is a white to gray clay (kaolin) layer and plinthite spots which indicate the presence of Fe content in the soil. The main vegetation is oil palm plantations and primary forest

c. *Entisol*, a soil that is still very young and has not yet developed. The horizons have not yet developed and differentiated. In the survey area, there is Entisol soil type which is categorized as Typic Udifluvents. This land is in a low land area.

Land Suitability

Land suitability classification for oil palm growing on mineral soils and peat soils which were also surveyed at the research site, refers to the land suitability criteria for oil palm on mineral soils based on technical guidelines for oil palm management published by the Palm Oil Research Center (PPKS) 1995.

Table 50. Land Suitability Criteria for Oil Palm on Mineral Soil

No.	Land Characteristics	Symbol	Limiting Factor Intensity			
			Without (0)	Ringan (1)	Moderate (2)	Berat (3)
1.	Rainfall (mm)	h	1.750-3.000	1.500-1.750; >3.000	1.250-1.500	<1.250
2.	Dry Moon (<60 mm)	k	<1	1-2	2-3	>3
3.	Elevation (m dpl)	l	1-100	200-300	300-400	>400
4.	Territory shape/ Slope (%)	w	Flat- undulating <8	Berombak-Bergelombang 8-15	Undulating – hilly 15-30	Hilly-Mountain >30
5.	Rocks on the surface and underground (% v)	b	<3	3-15	15-40	>40
6.	Effective Depth (cm)	s	>100	75-100	50-75	<50
7.	Soil Texture	t	Dusty loam, Sandy clay loam, Dusty clay loam, Clay loam	Clay, Sandy clay, Sandy loam, Loam	Sandy loam, Dusty	Heavy clay, Sand
8.	Drainage Class	d	Good, Moderate	Slightly Hindered, Fast	Fast, Hindered	Very fast, Very Inhibited, Flooded
9.	Soil Acidity (pH)	a	5,0-6,0	4,0-5,0	3,5-4,0	<3,5

While the classification of land suitability for oil palm plantations (Table 51). The analysis will be carried out by tabulation or matching using a limiting factor between the parameters that have been previously arranged in a desk study with the results of surveys and sampling from the research location.

Table 51. Classification of Land Suitability for Oil Palm Plants

Land Suitability Class	Criteria
S1 (Very Appropriate)	Land units having no more than one light delimiter (optimal)
S2 (Appropriate)	Land units that have more than one light barrier and/or do not have more than one moderate barrier
S3 (Fairly Appropriate)	Land units that have more than one medium barrier and/or do not have more than one heavy barrier

	N (Not Appropriate))	Land units that have two or more weight barriers that can still be repaired

*source: Buana, L., D. Siahaan, dan S. Adiputra. 2003. Modul M-100-203. Kultur Teknis Kelapa sawit, penilaian kesesuaian lahan, disain kebun dan pembukaan lahan. Pusat Penelitian Kelapa Sawit. Medan. Hal:1-9

In land suitability analysis, the primary data required is the physical and chemical properties of the soil by taking whole or composite soil samples. Parameters for compiling community oil palm technology assembly consist of overflow typology, plant age, seed preparation, land preparation and planting, fertilization, maintenance and harvesting. Secondary data includes climate data and production data.

Table 52. Land suitability classification for oil palm at PT AMS with PPKS criteria for mineral soils presented

No.	Land Characteristic	Symbol	Environmental Condition
1	Rainfall (mm)	h	2700 - 3100
2	Dry Moon (<60 mm)	k	1-2
3	Elevation (m dpl)	l	9.6 - 892
4	Territory shape / Slope (%)	w	Undulating - hilly 0 - 45
5	Rocks on the surface and underground (% v)	b	<3
6	Effective Depth (cm)	s	75-100
7	Soil texture	t	Sandy loam, Dusty Loam
8	Darinage Class	d	Slightly Hindered, Hindered, Rather Fast
9	Soil Acidity (pH)	a	3.8 - 5

Rainfall

Based on the recapitulation of rainfall data from 2015 to July 2022, it ranges from 1,406 to 3,496 mm with an average annual rainfall of 2,705 mm. The rainfall data is presented in Figure 30. Based on CHIRPS global rainfall data, the average annual rainfall ranges from 2,700 – 3,100 mm (Figure 31). Under normal conditions, climatic conditions are relatively wet throughout the year. The amount of rain in the rainy season is more than 200 mm/month and in the dry season is more than 100 mm/month. The number of rainy days in a year is about 170-210 days. This high rainfall will have an impact on the occurrence of susceptible soil erosion (rainfall erosivity). Rainfall erosivity factor in the AOI region ranged from 9,48-1,074 MJ.mm/(ha.hr), with an average of around 1,008 MJ.mm/(ha.hr).
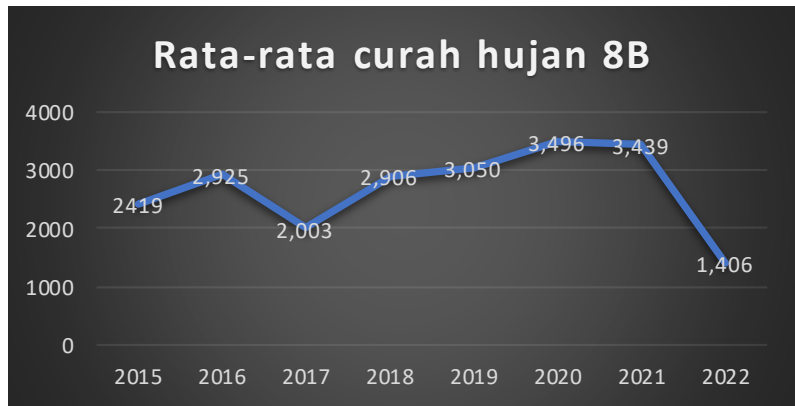
Figure 30. Annual rainfall for PT LGI & AMS
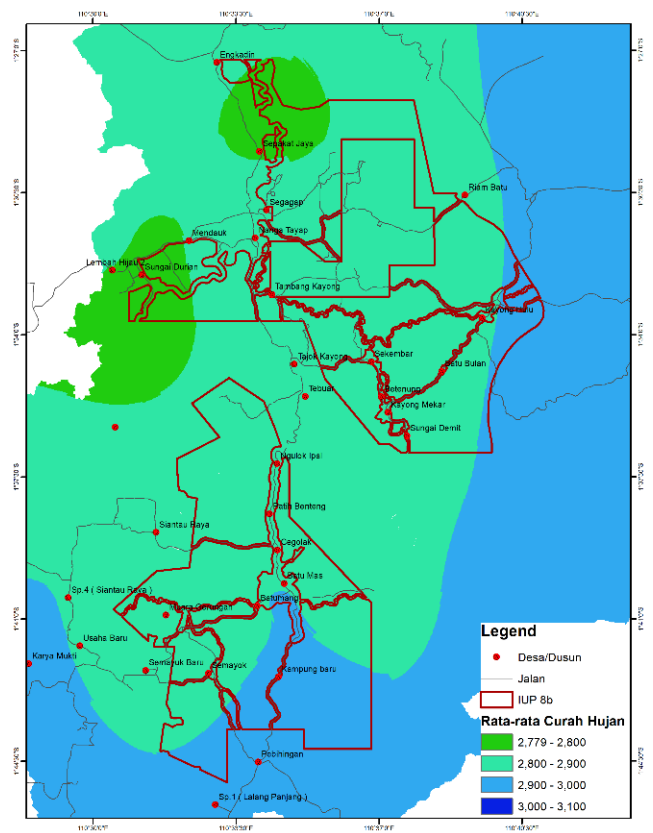
Figure 31. Rainfall Map of PT LGI & AMS

Topography

Based on the topographic map (Figure 32, left), the land elevation in AOI ranges from 9.6-815 m above sea level. The lowest elevation is around the mouth of the Kayong River. The highest elevation is around Mount Sembah, then Mount Sabyan (west of AOI) and Mount Pancung. Many hilly areas are scattered around the MU area such as Bukit Lempuding, B. Sempawan, B. Keranji, B. Engkabang, B. Periuk, B. Pebantan, B. Durian Sulung, B. Temelukung, B. Tugung Piling and B. Batu Bolah. The results of terrain analysis on topographic maps show that the dominant slope class in AOI is less than 3% (±23.7%) then the slope class is 3-8% (±22.4%). This area is located in the vicinity of major rivers. Slope class which is classified as steep (25-40%) is around 11.9% and very steep (more than 40%) is around 7.6%. These areas with steep to very steep slopes are located around areas with relief from small hills to mountains (Figure 32, right).
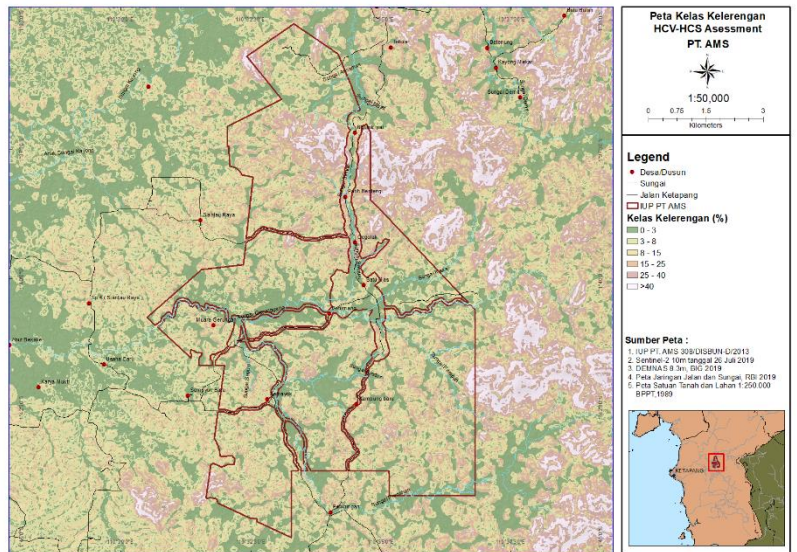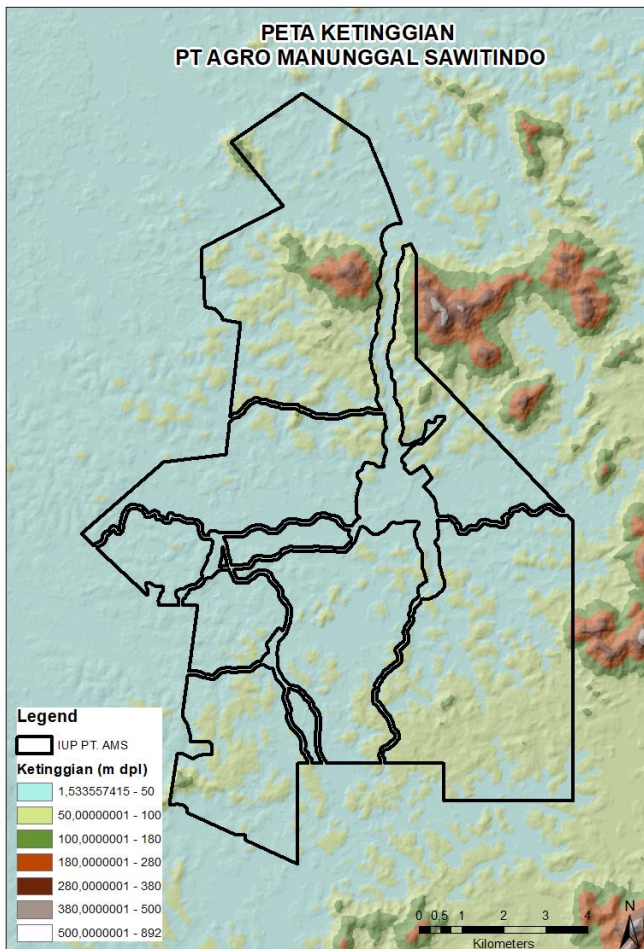
Figure 32. Left: PT AMS Topography map; Right: PT AMS Slope Class

Geology

Based on the geological map, the AOI assessment is divided into 5 geological formations (Figure 33), namely the Kerabai Volcano Rock formation (40.3%), Sukadana Granite (31.2%), Flower Basal (15.4%), Ketapang Complex (10.2%) and malihan Malihan Pinoh (0.2%). Among these geological formations, the dominant ones scattered in AOI are Kerabai Volcanic Rock (Kuk), Sukadana Granite (Kus) and Bunga Basalt (Kubu). The lithology of the Kerabai Volcano Rock formation is andesitic lava, dacite lava and rhyolite and is partly inseparable from pyroclastic material. The Sukadana Granite Formation is composed of quartz monzonite, monzogranite, sionogranite and alkaline feldspar granite, a little bit of quartz, quartz monzodiorite and quartz diorite. The hilly areas of AOI are in this formation. Most of this hilly area is rocky with thick shallow soil solum. In the Bunga Basal Formation, the lithology is composed of dense black to dark gray basalt with greenish-grey dacite and andesite members, lava, crystal tuff and volcanic breccias.
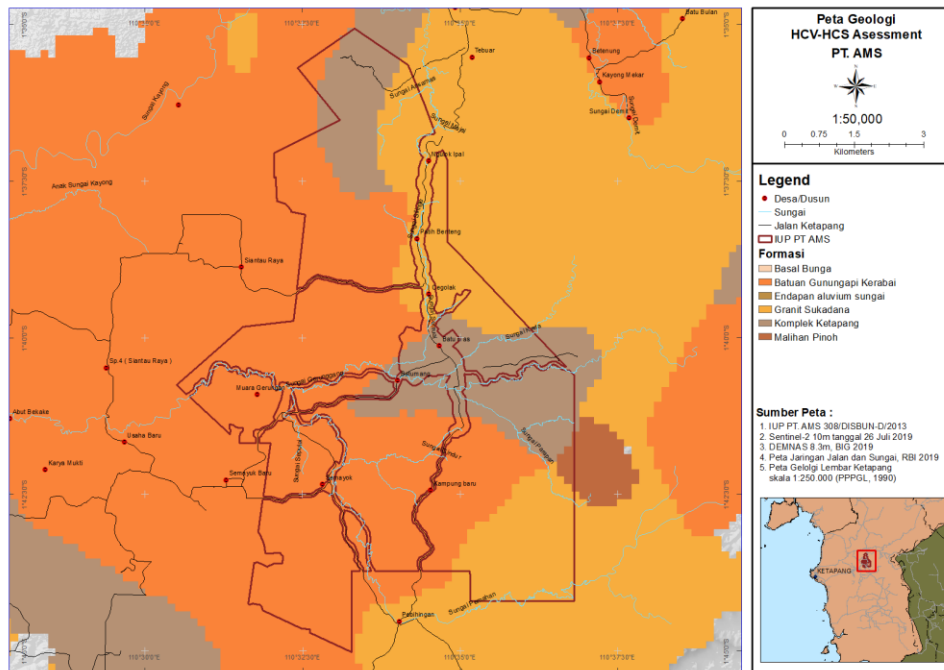
Figure 33. PT AMS Geological Map

Hydrology

Based on the riverstream map (Figure 34), the area of PT AMS is a catchment area (DTA) of the Kayong River covering an area of 178,752 Ha. This AOI area is a small part of the Pawan watershed area. Around 15.4% of the Sungai Kayong catchment area is the area of PT LGI (the middle part of the Sungai Kayong catchment). The largest contribution to water flow in the Kayong River comes from the Tayap River (42.7%), the Demit River (12.5%), the Lokan River (3.3%), and the Pemahan River (19.2%). The water flow of the Tayap River comes from the Gerunggang River in the middle and the Bunga River in the upstream. The Gerunggang River contributes to the water flow of the Pemahan River in the middle. The upper reaches of the Kayong and Tayap rivers are located around the hilly areas of Pancung, Menyembah and Sekahsamar. The upstream of the Demit River is a hilly area of Berubayan at Km 58. The upstream of the Pemahan River and the Gerunggang River is in the hilly area of Lambung and Lintang around the PT LAP area. PT AMS's plantation area is crossed by the Pemahan River and Gerunggang River. The length of the river flow in the AOI area from the mouth of the river to the upstream area is as follows: Bunga River ±18.7 Km, Demit River ±35.6 Km, Gerunggang River ±16.6 Km, Kayong River ±98.7 Km, Lokan River ±14.8 Km, Pemahan River ±47.7 Km, Segagap River ±17.3 Km and Tayap River ±95.3 Km.
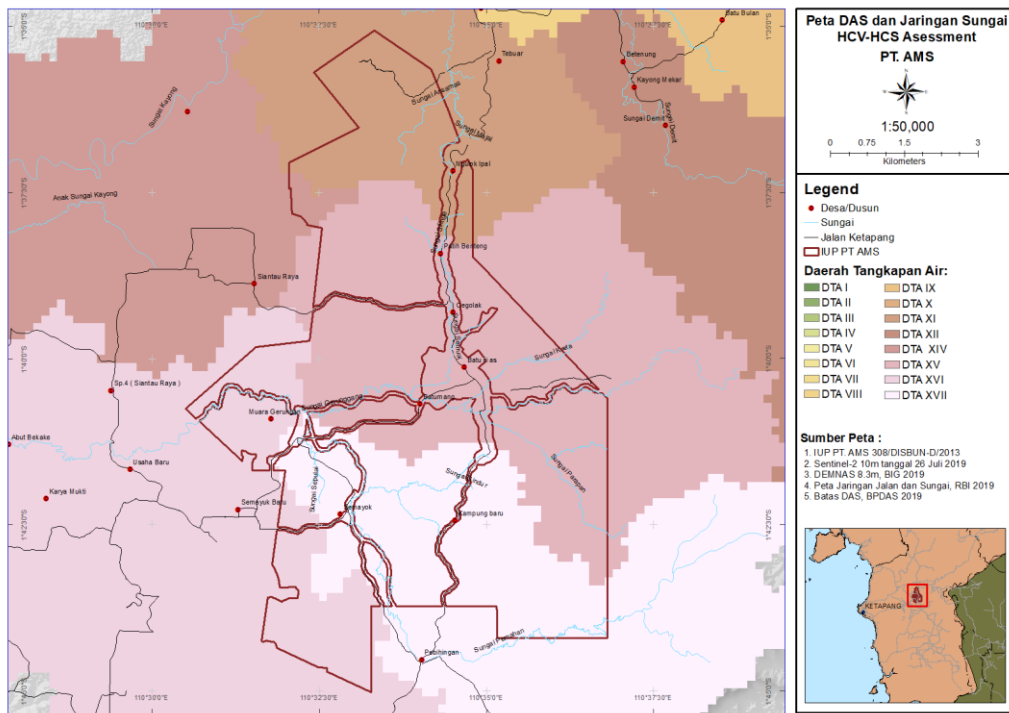
Figure 34. Map of Watershed and River Stream at the area of PT AMS

The results of the land suitability analysis of PT AMS there are 4 land suitability classes with the following division.

Table 53. Land Suitability Analysis Result of PT AMS

Plantation	Land Suitability	Limiting Factor	Total (Ha)
AMS	N-w	Territory Shape/ % Slope	150.07
	S2	Rainfall	6,183.64
	S3-w	Territory Shape/ % Slope	4,067.89
	S3-d	Drainage Class	12.54
AMS Total			10,414.14
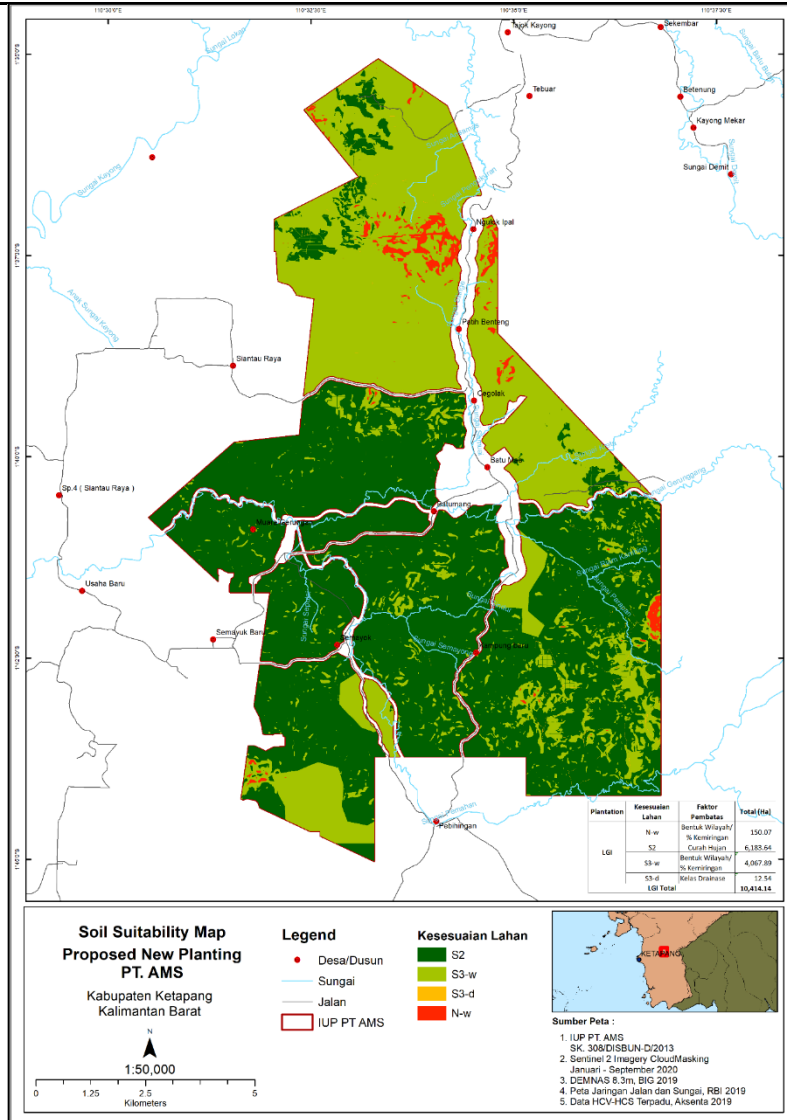
Figure 35. Map of Soil Suitability PT AMS

Signature	
Name	Husri Batubara
Position	Team Leader of Soil Survey and Land Suitability Analysis

Section 7: Greenhouse Gas (GHG)

Greenhouse Gas emissions on the development plans area are calculated using the RSPO PalmGHG Calculator Version 4.0, as of July 2021, for New Development. PT AMS has submitted its GHG Report for New Planting, which includes plans on how to mitigate its emission to the Green House Gas Unit at RSPO and approved to proceed to the nest step of NPP process on 04 July 2022

1. Data used

The development and new planting for PT Agro Manunggal Sawitindo will be based on the plantation permit (IUP), an area of 10,400 ha.

- Land cover class & average carbon value;

- Spatial data map of permit boundaries;

- Map of Conservation Area, land cover, soil types, and distribution of carbon stock map

Table 54. Summary of Land Cover Class & Carbon Value

Land cover class	Average carbon value (ton C/ha)	Physical description of the land cover
Low Density Forest (Hutan lahan rendah sekunder kerapatan sedang)	52.71	Secondary forest is found in areas with steep slopes. The remaining secondary forest in the study area is relatively protected from human disturbance due to difficult access, so that utilization in these areas is limited. However, repeated fires have also caused damage to the remaining forests.
Young Regenerating Forest (Hutan lahan rendah sekunder kerapatan rendah)	102.70	Scrub in the study area is found in areas with steep slopes. There are two types of shrub distribution in the study area, namely shrubs which are part of the expanse of secondary forest and shrubs that are scattered sporadically.
Rubber Plantation (AGRI)	48.00	Old rubber plantation that are used intensively owned by local community. Rubber plantation land not identified as conservation area. (Average carbon values using the RSPO palm-GHG calculator reference)
Shrub (Semak dan belukar)	24.56	Shrubs were found scattered throughout the study area. Shrubs are lands that are disturbed and are in an early successional stage. In general, shrubs in the study area are land that has been cleared for fields and/or areas that have not been burned for a long time and have experienced succession. The dominant species found in the shrubs were penaga (Callophylum grandifolium), rubber (Hevea brasiliensis), and pulai (Alstonia scholaris). The diversity of species and evenness of tree species in the bush is high.
Bushes (Semak)	6.70	Bushes were found in the form of land that had recently been cleared and/or burned. The bush area is dominated by weeds (Pennisetum polystachyon), rambang (Scleria sumatrensis), ferns (Stenochlaena palustris). Seedlings of tree species were also found in the bush area, including ubar (Syzygium sp.), nyatoh (Palaquium sp.), and garung (Macaranga gigantea).

Table 55. Land covers conditions and land use of PT AMS

Description		Area	
		Ha	%
A. Develop Area		4,671.69	45%
Planted Area	3,589.82		
Community Land	982.37		
Built-up Land	39.55		
Infrastructure	59.94		
B. Conservation Area		1,120.88	11%
Integrated HCV & HCS	1,120.88		
C. Potential Area for Development		4,621.58	44%
Agroforestry	0.22		
Bare Land	116.05		
Rubber Plantation	3,666.94		
Bushes	305.73		
Shrubs	532.63		
Total Area (A + B + C)		10,414.14	100%
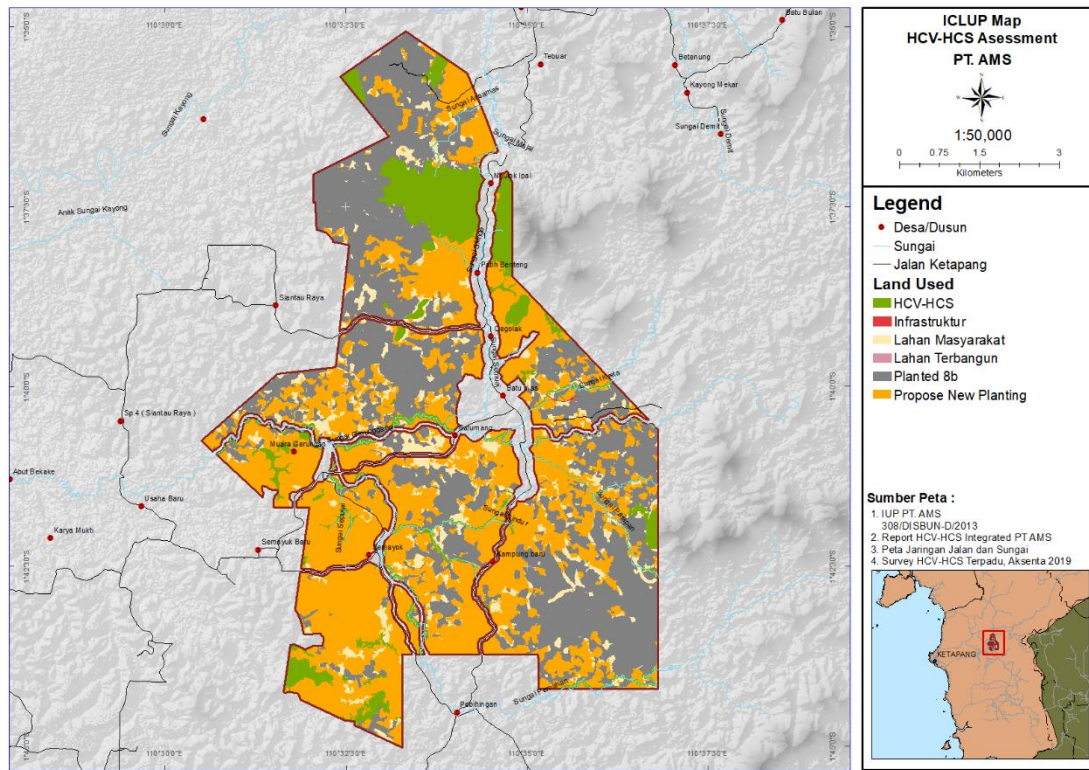
Figure 36. Map of Indicative Conservation Land Use Plan

Secondary data from company; trend of use of and sources of fertilizer, trend of FFB production, trend of mill extraction rate, trend of empty bunch & shells usage, trend of management of POME.

2. **Planting Cycles   : 25 years of planting cycles.**

3. **Dosage of fertilisers**
    a) TSP 2 kg/year/plant from Egypt
    b) MOP 2 kg/year/plant from Canada
    c) Urea 1.5 kg/year/plant from Bontang, East Kalimantan
    d) Kieserit 1.5 kg/ year/plant from Germany

4. **Yield**
    FFB per year: 25 tonnes (average of Bumitama)

5. **Processing**
    a) Extraction CPO 24% (average of Bumitama's Mill)
    b) Extraction Kernel 5 % (average of Bumitama's Mill)
    c) Extraction Shell 4 % (2% to be used and 2% for sale)

6. **Conservation Area**
    Conservation Area (integrated HCV- HCS) is determined by the company are 1,120.88 ha. There is no peat land and there will be no land clearance in the Conservation Area.

7. Processing Maps
- Overlay between maps displaying permit boundaries, conservation area, land cover and soil types to get the potential area for planting.
- Cut and overlay maps based on block characteristics

8. Alternatives of land clearing
- Preparation of the alternatives of land clearing based on cut and overlay maps by block characteristic
- The alternatives of land clearing are based on Sustainability Policy and regulations, good agricultural practices, good management of mills, considering the carbon stock rate of the area.

Table 56. Description of Development Scenarios

Scenario 1	• No land clearance on planned conservation areas in community land; • Land clearance of all mineral land in any land cover; • No Plan both for mill and methane capture facilities; • Total planting plan = 4,621.58 ha.
Scenario 2	• No land clearance on conservation areas in community land; • Land clearance of all mineral land; • Avoid some of rubber area; • No Plan both for mill and methane capture facilities; • Total planting plan = **3,570.84** ha.
Scenario 3	• No land clearance on conservation areas in community land; • Land clearance of all mineral land; • Avoid some of rubber and shrubs area; • No Plan both for mill and methane capture facilities; • Total planting plan = **2,578.37** ha.

Table 57. Resume of Development Scenarios

Description		Area (ha)	Scenario of Development		
			Alt 01	Alt 02	Alt 03
A.	Develop Area	4,671.69	4,671.69	4,671.69	4,671.69
B.	Conservation Area	1,120.88			
	Integrated HCV- HCS	1,120.88	1,120.88	1,120.88	1,120.88
	Other Conservatioan Area	-	-	1,050.74	2,043.20
C.	Potential Area for Development	4,621.58			
	Agroforestry	0.22	0.22	-	-
	Bare Land	116.05	116.05	116.05	116.05
	Rubber Plantation	3,666.94	3,666.94	2,616.42	1,679.36
	Bushes	305.73	305.73	305.73	305.73
	Shrubs	532.63	532.63	532.63	477.23
	Total for Area Proposed for New Planting		**4,621.58**	**3,570.84**	**2,578.37**
	Plan for Methane Capture		**N**	**N**	**N**
	TOTAL AREA (A + B + C)	**10,414.14**	**10,414.14**	**10,414.14**	**10,414.14**
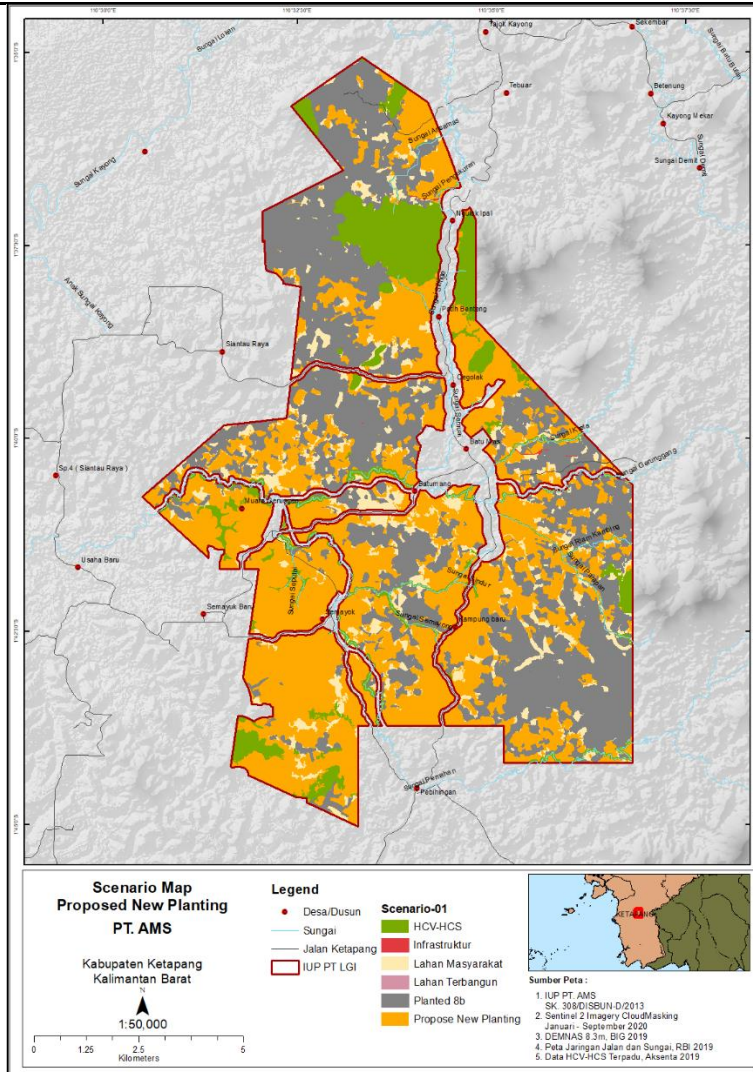
Figure 37. Scenario on Development Plan of PT AMS (Alternative 01)
(All the Conservation Area are avoided to land clearance)
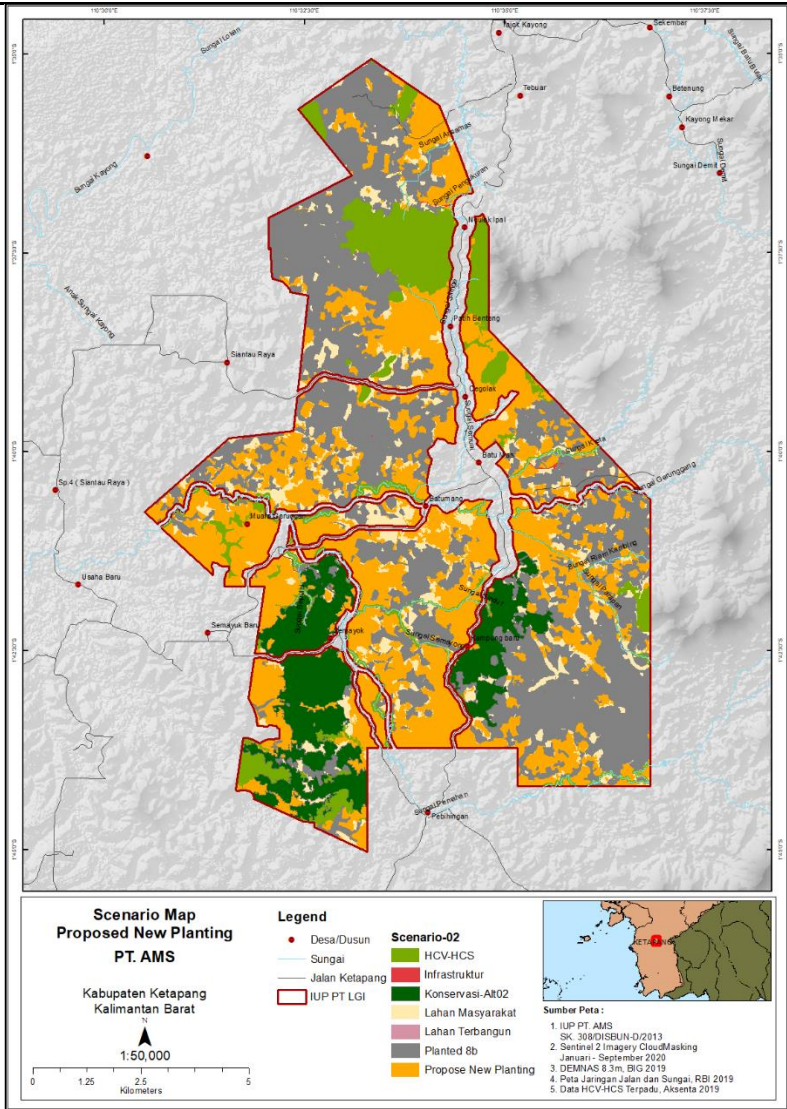
Figure 38. Scenario on Development Plan of PT AMS (Alternative 02)
(All the Conservation Area are avoided to land clearance)
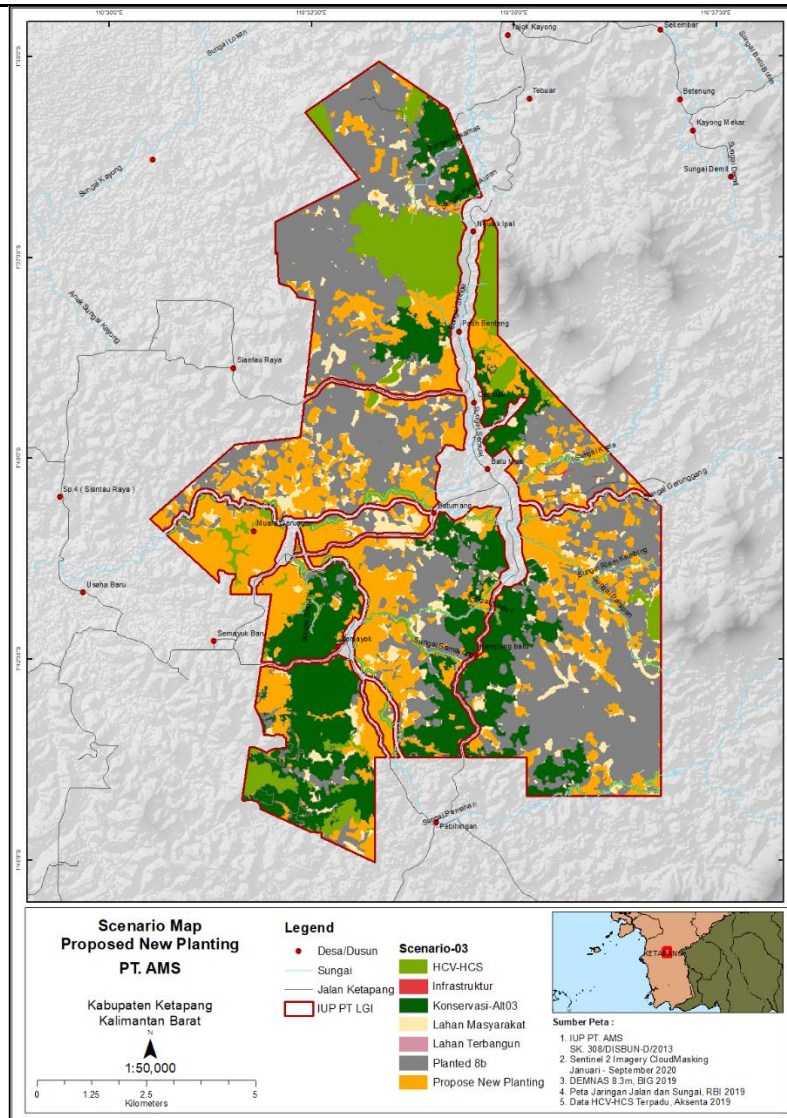
Figure 39. Scenario on Development Plan of PT AMS (Alternative 03)
(All the Conservation Area are avoided to land clearance)

9. Greenhouse Gas Emission Calculation

1. Entering the data from each of the alternatives into the Palm GHG Calculator, obtain the results of the carbon emissions per ton of CPO production

2. Choose an alternative plan for land clearance and GHG management which may not necessary be with the lowest carbon emission but rather an option which balances the goals of the company, the community, in line with the company's Sustainability Policy, meets with RSPO P&C also the Indonesian law and regulation and as well as for the general good for the environment.

Table 58. Summary of GHG calculations based on land clearing alternatives (in tCO_2e)

Alt.	Emisi (tCO2 e)						
	Land Clearing	Corp. Squest	Fertiliser	N2O	Fuel	Peat	Conservation
Alt 1	29,696.79	(41,010.40)	65.98	4,380.64	1,571.77	-	(1,505.23)
Alt 2	21,894.09	(31,686.45)	50.98	3,384.68	1,214.42	-	(1,505.23)
Alt 3	14,723.81	(22,879.66)	36.81	2,443.96	876.89	-	(1,505.23)

Table 59. Total Emission per ton of product based on the land clearing alternatives

Alt.	Total Field Emission tCO2e	t CO2e/ha	tCO2e/t FFB
1	(6,800.43)	(1.55)	(0.08)
2	(6,647.51)	(1.96)	(0.10)
3	(6,303.42)	(2.58)	(0.13)
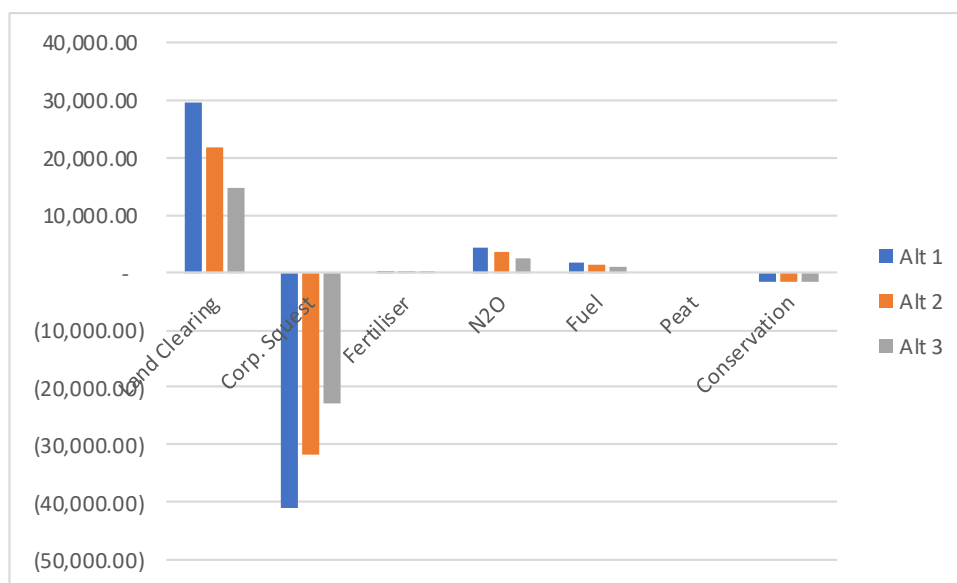
Figure 40. GHG Calculation based on land clearing alternatives

10. Choosing the Optimal Scenario for Land Clearance

Based on the GHG calculation, PT AMS will follow land clearance in accordance with the first alternative, with total emission produced from estate (plantation) $-6,800.43$ tones CO_2e. While the emissions per ton of product (FFB) is -0.08 tons CO_2e, with -1.55 tones CO_2e/ha. This option was chosen by taking into account the wishes of the community during the FPIC process, to surrender their rubber plantation land/ fields (agroforestry) to be converted into oil palm plantations.

The details are following:

1) No land clearance on planned conservation areas in community land;
2) Land clearance of all mineral land in any land cover;
3) Plan both for mill and methane capture facilities;
4) Total planting plan = **4,621.58** ha, and will be divided into 5 years of development

Table 60. Five Years Planting Projection of Proposed New Planting Area at PT AMS

Description		Area	
		Ha	%
A. Develop Area		4,671.69	45%
Planted Area	3,589.82		
Community Land	982.37		
Built-up Land	39.55		
Infrastructure	59.94		
B. Conservation Area		1,120.88	11%

	Integrated HCV & HCS	1,120.88		
C.	**Potential Area for Development**		4,621.58	44%
	2022	944.63		
	2023	932.40		
	2024	991.46		
	2025	704.57		
	2026	1,048.51		
	Total Area (A + B + C)		10,414.14	100%

Figure 41. Map of Development Plan Area on PT AMS

Potential Development Area		Area (ha)	tC/ha	tCO2e/ha	Total tCO2e
2022		**944.63**			
Bareland	19.35		6.70	24.57	475.46
Rubber	796.38		48.00	176.00	140,163.73
Bushes	53.47		6.70	24.57	1,313.68
Shrubs	75.42		24.56	90.05	6,791.84
2023		**932.40**			
Bareland	19.27		6.70	24.57	473.43
Rubber	730.23		48.00	176.00	128,519.78
Bushes	86.42		6.70	24.57	2,122.97
Shrubs	96.49		24.56	90.05	8,688.86
2024		**991.46**			
Bareland	40.37		6.70	24.57	991.63
Rubber	746.11		48.00	176.00	131,315.53
Oil Palm	0.05		-	-	-
Bushes	42.55		6.70	24.57	1,045.22
Shrubs	162.39		24.56	90.05	14,624.17
2025		**704.57**			
Bareland	19.30		6.70	24.57	474.06
Rubber	528.94		48.00	176.00	93,093.45
Bushes	41.73		6.70	24.57	1,025.19
Shrubs	114.60		24.56	90.05	10,320.49
2026		**1,048.51**			
Agroforestry	0.22		-	-	-
Bareland	17.76		6.70	24.57	436.30
Rubber	865.23		48.00	176.00	152,280.75
Bushes	81.57		6.70	24.57	2,003.82
Shrubs	83.73		24.56	90.05	7,539.91
Total Area		**4,621.58**			

Table 61. Carbon Value Summary of the Development Area

Signature	
Name	Saeshaputi Rahmanita Prathiwi
Position	Sustainability Specialist (GHG Calculator & NPP Procedure)

Section 8: Land Use Change Analysis (LUCA)

PT AMS has conducted and reported a Land Use Change Analysis to the RSPO on 07 April 2016 and was declared a Pass on 17 October 2017. The analysis is based on the HCV assessment conducted by PT AMS for the first time on 26 June 2012. Analysis team: Forestry consultant, PT Ata Marie and BGA Sustainability team.

Assessment Methodology

The methodology adopted to analyze the LUC analysis conducted by the company was by visually and statistically assessing the remote sensing images and other spatial data submitted by the company to RSPO. The first step of the assessment process was checking all the data submitted by the company for their completeness according to the LUC Reporting Checklist. When all required data are complete, the next step was visual inspection of the satellite imageries for their quality

i.e. cloud coverage, stripes in Landsat 7 images etc. Subsequently, the images were overlaid onto the geo-referenced boundary of the management unit, and visually verifying if the satellite image/s cover the entire management unit and detecting for any irregularities.

The next step was verification of the area of the management unit. This was done by geometrical calculation on the boundary shapefile and cross checking it with the reporting template provided by the company. The land cover classes provided by the compa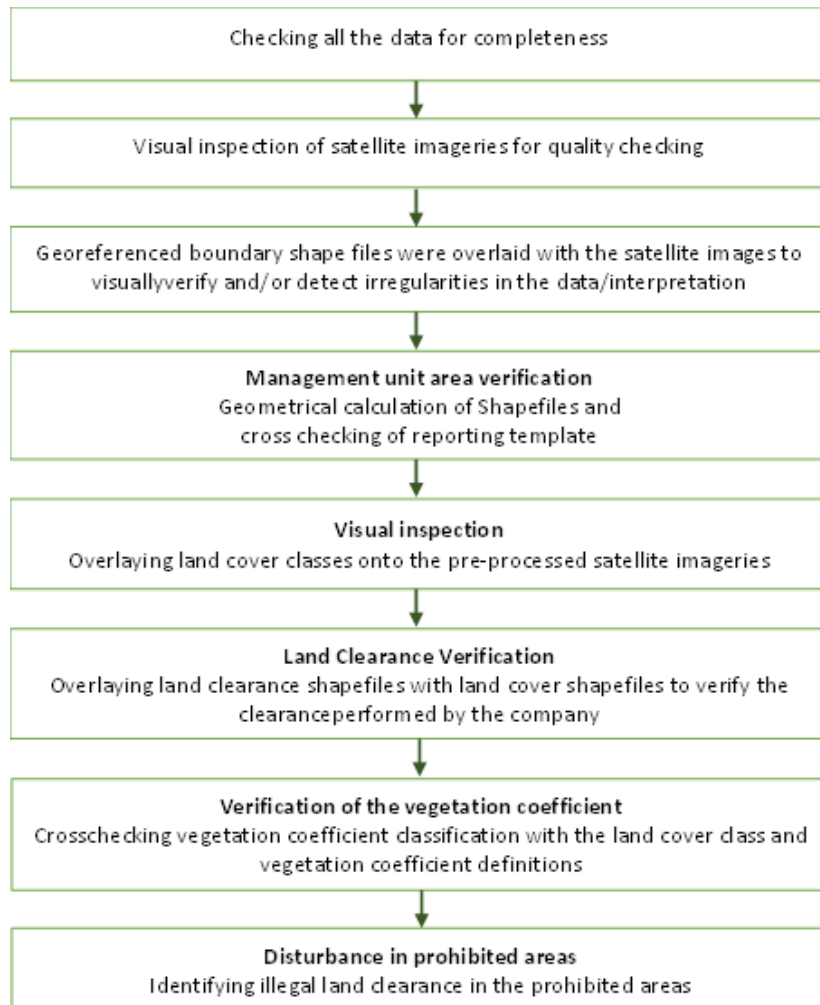ny were assessed by overlaying the land cover classes onto the pre-processed satellite imageries and visually inspect for their correctness. Geometrical calculation was also conducted to verify the area (ha) of the land cover classes and compared to the calculation conducted by the company. The verification of the vegetation coefficient was also conducted by crosschecking the vegetation coefficient classification ion with the land cover classes and vegetation coefficient definitions. The LUC analysis methodology was verified by visually inspecting the classification results and checking whether any irregularities is present in the data.

Checking all the data for completeness
↓
Visual inspection of satellite imageries for quality checking
↓
Georeferenced boundary shape files were overlaid with the satellite images to visually verify and/or detect irregularities in the data/interpretation
↓
Management unit area verification
Geometrical calculation of Shapefiles and cross checking of reporting template
↓
Visual inspection
Overlaying land cover classes onto the pre-processed satellite imageries
↓
Land Clearance Verification
Overlaying land clearance shapefiles with land cover shapefiles to verify the clearance performed by the company
↓
Verification of the vegetation coefficient
Crosschecking vegetation coefficient classification with the land cover class and vegetation coefficient definitions
↓
Disturbance in prohibited areas
Identifying illegal land clearance in the prohibited areas

Flow Chart 1. The methods used to assess the LUC report submitted by the company

Data Used

Table 62. Time Series of Satellite Imagery used for LUCA

PT AMS		
Periode	**Date of Acquisition**	**Cloud Cover**
Nov 2005 – Nov 2007	28-Jul-05	0% (stripped)
Dec 2007 – Dec 2009	13-Apr-07	15% (stripped)
Jan 2010 – 9 May 2014, After the management unit acquired	10-Jul-10	10% (stripped)
by Bumitama Agri.Ltd (becoming RSPO member)	16-Jun-13	0% (stripped)
9 May 2014 – 15 Nov 2018	12-Dec-17	0%
15 Nov 2018 - November 2020	18-Sep-20	10%
(Latest satellite image used for ground truthing)	Mosaic dan cloud masking Januari 2020-September 2020	5%
Latest Condition when Verification of NPP	31-May-22	2.70%

Land Use Change Calculation

Corporate land clearance is defined as land clearing for the purpose of oil palm plantation development and all facilities that support the sustainability of oil palm plantation activities. Whereas Non-corporate land clearance is defined as land clearing outside the company's objectives, including government projects that involve the community or to build public facilities, or by community members who act individually to support their livelihoods and without funding by any funding institution or organization even.

On satellite imagery, land clearing for corporate purposes can be clearly identified since the pre-assessment in the LUCA study was conducted. Corporate clearance has different land clearing characteristics than community clearing or causes of natural disasters. Land clearing is usually relatively broad, with a fast process, land clearing patterns and land cover depicted on satellite imagery are usually systematic / regular (one or more planting blocks can be seen on satellite images, not sporadic), and land clearing forms are usually square with a straight border. An additional feature that can indicate land clearing or degradation caused by clearing by corporations is the existence of block roads.

Table 63. Historical Land Use Change in each cut-off date (in hectares), based on IUP

Land Cover	28-Jul-05	13-Apr-07	10-Jul-10	16-Jun-13	12-Dec-17	18-Sep-20	31-May-22
Agroforestry	9,809.35	9,882.25	10,026.60	9,385.27	3,099.80	2,030.72	4,243.88
Shrubs	59.25	137.17	243.59	119.44	61.10	61.10	61.10
Secondary Forest	77.92	57.80	57.80	57.80	57.80	57.80	170.19
Oil Palm			-	160.13	3,574.50	4,024.39	4,511.10
Built-up Area			-		4.65	24.74	42.53
Bareland	467.63	336.93	86.17	691.50	112.60	227.11	111.81
Bushes			-		236.67	276.07	267.95
Young Shurbs			-		3,267.03	3,712.21	1,005.58
Grand Total	**10,414.14**	**10,414.14**	**10,414.14**	**10,414.14**	**10,414.14**	**10,414.14**	**10,414.14**

Table 64. Raw land covers data per period on the potential development area

Period November 2005 - November 2007- *in hectares*

Non-Corporate

Land cover class		13-Apr-07				
		Agroforestry	Shrubs	Secondary Forest	Bareland	Grand Total
28-Jul-05	Agroforestry	9,757.02	-	-	52.33	9,809.35
	Shrubs	-	59.25	-	-	59.25
	Secondary Forest	-	77.92	-	0.00	77.92
	Bareland	125.23	-	57.80	284.60	467.63
	Grand Total	9,882.25	137.17	57.80	336.93	10,414.14

Period December 2007-December 2009- *in hectares*

Non-Corporate

Land cover class		10-Jul-10				
		Agroforestry	Shrubs	Secondary Forest	Bareland	Grand Total
13-Apr-07	Agroforestry	9,863.41	-	-	18.84	9,882.25
	Shrubs	-	137.17	-	-	137.17
	Secondary Forest	-	-	57.80	-	57.80
	Bareland	163.19	106.42	-	67.33	336.93
	Grand Total	10,026.60	243.59	57.80	86.17	10,414.14

Period January 2010-May 2014- *in hectares*

Corporate

Land cover class		16-Jun-13					
		Agroforestry	Shrubs	Secondary Forest	Oil Palm	Bareland	Grand Total
10-Jul-10	Agroforestry	0.03	-	-	160.13	117.15	277.31
	Shrubs	-	-	-	-	19.72	19.72
	Secondary Forest	-	-	-	-	-	-
	Oil Palm	-	-	-	-	-	-
	Bareland	-	-	-	-	0.00	0.00
	Grand Total	0.03	-	-	160.13	136.87	297.03

Non-Corporate

Land cover class		16-Jun-13					
		Agroforestry	Shrubs	Secondary Forest	Oil Palm	Bareland	Grand Total
10-Jul-10	Agroforestry	9,298.03	0.00	-	-	451.25	9,749.29
	Shrubs	45.44	119.44	-	-	58.98	223.86
	Secondary Forest	-	-	-	57.80	-	57.80
	Oil Palm	-	-	-	-	-	-
	Bareland	41.76	-	-	-	44.41	86.16
	Grand Total	9,385.23	119.44	-	57.80	554.64	10,117.11

Period May 2014-November 2018 (Period NPP PT AMS) - *in hectares*

Corporate

Land cover class		12-Dec-17								
		Agroforestry	Shrubs	Secondary Forest	Oil Palm	Built-Up Area	Bareland	Bushes	Young Shrubs	Grand Total
16-Jun-13	Agroforestry	0.00	-	-	2,888.13	-	-	-	-	2,888.13
	Shrubs	-	-	-	43.51	-	-	-	-	43.51
	Secondary Forest	-	-	-	-	-	-	-	-	-
	Oil Palm	-	-	-	160.13	-	-	-	-	160.13
	Built-Up Area	-	-	-	-	-	-	-	-	-
	Bareland	0.04	-	-	426.63	-	0.20	0.00	-	426.88
	Bushes	-	-	-	-	-	-	-	-	-
	Young Shrubs	-	-	-	-	-	-	-	-	-
	Grand Total	0.04	-	-	3,518.40	-	0.20	0.00	-	3,518.65

Non-Corporate

Land cover class		12-Dec-17								
		Agroforestry	Shrubs	Secondary Forest	Oil Palm	Built-Up Area	Bareland	Bushes	Young Shrubs	Grand Total
16-Jun-13	Agroforestry	3,050.69	-	-	11.04	0.32	47.32	189.42	3,198.35	6,497.13
	Shrubs	14.84	61.10	-	-	-	-	-	-	75.93
	Secondary Forest	-	-	57.80	-	-	-	-	-	57.80
	Oil Palm	-	-	-	-	-	-	-	-	-
	Built-Up Area	-	-	-	-	-	-	-	-	-
	Bareland	34.23	-	-	45.05	4.32	65.08	47.26	68.68	264.63
	Bushes	-	-	-	-	-	-	-	-	-
	Young Shrubs	-	-	-	-	-	-	-	-	-
	Grand Total	3,099.76	61.10	57.80	56.09	4.64	112.40	236.67	3,267.03	6,895.49

Period November 2018 -Maret 2020 (HCVHCS Integrated Assessment) - *in hectares*

Corporate

Land cover class	18-Sep-20								
(12-Dec-17)	Agroforestry	Shrubs	Secondary Forest	Oil Palm	Built-Up Area	Bareland	Bushes	Young Shrubs	Grand Total
Agroforestry	-	-	-	22.35		0.94		-	23.28
Shrubs	-	-	-	-	-	-	-	-	-
Secondary Forest	-	-	-	-	-	-	-	-	-
Oil Palm	-	-	-	3,518.40	-	-	-	-	3,518.40
Built-Up Area	-	-	-		0.01	-	-	-	0.01
Bareland	-	-	-	-	-	0.20	-	-	0.20
Bushes	-	-	-	-	-	-	-	-	-
Young Shrubs	-	-	-	-	-	-	-	-	-
Grand Total	-	-	-	3,540.75	0.01	1.14	-	-	3,541.90

Non-Corporate

Land cover class	18-Sep-20								
(12-Dec-17)	Agroforestry	Shrubs	Secondary Forest	Oil Palm	Built-Up Area	Bareland	Bushes	Young Shrubs	Grand Total
Agroforestry	2,030.60	-	-	583.15	9.67	42.23	15.59	395.27	3,076.52
Shrubs	-	61.10	-	-	-	-	-	-	61.10
Secondary Forest	-	-	57.80	-	-	-	-	-	57.80
Oil Palm	-	-	-	50.76	0.34	0.87	-	4.12	56.09
Built-Up Area	-	-	-	-	4.64	-	-	-	4.64
Bareland	-	-	-	-	2.89	109.51	-	-	112.40
Bushes	-	-	-	-	-	-	236.67	-	236.67
Young Shrubs	-	-	-	-	-	-	-	3,267.03	3,267.03
Grand Total	2,030.60	61.10	57.80	633.90	17.54	152.61	252.27	3,666.42	6,872.24

Period Maret 2020 - May 2021- *in hectares*

Non-Corporate

| Land cover class	31-May-22								
(18-Sep-20)	Agroforestry	Shrubs	Secondary Forest	Oil Palm	Built-Up Area	Bareland	Bushes	Young Shrubs	Grand Total
Agroforestry	2,030.72	-	-	-	-	-	-	-	2,030.72
Shrubs	-	61.10	-	-	-	-	-	-	61.10
Secondary Forest	-	-	57.80	-	-	-	-	-	57.80
Oil Palm	-	-	-	4,024.39	-	-	-	-	4,024.39
Built-Up Area	-	-	-	-	24.74	-	-	-	24.74
Bareland	-	-	-	5.24		29.86	35.45	156.57	227.11
Bushes	97.00	-	-	107.02	1.15	8.58	13.28	49.03	276.07
Young Shrubs	2,116.16	-	112.39	374.45	16.64	73.37	219.22	799.98	3,712.21
Grand Total	4,243.88	61.10	170.19	4,511.10	42.53	111.81	267.95	1,005.58	10,414.14
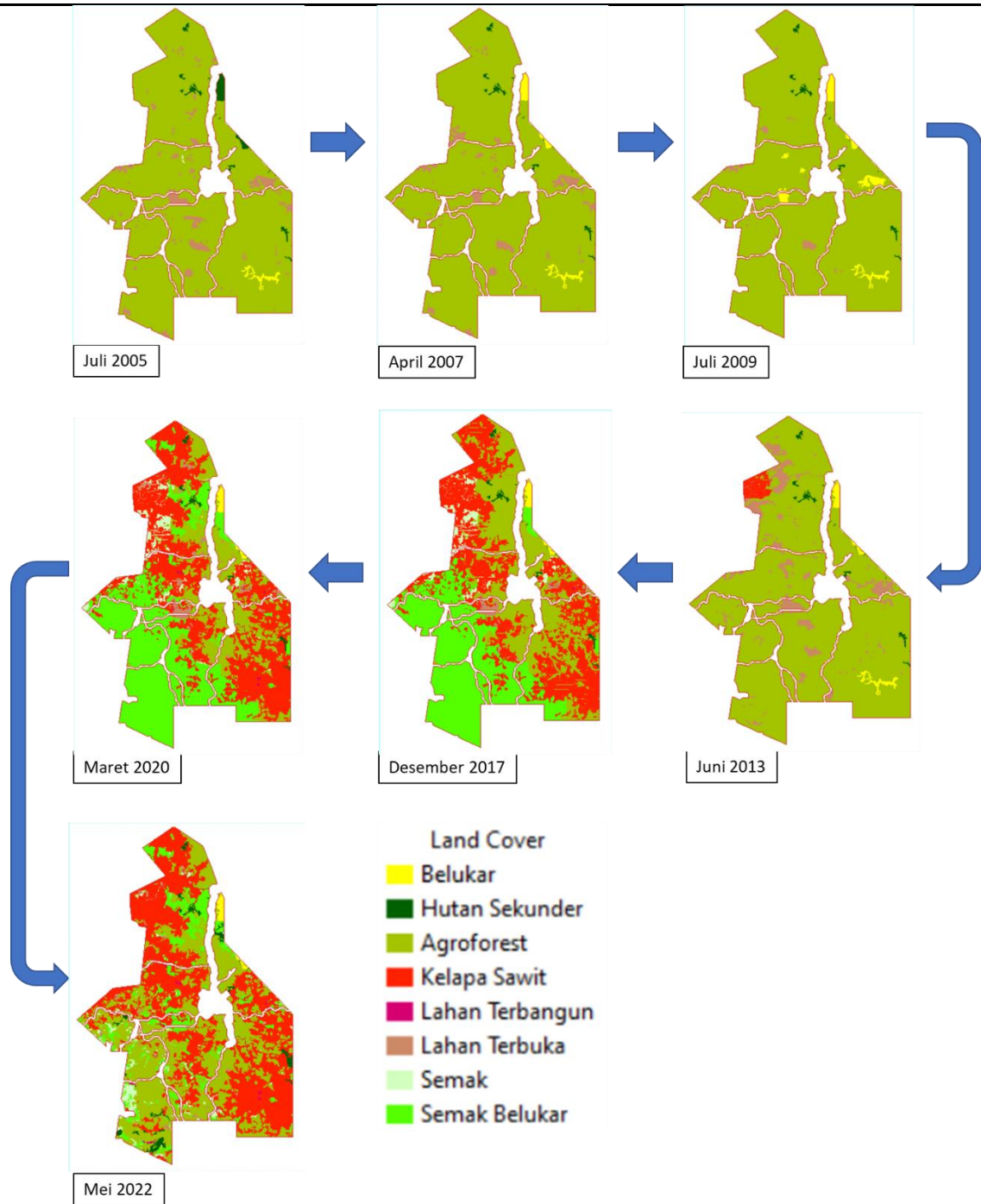
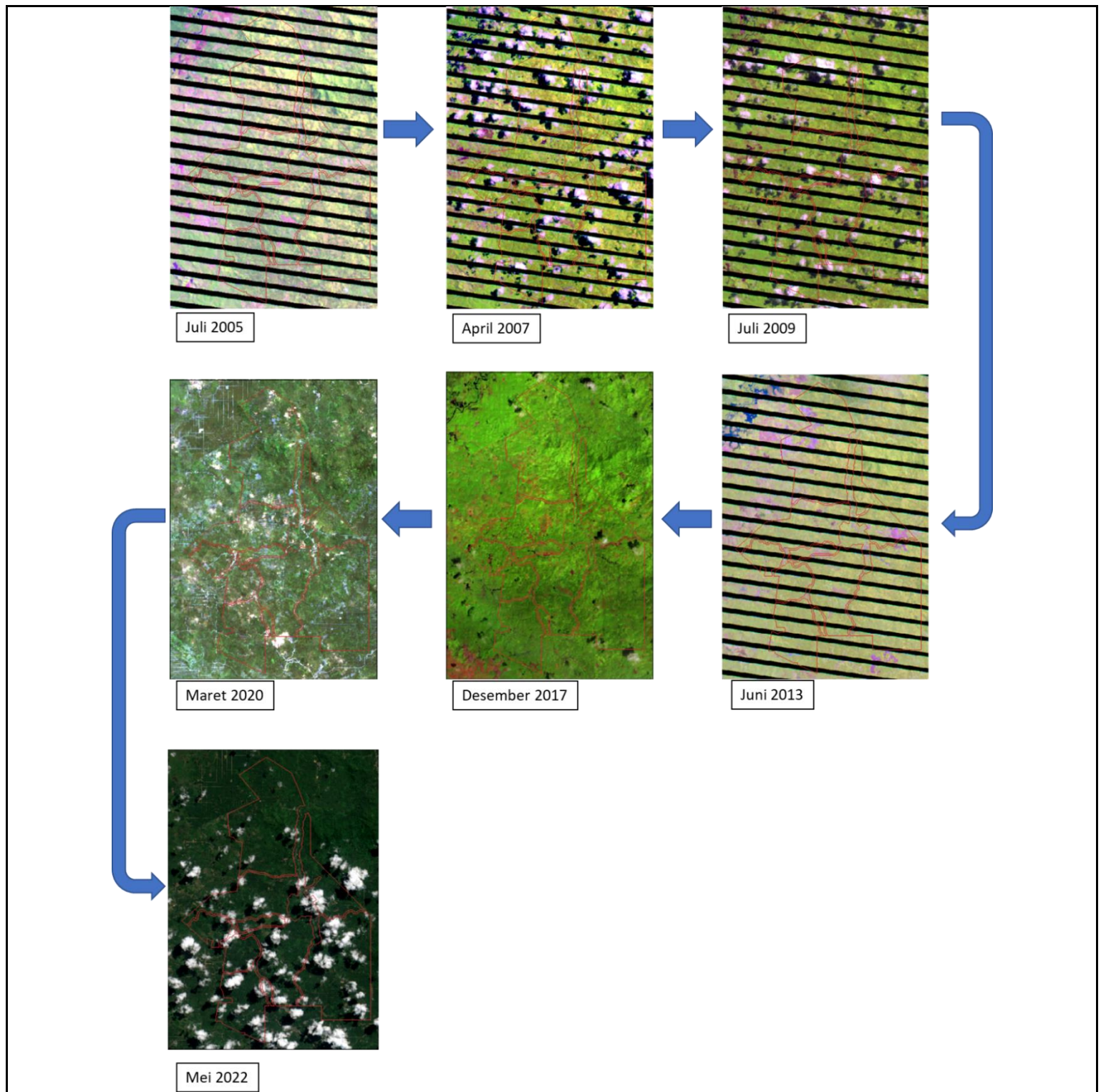Figure 42a. Time Series LUC Analysis on the potential development area

Figure 42b. Time Series LUC Analysis on the potential development area

Signature	
Name	M. Vikky Arindi
Position	Mitigation Specialist

Section 9: Conclusions

PT AMS as a subsidiary of Bumitama Agri Ltd., which is a member of the RSPO, conducts plantation operations with a commitment to the Bumitama Sustainability Policy and adheres to the required sustainability principles.

This study and assessment in the context of PT AMS's plantation operations has been carried out based on the prevailing laws and regulations in Indonesia, as well as international regulations that have been ratified. The study was conducted using a standard toolkit that has been recognized/endorsed by global institutions and the RSPO.

Management and Monitoring of recommendations for integrated HCV-HCS assessment, Social Impact, Land Management and emissions, in detail, including achievement targets and timelines are written in the Summary of Integrated Management Plan document.

Section 10: Confirmation of Report

This document is the summary of assessment result on Environment Impact Assessment (EIA), Social Impact Assessment (SIA), Integrated High Conservation Value (HCV) – High Carbon Stock HCS), and Land Use Change Analysis (LUCA) and High Carbon Stock (HCS) in PT Agro Manunggal Sawitindo – District of Ketapang, West Kalimantan Province and has been approved by the Management. This Assessment result will be applied as one of the guidelines in managing oil palm plantation.

Date of Completion	23 September 2022
Signature	
Name	**Martin Mach**
Position	**Deputy of Corporate Sustainability & CSR**
Signature	
Name	**Kamsen Saragih**
Position	**Director of PT Agro Manunggal Sawitindo**