

Output 2 National park REDD+ model is developed at Gunung Palung National Park (GPNP)

Activity 2 Components of the Output 2

According to Project Design Matrix (PDM) of the project, activities under the Output 2 are separated into 8 activities (from Activity 2-1 to Activity 2-8).

Activity 2-1 Conduct trainings on facilitation and other professional skills

1. Proposed participatory forest carbon monitoring method for GPNP and Its landscape

As discussed in 2.1. (4) of Activity 1-5 above, the Provincial REDD+ Program Implementation Working Group examines village-based forest monitoring for community participation. In monitoring GPNP and its Landscape also, the following strategies implicates the possible needs in future to monitoring Activity Data that can synchronizing monitoring spatial plans by village, and data relating to bio-diversity by GPNP Office that can contribute to bio-diversity safeguard. According to the current Head of GPNP Office, prevention and seeking solution of conflicts on boundary of national parks and forest protection in the short term⁵².

Both monitoring emphasize participation of local community from the both perspectives of spatial plans and national park management.

Table 31 Summary of strategies relating to GPNP and its Landscape monitoring

Strategy (Published year)	Main In-charge organization	Summary of strategy relating to monitoring	Remarks
Strategic Environmental Study (KLHS) on Draft Local Ordinance of Spatial Plan (RTRW) in 2014-204 of Kayong Utara District (2014) ⁵³	District Public Work Service (DisPU)	1) A team to monitor implementation RTRW will be organized mainly based on the working group on KLHS. 2) SOP and mechanism of monitoring and public ombudsman on implementation will be developed.	Local Ordinance was enacted in 2015 ⁵⁴
2016- 2025 Long-term Management Plan of Gunung Palung National Park (2015) ⁵⁵	GPNP Office (BTNGP)	1) Inventory of population on important/ protected fauna, regular monitoring by park office staff with local	

⁵² According to the results of interviews in GPNP Office on 15 Feb. 2016 (Head)

⁵³ Pemerintah Kabupaten Kayong Utara Provinsi Kalimantan Barat. 2014. Kajian Lingkungan Hidup Strategis Ranperda Rencana Tata Ruang Wilyah Kabupaten Kayong Utara Tahun 2-14-2034

⁵⁴ Peraturan Daerah Kabupaten Kayong Utara Nomor 8 Tahun 2015 tentang Rencana Tata Ruang Wilyah Kabupaten Kayong Utara Tahun 2015-2035 (18 Agustus 2015)

⁵⁵ Direktorat Jenderal Konservasi Sumber Daya Alam dan Ekosistem Kementerian Lingkungan Hidup dan Kehutanan. DIPA 2015 (Rancangan Desember 2015). Rencana Pengelolaan Jangka Panjang Taman Nasional Gunung Palung Periode 2016-2025 Provinsi Kalimantan Barat

Strategy (Published year)	Main In-charge organization	Summary of strategy relating to monitoring	Remarks
		<p>community (Objective 3. Maintaining important/ protected species in situ national park)</p> <p>2) Inventory of population on important/ protected flora, regular monitoring by park office staff with local community (Objective 3. Maintaining important/ protected species in situ national park)</p> <p>3) Participatory mapping of community use space in Special Zone/Traditional Use Zone/Buffer Zone to agree spatial plan and management rules, establishing zone rules as customary law/ village regulation (Objective 4. Maintaining cultural and social benefit)</p> <p>4) Inventory of economically potential nature resources (Objective 4. Maintaining cultural and social benefit)</p> <p>5) Inventory of potential of eco-tourism and environmental service (Objective 5. Realizing economic benefit to local development)</p> <p>6) Development of database and management information system (Objective 7. Utilization of management information system in decision making on national park management)</p>	

(1) Forest ecosystem carbon monitoring resources of GPNP and stakeholders

According to the information obtained in the regular meeting of “Gunung Palung Friends Forum”⁵⁶, which is in the process of preparation for multi-stakeholders’ forum aiming at landscape management, the following potential partners in implementation of monitoring. Especially “ASRI”, NGO in cooperation with GPNP has community partners called as “Sahut” to observe indication of illegal logging at 34 hamlet (dusun) around the national park.

⁵⁶ Held on 11 Nov. 2015

Overviews of Potential Implementers of Monitoring in Field Level (GPNP Landscape)

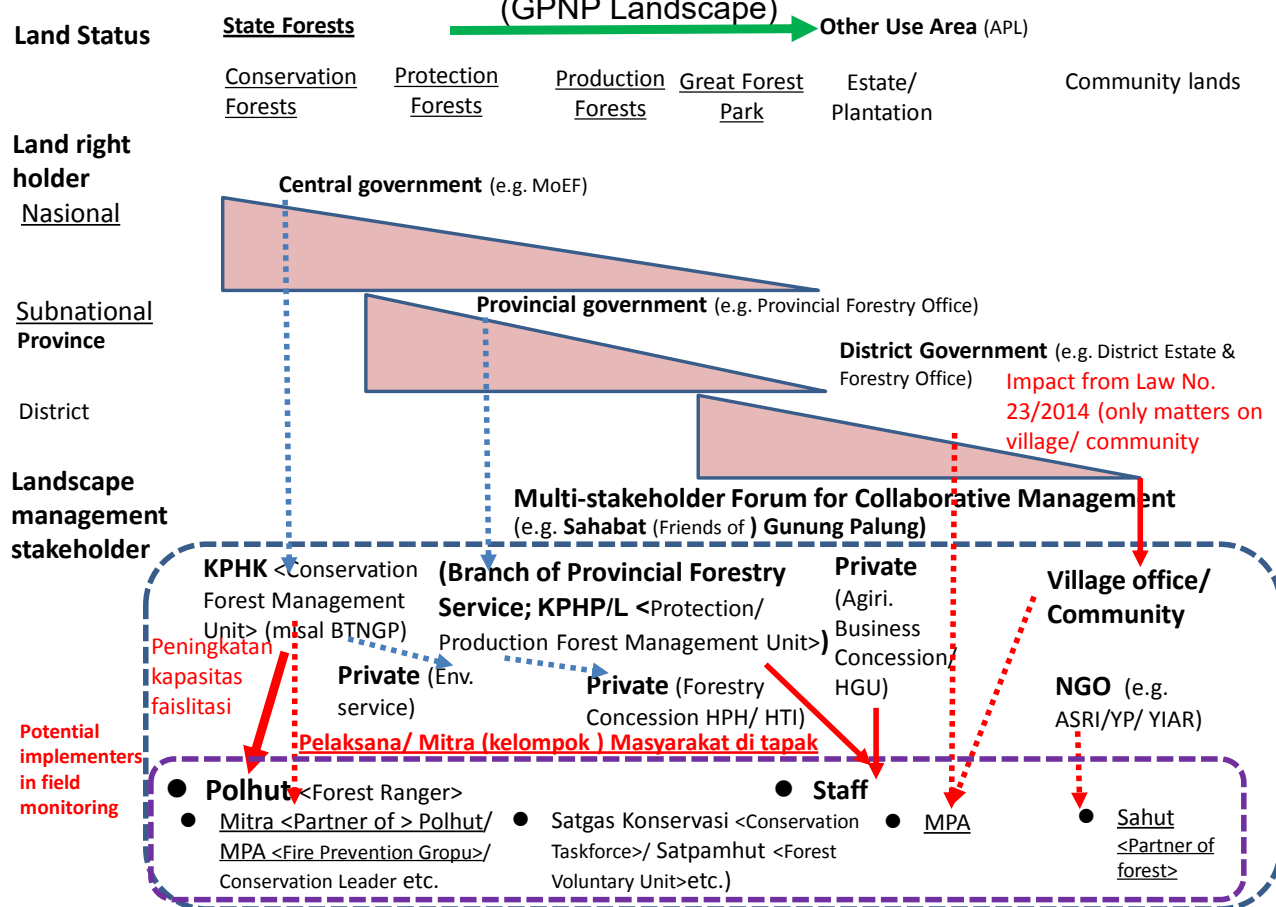


Figure 53 Summary of potential partners in implementation monitoring of GPNP and its Landscape management

Table below shows the summary of monitoring resources mainly potential community partners of GPNP Office.

- The former targeted villages of CCLA approach in IFCS are limited. There is also a case that sense of ownership of village administration is limited⁵⁷.
- It is assumed that patrol activities for collaborative management of zonation of Special Zone/ Traditional Use Zone/ Buffer Zone will involve MMP as the community partners of forest rangers, and MPA as fire prevention volunteers group of the villages located adjoining such zones. When it comes to collaborative management for whole area, it is better to involve village administration itself⁵⁸ which can easily synchronize monitoring Village Spatial Plan (RTR Desa) or MPA organized mainly by district authorities concerns, because all villages don't have MMA and MPA organized by GPNP Office.

⁵⁷ According to the results of interviews in Sudahan Jaya Village Office on 16 Feb. 2016 (Village Head)

⁵⁸ The village head of Sedahan Jaya Village at the regular meeting held on 11 Nov. 2015 for organizing forum proposed regular joint patrol with national park office and village.

Table 32 Summary of monitoring resources as community praters of GPNP and its Landscape
(As of collected information by Dec. 2015)

No.	Village (Sub-district)				Adjacency to GPNP*	Community partner of GPNP	
		Former IFACS (CCLA approach) targeted villages ⁵⁹	IJREDD targeted model villages	Forum scope (Sub-di strict)	PD: PD Scope (+Added in PD scope enlargement)	MMP 60	MPA ⁶¹
	Kayong Utara District						
	(Sei. Laur Sub-district)			*			
	(Simpang Dua District)			*			
	(Simpang Hulu Sub-district)			*			
	(Simpang Hilir Sub-district)			*	PD		
1	Batu Barat		*		*		X
	Lubuk Batu				+		
2	Matan Jaya		*		*		
3	Medan Jaya	Implemented by Gemawan			*	X	X
	Nipah Kuning				+		
4	Penjataan				*		
	Padu Banjar				+		
	Pemangkat				+		
	Pulau Kumbang				+		
5	Rantau Panjang				*	X	X
6	(Sungai) Mata-mata	Implemented by Gemawan			*	X	X
7	Teluk Melano				*		X
	(Sukadana Sub-district)			*	PD		
8	Benawai Agung	Implemented by ASRI			*		
9	Gunung Sembilan				*		
10	Harapan Mulia	Implemented			*	X	X

⁵⁹ Community Conservation Livelihood Agreement (CCLA) approach conducted by IFACS cooperation, through by local NGOs of ASRI and Gemawan

⁶⁰ Forest rangers' partner community(Masyarakat Mitra Polhut): 30persons/ group

⁶¹ Fire prevention volunteers community (Masyarakat Peduli Api) organized by GPNP in 2010 (6 persons/ village)

No.	Village (Sub-district)				Adjacency to GPNP*	Community partner of GPNP	
		Former IFACS (CCLA approach) targeted villages ⁵⁹	IJREDD targeted model villages	Forum scope (Sub-di strict)	PD: PD Scope (+Added in PD scope enlargement)	MMP 60	MPA ⁶¹
		by Gemawan					
11	Pangkalan Buton	Implemented by Gemawan			*	X	
12	Pampang Harapan				*		
13	Sedahan Jaya	Implemented by ASRI	*		*		
14	Sejahtera	Implemented by Gemawan	*		*		X (12 persons)
15	Simpang Tiga	Implemented by Gemawan			*		
16	Sutera	Implemented by ASRI (Dus. Payak Itam)			*	X	
	Ketapang District						
	(Mantan Hilir Utara Sub-district)			*			
17	Kuala Satong				*		
18	Laman Satong				*		X
19	Riam Berasap Jaya	Implemented by ASRI	*		*	X	X
	(Nanga Tayap Sub-district)			*			
20	Sempurna(**A)		*		*		
21	Teluk Bayur				*		
19	Pangkalan Telok	Implemented by ASRI (Dus. Pangakalan Jihing)			*		
	Sandai Sub-district						

No.	Village (Sub-district)				Adjacency to GPNP*	Community partner of GPNP	
		Former IFACS (CCLA approach) targeted villages ⁵⁹	IJREDD targeted model villages	Forum scope (Sub-di strict)	PD: PD Scope (+Added in PD scope enlargement)	MMP 60	MPA ⁶¹
22	Penjawaan				*		
23	Jago Bersatu				*		
	Sandai Laur Sub-district						
24	Cali						
25	Pengkalan Teluk						

(2) Institutional arrangement of data collection and management of GPNP

GPNP office operates Conservation Data Information System (SIDAK)⁶² prepared by Directorate General of Nature Conservation and Forest Protection (PHKA; now Directorate General of Nature Resource and Ecosystem Conservation [KSDAE]). Approximately 5 staffs of GPNP office concurrently do collecting data from the staff stationed at the branch of GPNP office (Seksi, Resort) and then input and/or process the data. Monitoring plays a role of data collection system to support database system.

Draft Long-term Management Plan of GPNP suggested the needs of “Database Administrator” who works full-time in charge of data collection and management systematically so as to control quality of data management. The results of meeting with the Head and the persons who area in charge of database in GPNP Office held on 17 Feb. 2016 concludes that building a database focusing on data collection and management needed for Resort Based Management (RBM) taking into consideration needs for management of this national park not just according to SIDAK from the view point of national park management.

Meanwhile a private company who is a member of “Friends of Gunung Palung” Forum uses a free and open sourced software called as SMART⁶³ for patrol. The forum conducted sharing the experiences to use monitoring tool (case of using SMART, data entry format at field using free open-sourced appreciation for mobile phone).

Furthermore the forum continues preparation for holding training how to use SMART. According to the progress of these development, GPNP Office will start to examine building a RBM-based database using SMART and then collecting data by entry data directly at field using such appreciation for mobile phone.

⁶² Sistem Informasi Pendataan Konservasi PHKA

⁶³ Spatial Monitoring and Reporting Tool. This software was developed by the cooperation international NGOs who are active in wildlife conservation for patrols by rangers. One of option is tablet with GPS build-in.

1.2. (Proposed) Participatory forest carbon monitoring method for GPNP and its Landscape

(1) (Proposed) GPNP facilitation model to field level forest carbon monitoring of protected area's landscape

The following model as facilitation method to field level forest carbon monitoring is proposed based on the discussion in 1.1 above and taking into consideration for producing synergy to other activity outputs for Output 2 of IJ-REDD+.

(Proposed) Field Monitoring Development Model

(GPNP Landscape & Applicable to HL etc.)

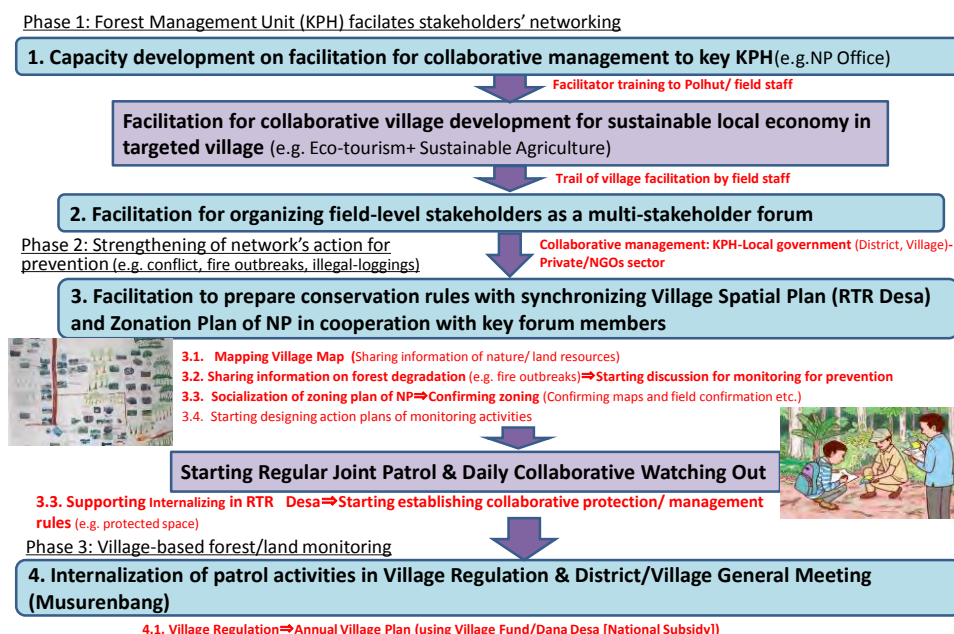


Figure 54 (Proposed) Phased facilitation process to village-based forest monitoring of GPNP and its Landscape

GPNP Office will be requested to facilitate to prepare rules of implementation of regular joint patrols and management of protected space in village level as the basis of monitoring of Village Spatial Plan.

(2) (Proposed) Basic method of implementation of field level forest carbon monitoring by GPNP and its Landscape's multi-stakeholders' forum

The table below proposes a method for GPNP office to conduct field monitoring on activity data (forest degradation etc.) through collaboration with villages (village-based monitoring). Field monitoring comprised "Regular Joint Patrol" and "Daily Collaborative watch-out" based on the collaborative mind developed through Regular Joint Patrol. The field information detected in patrol will be used to plan reduction activities promptly by sharing the information through the branch of GPNP Office.

Table 33 (Proposed) Basic items of implementation of field level forest carbon monitoring by multi-stakeholders of GPNP and its Landscape

Component	(Draft) Basic plan	Remarks
Activity Data	<p>The existing base maps⁶⁴ will be corrected and improve as follows.</p> <p>Village will play hub function of monitoring data collection and management based on the patrol/watch-out rules in village level. Village records monitoring data (common format and updating Village Maps by hand-written) based on the patrol rules. The data will be shared by reporting to the branch of the National Park Office.</p> <p>The Regular Joint Patrol focuses on around inside the boundary of NP. In the Regular Joint Patrol, free and open source software for mobile phone will be used to entry data at field, which can integrate into database system integrated with RBM using free open source software SMART (data entry by mainly patrol implementers from the National Park Office, District and private company).</p> <p>The data of updated Village Map of Daily Collaborative Watch-out will be collected by the National Park Office regularly to prepare GIS-digitalized map.</p> <p>The base maps will be updated on the results above using GIS (using Q-GIS etc. which can be usable freely). The result including recapitulation of area calculation will be shared through Provincial BLHD.</p>	<p>The Forum will contribute to update the base maps in provincial annual monitoring in cooperation with (developing) Provincial REDD+ Program Implementation Working Group. National Park Office will function as database center of Forum.</p>
Emission Factor	Not covered	Covered by Monitoring conducted by (developing) Provincial REDD+ Program Implementation Working Group
GHG equivalent calculation	Not covered	Covered by Monitoring conducted by (developing) Provincial REDD+ Program Implementation Working Group

⁶⁴ The detailed LC maps prepared as the REDD+ base maps in the course of IJREDD (Current time is 2013) are also utilizable.

The Forum will support to prepare and update GIS digitalized maps of village maps and feed back to village so as for villages to utilize for village development (see the figure below).

(Proposed) Basic Structure of Data Collection & Management Process in Village-based Forest Monitoring

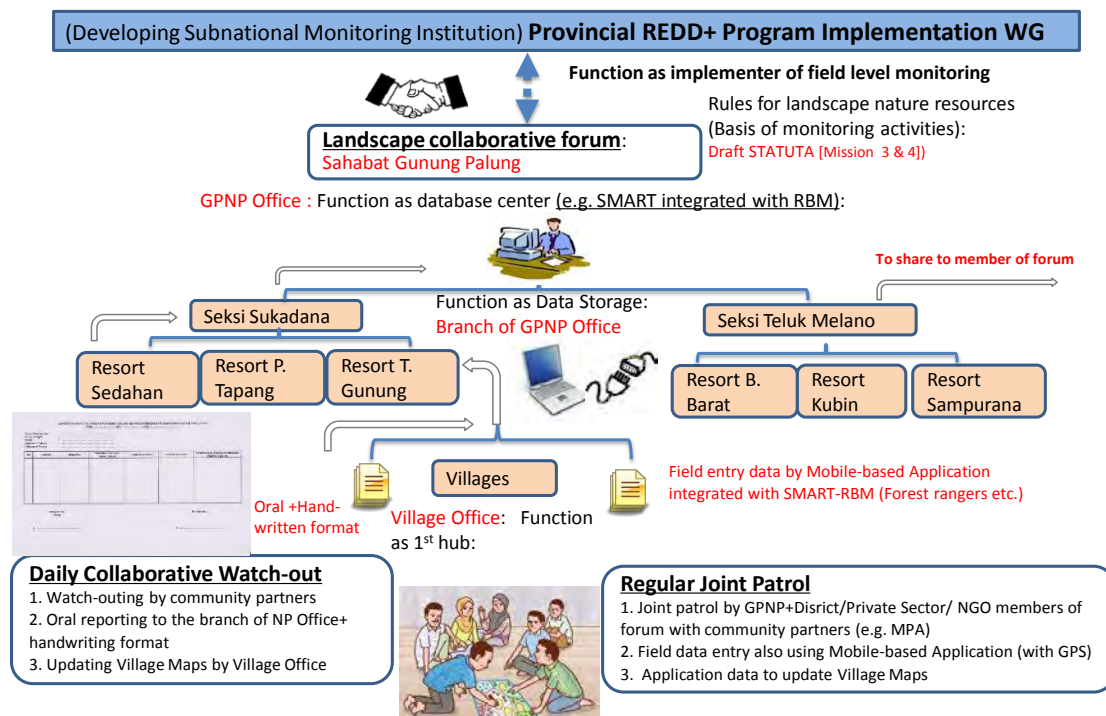


Figure 55 (Proposed) Structure of monitoring (data collection and management system plan) of GPNP and its Landscape management

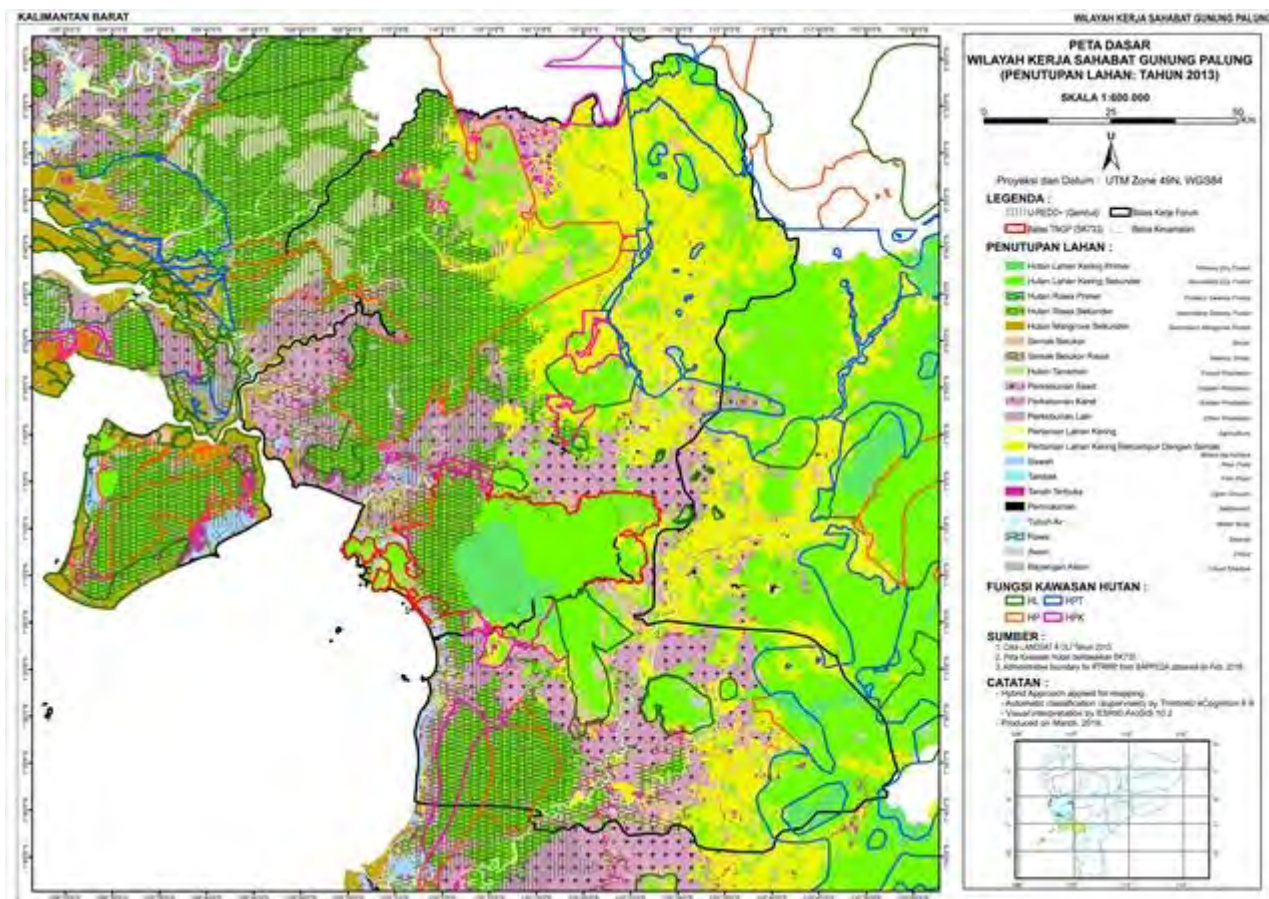


Figure 56 Sample of base map for Collaborative Monitoring in field level by the Forum

(3) Discussion on forest carbon monitoring method in implementation by applying REDD+ project scheme for GPNP and its Landscape

Because the candidate proponent is not defined, it is difficult to examine the feasible forest carbon monitoring method in implementation of landscape by applying REDD+ Prone scheme. And monitoring should continue in the long run, the method should be sustainable and appropriate to role and capacity of stakeholders. The followings are some draft for discussion with stakeholders.

- In applying REDD+ project scheme at pilot sites of GPNP and its Landscape, monitoring of activity data mainly collected by utilizing satellite imagery and emission factors mainly collected by sample plot survey will be conducted in cooperation with “(developing) Provincial REDD+ Program Implementation Working Group” once 5 years. The detailed LCMs covering project design scope will be updated.
- In order to supplement the monitoring mentioned above and to support implementation of field monitoring by “(developing) Provincial REDD+ Program Implementation Working Group”, implementation of village-based forest monitoring discussed above will be supported.
- In order to smooth reporting to carbon credit accreditation scheme, a proponent will be requested to

outsourcing to university or private company who are familiar with concrete planning, implementation and reporting of project monitoring.

Table 34 (Proposed) Basic plan of monitoring plan for application of REDD+ project schema for GPNP and its Landscape

Component	Perspective	(Draft) Basic Plan	Remarks
Organization/Personnel	Overall Administration and supervision	Proponent (Project Manager)	Not defined
	GIS data storage (Village maps etc.)	GPNP Office (Database Administrator)	Not defined
	Data backup and IT system management	GPNP Office (Database Administrator)	Not defined
	Remote sensing processing on change	(Developing) REDD+ Implementation Group Provincial Program Working	a) Under discussion by Provincial BLHD b) To be audited by BPKH for QA/QC
	GIS analysis on change	(Developing) REDD+ Implementation Group Provincial Program Working	a) Under discussion by Provincial BLHD b) To be audited by BPKH for QA/QC
	Overall data backup and IT system management	(Developing) REDD+ Implementation Group Provincial Program Working	Under discussion by Provincial BLHD
	Documentation and outreach	Proponent (Communication Coordinator)	Possible disclosure at Website which is under discussion to be established by Provincial BLHD/ Provincial REDD+ Working Group

2. Training to facilitate implementation of participatory forest carbon monitoring of GPNP and Its landscape

(1) Implementation of training to facilitate for village-based forest monitoring

Based on the discussion above, the following trainings were conducted to facilitate village-based forest monitoring at Sudahan Jaya Village as the first trial village.



Discussion on patrols to prevent illegal-logging (Multi-purpose hall of village office)(25 Feb. 2016; Sudahan Jaya Village, Sukadana Sub-district, Kayong Utara District)



Reviews on fire outbreaks in 2015 at Forum Meeting (Environmental Education Center of Yayasan Gunung Palung [Local NGO]) (16 Mar. 2016; Pampang Harapan Village, Sukadana Sub-district, Kayong Utara District)

Figure 57 Overview of On-the-Job Training to facilitate village-based forest monitoring by multi-stakeholder forum

(2) Capacity building measures for implementing village-based forest monitoring for GPNP and its surrounding landscape

The following activities are proposed as the necessary capacity building based on the discussion in 1.2 (2) above.

Table 35 (Proposed) Capacity building measures for preparing implementation of village-based forest monitoring for GPNP and its surrounding landscape

Component	Targets	Necessary capacity	(Draft) Building measures	Remarks
Activity Data	Community partners of forum, and persons concerned with village administration	Capacity to do joint patrol and to update Village Maps using the patrol results	Field practice/ Field FGD in each targeted village	a) Participated by the following resource persons <ol style="list-style-type: none"> Village spatial plan: District and Village Office etc. Boundary of GPNP: Former forest rangers who were in charge of the targeted villages, BPKH Zoning of NP: GPNP Office SMART Tablet etc.: Private sector b) After field practice/ field FGD, a practice to design action plan for monitoring activities (rules of implementation, format of handwriting data collection) .

Activity 2-2 Study drivers of deforestation/degradation and diversity of local conditions.

1. Implement socio-economic survey and analysis⁶⁵

In this study, analysis was conducted using the results of land cover maps created for analysis of four district maps, as well as results of a socio-economic survey, in order to ascertain the drivers of deforestation/degradation. Then from the results of the socio-economic survey, conditions such as each region's livelihood activities, use of natural resources, land use and agricultural production activities were arranged, drivers of deforestation and degradation were specified, and various regional situations were sorted. The results of the socio-economic survey were compiled in a Socio-economic Survey Report (Supplemental Document 1), and the same report also compiled details of regional diversity.

2. Ascertaining land cover changes using satellite image analysis

In order to ascertain the relevance between changes to deforestation and degradation and other changes to land use, the results of analysis of four district maps were used to sample land cover of 24 surrounding villages and two counties with a buffer of four villages and 5 km, and changes to the rate of deforestation and other land use that occurred during the period from 2000 until 2013 were ascertained (Figure 58). Criteria for establishment of the extracted buffer was set at 5km after determining from interviews that this was the accessible distance to community people on foot or by motorcycle.

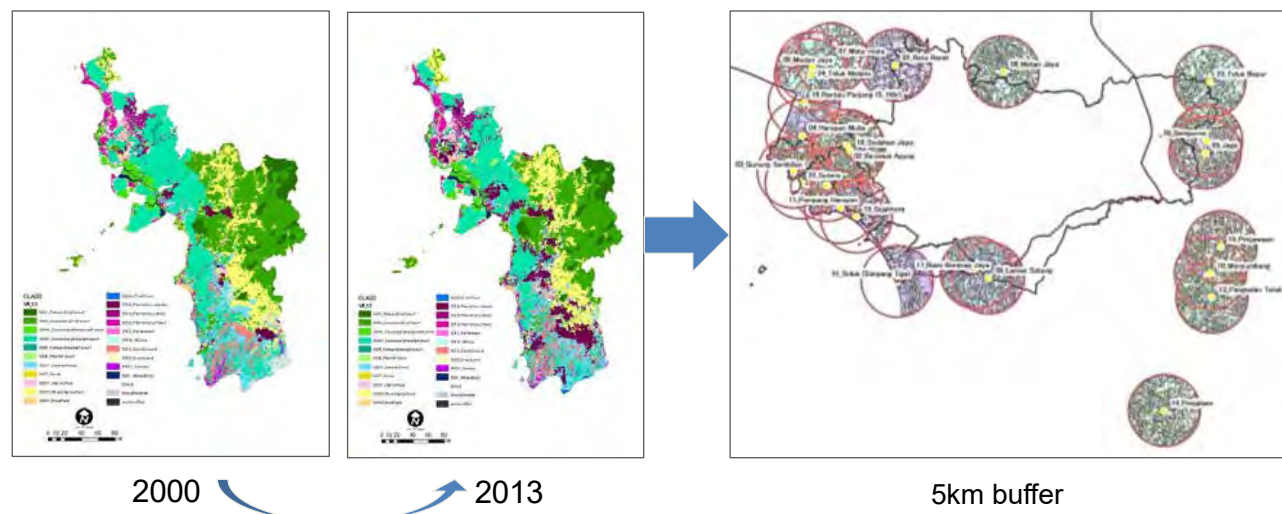


Figure 58 Process for ascertaining land cover change

The land covers obtained from the results of satellite image analysis, Primary Dry Forest, Secondary Dry Forest, Primary Mangrove Forest, Secondary Mangrove Forest, Primary Swamp Forest, Secondary Swamp Forest and Plants Forest were integrated as Forest Area, and changes to forest area where

⁶⁵ The detail result of socio-economic survey compiled as a report (see see Appendix 6)

arranged. It was found that Pangkalan Teluk, Mensumbang and Penjawaan, where the rate of deforestation is high, are located in the eastern part of the National Park, while Jago and Sempurna are adjacent to the eastern part of the National Park (Table 36), and there is much deforestation on the eastern side. On the other hand, villages where the rate of deforestation is 10% or lower are dispersed on the western side of the National Park and along the national border, and the reason for the low rate of deforestation was attributed to the limited area of accessible forest.

Table 36 Changes to forest areas

Village	Forest area (ha) 2000	Forest area (ha) 2013	Deforestation rate % 2000-2013
Pangkalan Teluk	3,680.2	219.0	94.05%
Penjajaan	3,235.8	281.4	91.30%
Mensumbang	3,682.8	489.3	86.71%
Penjawaan	4,798.7	742.2	84.53%
Jago	5,323.3	2,566.8	51.78%
Sempurna	5,403.1	2,690.2	50.21%
Mata-mata	2,532.7	1,471.1	41.92%
Teluk Melano	2,942.1	1,757.4	40.27%
Simpang Tiga	2,630.5	1,592.8	39.45%
Teluk Bayur	3,509.9	2,148.1	38.80%
Medan Jaya	3,429.7	2,174.0	36.61%
Riam Berasap	5,110.8	3,314.5	35.15%
Rantau Panjang	1,711.0	1,147.7	32.92%
Laman Satong	5,008.3	3,361.9	32.87%
Pemangkat	7,937.9	5,747.8	27.59%
Pulau Kumbang	11,009.9	8,455.9	23.20%
Nipahkuning	8,392.3	6,475.6	22.84%
Padubancar	9,138.3	7,513.4	17.78%
Pampang Harapan	2,858.1	2,469.4	13.60%
Sejahtera	2,801.8	2,479.2	11.51%
Harapan Mulia	3,089.0	2,772.6	10.24%
Matan Jaya	5,782.6	5,200.9	10.06%
Sutera	2,956.1	2,679.0	9.37%
Gunung Sembilan	2,859.6	2,619.6	8.39%
Batu Barat	3,799.6	3,669.7	3.42%
Benawai Agung	3,311.8	3,279.7	0.97%

Village	Forest area (ha) 2000	Forest area (ha) 2013	Deforestation rate % 2000-2013
Sedahan Jaya	3,662.1	3,693.9	-0.87%
Pangkalan Buton	3,823	3,867	-1.13%

In order to identify the land use contributing to changes in forest area, the numerical values of other land cover in the sampled 5km buffer for each village with a forest area decrease rate of 30% or higher were totaled, and each land cover correlation was confirmed. As a result of the analysis, it was established that there were four types of land cover related to forest area change: rubber, shrubs, farming areas and oil palm plantations. However, the area of change for rubber and shrubs was small. Therefore multiple regression analysis was conducted for three land cover types of forests, farming areas and oil palm plantations. As a result of multiple regression analysis, it was observed that there was significance affecting forest area in two land uses, as the value of Significance F appeared as 0.035 (coefficient of determination: 0.5). In addition, both farming area (-0.25) and oil palm plantations (-1.03) have negative coefficients, which proves that they have a negative effect on forest area change. Furthermore, oil palm has a t value of -7.09, and it was found that this had an effect on forest area decrease close to 10 times greater than that of farming areas.

Table 37 Results of multiple regression analysis

	Degree of freedom	Change	Variance	Observed variance ratio	Significance F
Regression	2	513,672,298.6	256,836,149.3	27.795	0.035
Residual	2	18,480,488.9	9,240,244.5		
Total	4	532,152,787.5			

	Coefficient	Standard error	t	P-value	Lower limit 95%	Upper limit 95%
Constant (forest)	69,128.45	8,612.44	8.03	0.02	32,072.13	106,184.76
Oil palm	-1.03	0.14	-7.09	0.02	-1.65	-0.40
Farming areas	-0.25	0.34	-0.72	0.54	-1.73	1.23

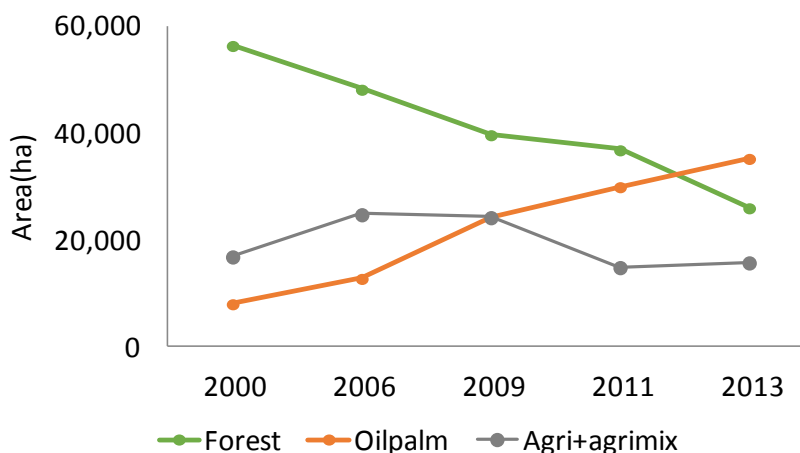


Figure 59 Land cover changes

3. Additional survey results from 4 villages around a Protection Forest

In order to understand the socio-economic situation around the National Park, additional surveys were conducted in 4 villages (Padu Banjar, Pulau Kumbang, Pemangkat, and Nipah) around the Sungai Paduan Protection Forest in Kayong Utara District (the areas inside the circles in the map below).

The purpose of this survey was to investigate whether or not the regions around the National Park have the same socio-economic conditions as the National Park, thus 2 sub-villages were selected from 4 villages as survey samples, covering a total of 8 sub-villages, and 10 households were sampled from each sub-village, and 80 samples were taken in total.



Figure 60 Surveyed areas

3.1. Changes in forest area in 4 villages around a Protection Forest

Using satellite image analysis results, 5 km buffer circle was set around the 4 target villages, and land cover was checked from the year 2000 until 2013. The deforestation rate in the 4 villages was 17-27%. (However, there was a large amount of cloud cover in the data on 2013, and it is possible that the deforestation rate is rising because the forest area that can be analyzed as it was decreasing) (Figure 59). Moreover, changes to forest area and other land cover were shown in the diagram below (Figure 81). As a result of performing analysis of variance to look for the main causes impacting on forest area, it was ascertained that compared with areas around the National Park (particularly the northern and southern side), there was little effect from oil palm plantation development, and use of agricultural land was having a negative impact. It was suggested as being possible that the existence of the Protection Forest prevents issuance of large-scale concessions and mitigate the deforestation rate.

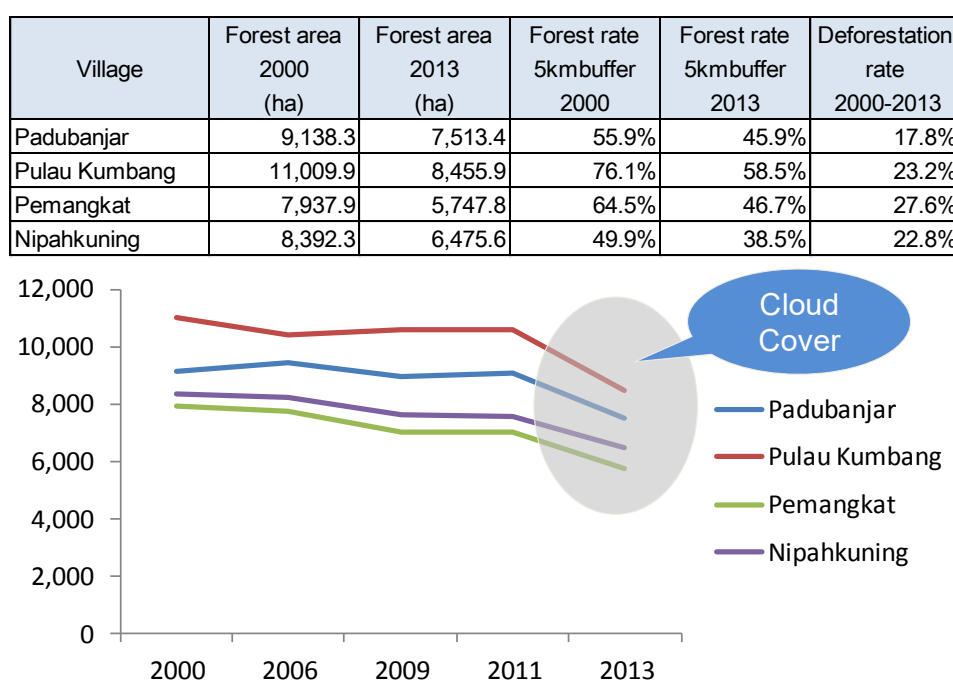


Figure 61 Changes in forest area

t-ratio	Padubanjar	Pulau Kumbang	Pemangkat	Nipahkuning
Agriculture	-6.592	-0.437	-100.723	-9.490
Plantation_oilpalm	-9.476	-3.535	-23.800	-4.626
Plantation_rubber	-2.865	2.314	-20.827	-0.456

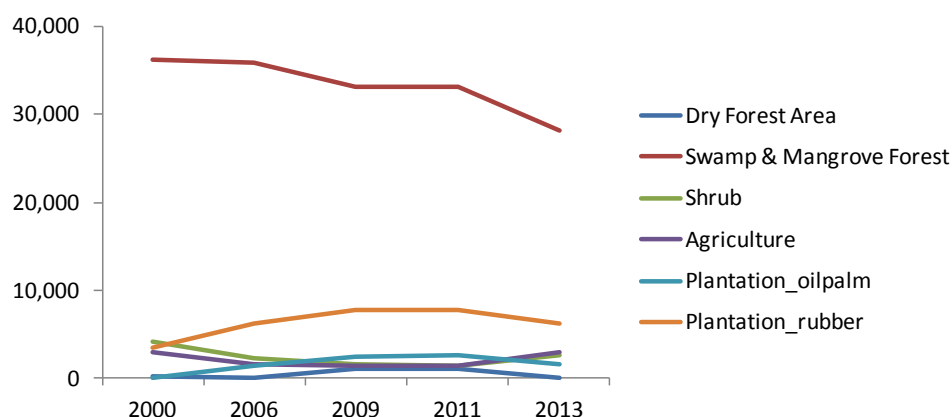


Figure 62 Result of changes to forest area and analysis of variance

4. Identification of agents and drivers of deforestation and forest degradation

Based on the sources described above, 1 agent group was identified in planned deforestation and 3 agents group were identified in unplanned deforestation and forest degradation. Oil palm plantation settler is the main agents responsible for deforestation since around the year of 2007. Other agents, small scale subsistence farmers who converted forest area to crops land and forest resource user, also present in the project area.

a. Planned deforestation

This REDD+ program defines one main agent and drivers of deforestation and forest degradation-converting the forest area to oil palm plantation. These are the dominant agents of deforestation and forest degradation in the area and are expected to be in the coming decades.

Agent 1	Oil palm plantation settler
Driver	In accordance with the satellite imagery analysis, area of plantations has been increasing since 2006.

b. Unplanned deforestation and forest degradation

There are other potential agents of deforestation and degradation in the project area however according to expert opinion these do not cause significant deforestation in comparison to agent 1. In order to secure the safeguard aspects the REDD+ program also need to consider following agents;

Agent 2	Subsistence small scale farmer without irrigation system (rice production in dry paddy)
Driver	<p>- Land use conversion for crops land</p> <p>The community who are engaging in upland rice and/or shifting cultivation. Their main income generation is labor salary in oil palm plantation. Instable employment condition has community returned to substantial farming like shifting cultivation and there is a possibility that the number of land conversion to crops land will be increasing by population growth of the target area.</p>

Agent 3	Forest resource user in particular non timber forest products (NTFPs)
Driver	<p>- Growing forest resource utilization pressure</p> <p>The fuel wood is the main source of cooking while propane gas is widely introduced in project area. Approximately 76% (minimum30%- maximum97%) of target households collecting fuel woods in forest area and 19% (minimum3.3%- maximum71.5%) of target households are deriving their income from NTFPs selling. The customary way of natural resource use is sustainable. However there is the possibility that the forest utilization pressure will be increasing by population growth of the target area.</p>

Agent 4	Small scale loggers
Driver	<p>- Logging</p> <p>In mainly 1990's, the impact on deforestation caused by illegal logging had been decreasing since the main income source around project area has been shifted to employment of oil palm plantation and logging for self consumption as building materials are continuing on a small scale. However there is the possibility that the timber utilization will be increasing by population growth of the target area.</p>

Activity 2-3 Identify Target Villages and share information on IJ-REDD at the villages

1. Selecting Procedure of Target Villages

Diverse livelihoods and forms of resource use can be seen in Gunung Palung National Park and the surrounding area, so grouping was carried out based on the socio-economic survey conducted in 2-2 with the aim of selecting Target Villages using principal component analysis. Analysis was performed with grouping by tallying questionnaires from the socio-economic survey, selecting from the socio-economic survey the causes impacting on deforestation inside the National Park and causes likely to mitigate the impact. The figure below (Figure 63 and Figure 64) shows the processes for grouping.

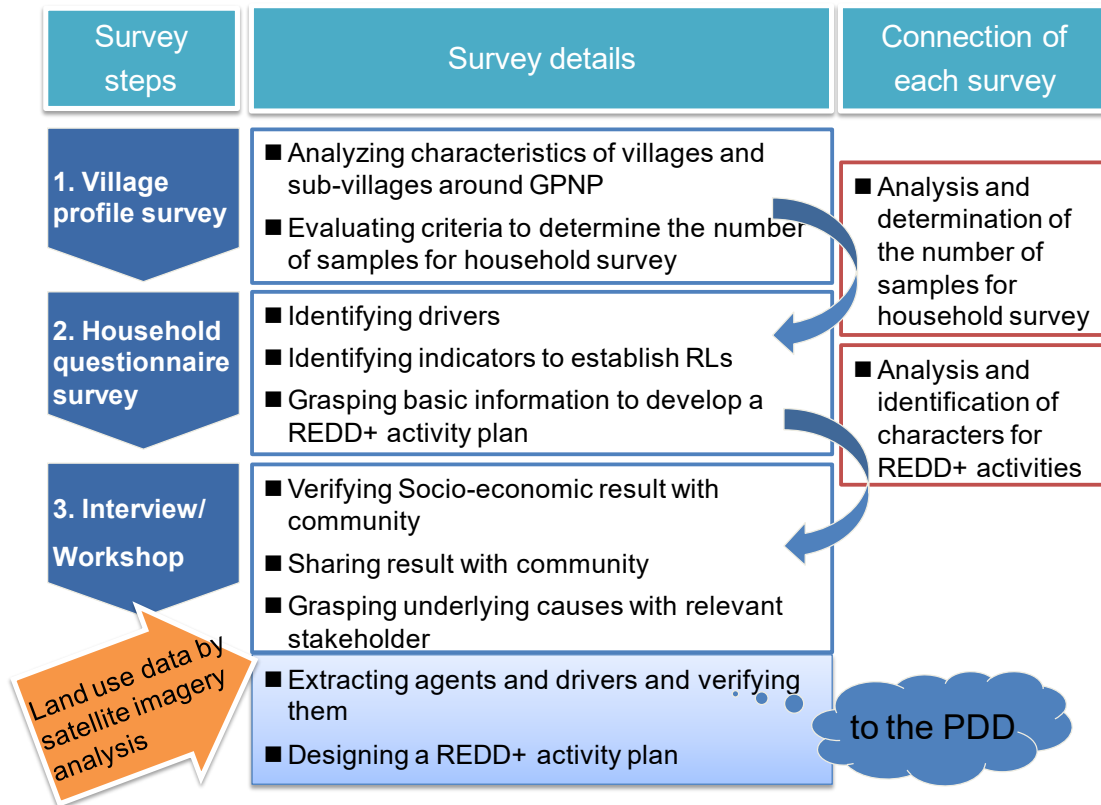


Figure 63 Survey flow chart

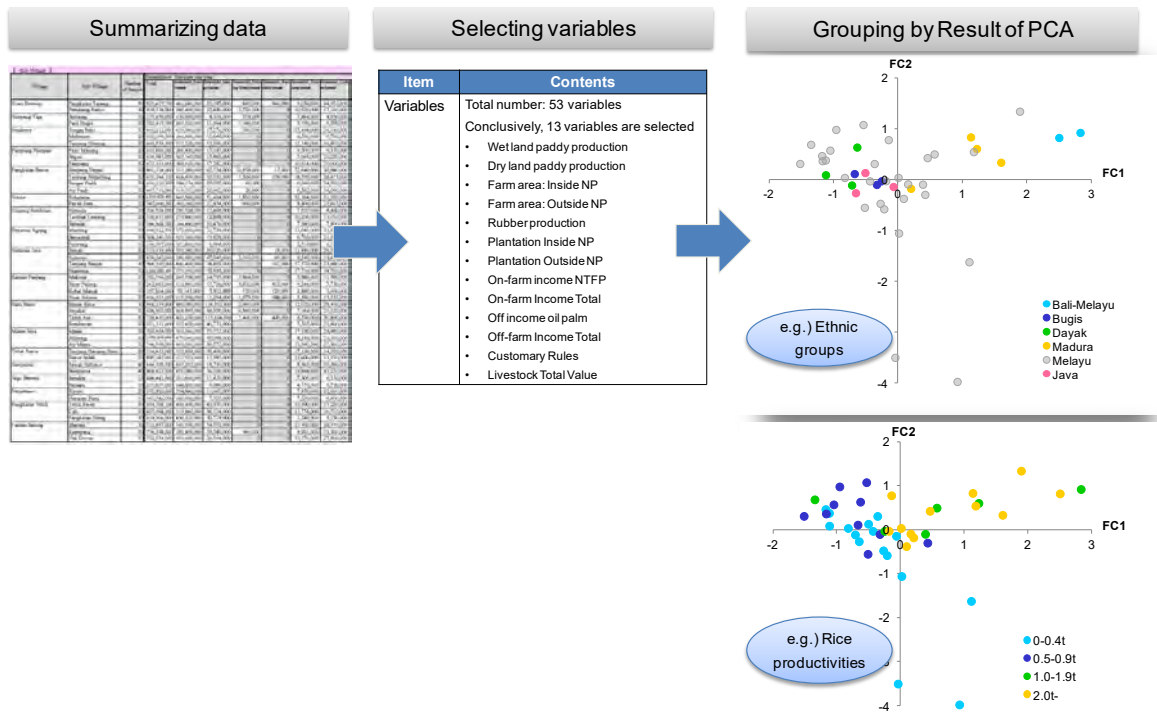


Figure 64 Survey Procedure

2. Grouping villages by principal components analysis

As seen up to this point, the survey results show that there are differences in the living conditions and farming methods of each community, then the average values of each community were calculated and analysis was carried out based on these data. Although this produces a disadvantage in this information related to household-specific qualitative differences can no longer be used, it becomes possible to appropriately express spatial characteristics in a survey that is deeply linked to land use. The following four points outline the purpose of socio-economic surveys:

1. To specify the driver(s) behind deforestation/degradation of forests. To clarify the principal causes behind the driver(s).
2. To sample resident groups relating to the driver(s) behind deforestation/degradation of forests from a social and spatial perspective.
3. To draft REDD+ activities in order to reduce deforestation/degradation of forests.

In order to achieve the purposes described above, it is necessary to integrate and express a large amount of information in compliance with the purposes. For that reason, principal component analysis was conducted by extracting from the socio-economic survey the causes impacting on deforestation inside the National Park and causes likely to mitigate the impact. The tables below show the total amounts of variance (Table 38) and the principal component score coefficient matrix (Table 39).

Table 38 Totals of explained variance

Component No.	Initial eigenvalue	Sum of loading squares after sampling				
		Variance%	Cumulative %	Total	Variance %	Cumulative %
1	3.397	26.127	26.127	3.397	26.127	26.127
2	2.882	22.171	48.298	2.882	22.171	48.298
3	1.988	15.289	63.586	1.988	15.289	63.586
4	1.310	10.075	73.661	1.310	10.075	73.661
5	.837	6.436	80.097			
6	.736	5.664	85.761			
7	.644	4.956	90.717			
8	.460	3.542	94.259			
9	.307	2.361	96.621			
10	.231	1.780	98.401			
11	.135	1.039	99.440			
12	.048	.368	99.808			
13	.025	.192	100.000			

Table 39 Principal component score coefficient matrix

Item	Component			
	1	2	3	4
Livestock Total Value	.156	-.106	.059	-.002
Farm Inside NP	.079	.296	.105	.159
Farm Outside NP	.074	-.206	.323	-.186
Plantation Outside NP	-.174	-.053	.256	-.207
Plantation Inside NP	.112	.285	.140	.162
On farm Income NTFP	.162	-.026	-.125	.378
Off Income oil palm	-.163	.008	.288	.240
On farm Income Total	.243	.042	.220	-.115
Off farm Income Total	-.125	-.060	.109	.501
Wetland paddy Production	.238	-.117	.137	-.077
Dryland paddy Production	-.129	-.074	.218	.102
Rubber Production	-.024	.260	.237	-.154
Recognition Customary Rules	.120	-.170	.132	.360

Looking at the results obtained from principal component analysis, around a quarter (26%) of all information is collected for the 1st principal component, and approximately half (48%) is collected cumulatively up to and including the 2nd principal component.

From the principal component score, the 1st principal component shows in the positive axis direction the farming and farming income from land owned and relied-on by residents, and in the negative axis direction the on-farm and off-farm income on land where land use is unauthorized, forming an axis that shows the structure of household finances or residents' economic activities. From such axis characteristics it can be ascertained that residents positions on the right (positive) side of the 1st principal component have household economies that are strongly reliant on income from agricultural production in continuous farming (particularly rice crops in wet land paddy fields), while those to the left (negative) side are communities reliant on income from unstable or small-scale farming and off-farm activities.

Next, looking at the 2nd principal component, the axis shows community groups carrying out farming activities inside the National Park located in the positive direction, while groups carrying out farming activities outside the National Park as located in a negative direction, or in other words, this is an axis that evaluates the impact on forests inside the National Park. The 1st and 2nd axes show 48% of all information, therefore we will attempt to analyze the conditions of each community in scatter diagrams based on these two axes.

Note that the 3rd principal component has an entirely positive coefficient aside from NTFP (a forest byproduct), which results in an axis where communities with large-scale economic activities are distributed on the positive side and communities with small-scale economic activities are distributed on

the negative side.

The 4th principal component can be explained as a supplementary action of the 1st and 2nd principal components. Communities with high income from NTFP in off-farm income and high numerical values with burnt fields added are distributed on the positive side, and communities that own land outside the National Park and are reliant on-farm income and rubber planting are distributed on the negative side. This can be explained as an axis where the former shows a high risk of deforestation/degradation of forests, and the latter shows a low risk. However, this can be analyzed adequately in combination with the 1st and 2nd principal components. Explanations of each principal component have been compiled in the table below.

Table 40 Explanations of components

Principal component	Explanation
1 st principal component	Farming on owned land and farming on unauthorized land
2 nd principal component	Activities outside the National Park (with effects on forests inside the National Park)
3 rd principal component	Scale of economic activity
4 th principal component	Effects on forests due to livelihood activities

From the results described above, since the 4th principal component showed the supplementary action of the 1st and 2nd principal components, the 1st, 2nd and 3rd principal components were used to explain the results of principal component analysis from a spatial perspective.

From these results, the characteristics of quadrants when the 1st principal component was on the vertical axis and the 2nd principal component is on the second axis have been compiled in the table below. Since the results of the analysis showed that communities distributed in the 2nd and 3rd quadrants have similar trends, the 2nd and 3rd quadrants have been compiled as one group.

Basing on the result of analysis and discussion with GPNP staffs, the project has selected 6 target villages from each group.

Group B,C (quadrant)

- Small-scale rainwater rice production (including mobile cultivation) is carried out.
- Off-farm livelihoods are established.
- Level of familiarity with customary rules is low to medium.

Group A (4th quadrant)

- Although wet paddy rice production is carried out, production volume is low.
- Inside National Park
- Low level of familiarity with customary rules

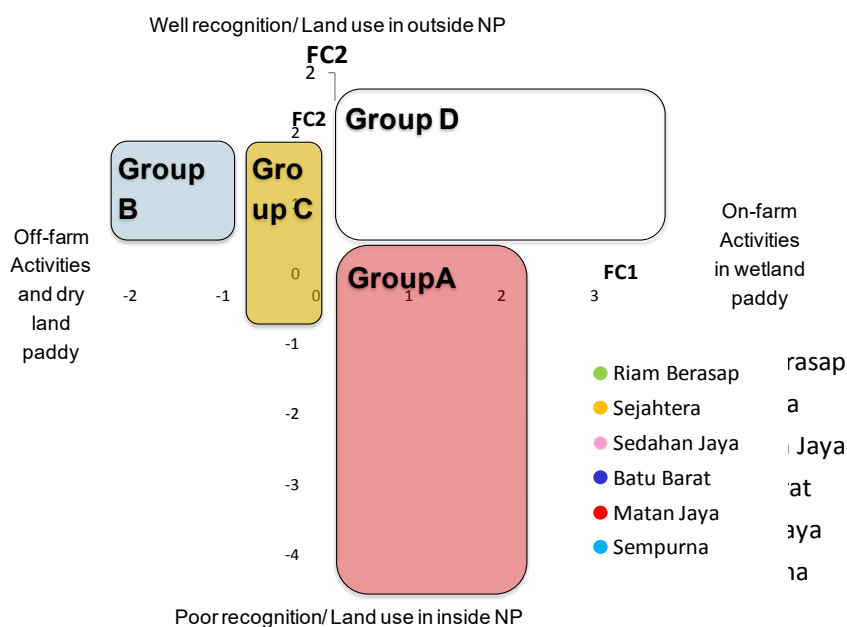


Figure 65 Grouping villages by principal components analysis

Table 41 Grouping basing on characteristics of community

Community group	Main income generation	Dependence of substantial farming	NTFP usage	Underlying problem
Group A	Harvesting Dry land paddy / NTFP selling/ small scale logger	High	Yes	<ul style="list-style-type: none"> Insufficient yield amount Lack of agricultural techniques Insufficient income
Group B	Harvesting rubber plantation	High-Middle	Yes	<ul style="list-style-type: none"> Influenced by market price of rubber New migrants cannot gain enough land
Group C	Labor salary in oil palm plantation	Middle	Yes	<ul style="list-style-type: none"> Lost own farming area Income disparities
Group D	Harvesting Wetland paddy	Low	Yes	<ul style="list-style-type: none"> Conflict over the resource allocation

3. Sharing of data process

Socio-economic survey data obtained in this Project exists in the form of 1) base data entered in questionnaires, which is raw data, and 2) aggregate data compiling raw data from each village or sub-village, and work arises in the processing of this aggregate data into graphs, etc. for statistical analysis and to share it with stakeholders (Figure 66).

Going forwards, continuous monitoring will be important in order to ascertain the effects of REDD+ activities. Keeping in mind the fact that National Park personnel continuously manage socio-economic information, the process for data obtained in socio-economic surveys has been shared with GPNP personnel.

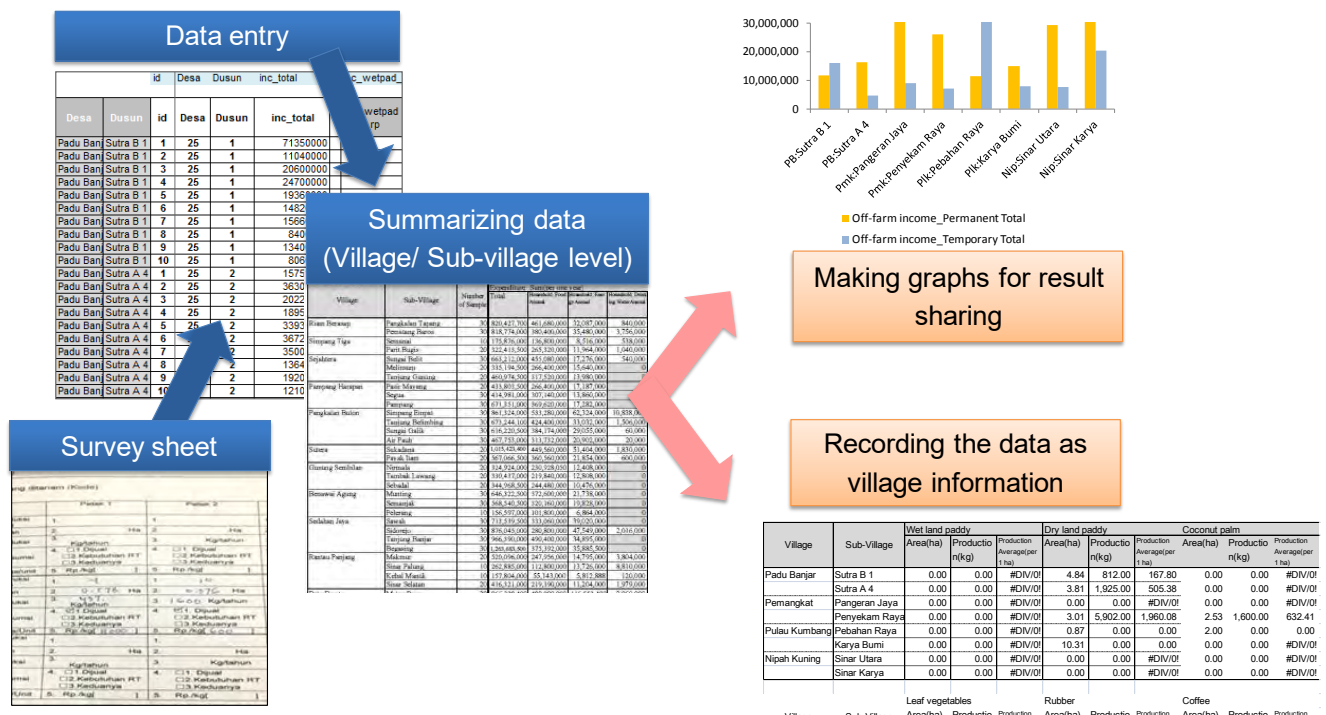


Figure 66 Data process procedure of socio-economic survey

Data process sharing was carried out in March 2016 at the GPNP Office with the participation of 4 members of personnel in charge of National Park data management. The data used in processing was the raw data actually obtained in this Project, from which summary tables were created, which in turn were used to produce graphs, and a discussion was held regarding what could be interpreted from the graphs. Summary tables were produced in two situations: using Excel functions, and using pivot tables.

Activity 2-4 Draft a REDD+ activity plan including the development of benefit sharing methods, performance indicators and safeguard indicators

(Not addressed by REDD+ planning study team)

Activity 2-5 Develop RL/REL and carbon monitoring method.

1.1. Method of developing FREL

In order to proceed with REDD+ for GPNP and its Landscape (landscape REDD+, i.e. Direction 3), it is necessary to consider that the FREL to be established will be a part of the medium-long term REDD+ of West Kalimantan Province (sub-national base) as a whole. Thus, activities conducted in small scales (all of Directions) shall be designed to incorporate into sub-national base in the future. Following parts were picked up as critical points to be kept consistency among different scales of activities (village to Provincial scales)

(1) Classification class

Classification class of land cover map in Indonesia was based on the classification category provided by the MoEF. But, some details classification had been discussed in some small projects. For example, IJ-REDD+ analyzed secondary forests to divide into two classes as normal secondary forests and degraded forests in consideration of carbon stock. Furthermore, ecosystem category of each forest class inside of GPNP was also added to the classification based on the ecosystem map developed by GPNP Office. Current REDD+ activities in various scales will be merged into sub-national (Provincial) in the future, therefore, any REDD+ activities should keep consistency of using land and forest cover classification. Also Indonesia or West Kalimantan Province are requested to announce such concept of land and forest classification.

(2) Method of specifying emission factor

According to IPCC guidelines, it is expected to improve calculation accuracy of GHG emissions and absorptions occurred in the REDD+ project conducted in this study by specifying emission factor, and deliver high reliability on credit being issued in the future. Thus, in specifying emission factor, the knowledge and experiences had been accumulated by IJ-REDD+ are organized based on leading researches, which were conducted in target areas (around GPNP), and its review while utilizing result of leading researches undertaken by IPCC, the Center for International Forestry Research (CIFOR) and so

forth (Figure 67). From now, continuous emission factor development should be conducted and validity for applying the emission factor in different sites (small to large target sites) should be analyzed. Thereafter, to conduct forest survey easily and flexibility, if necessary, plot study and sample trees study are conducted with consideration of participatory monitoring from relevant bodies in Indonesia and medium-long term perspective.

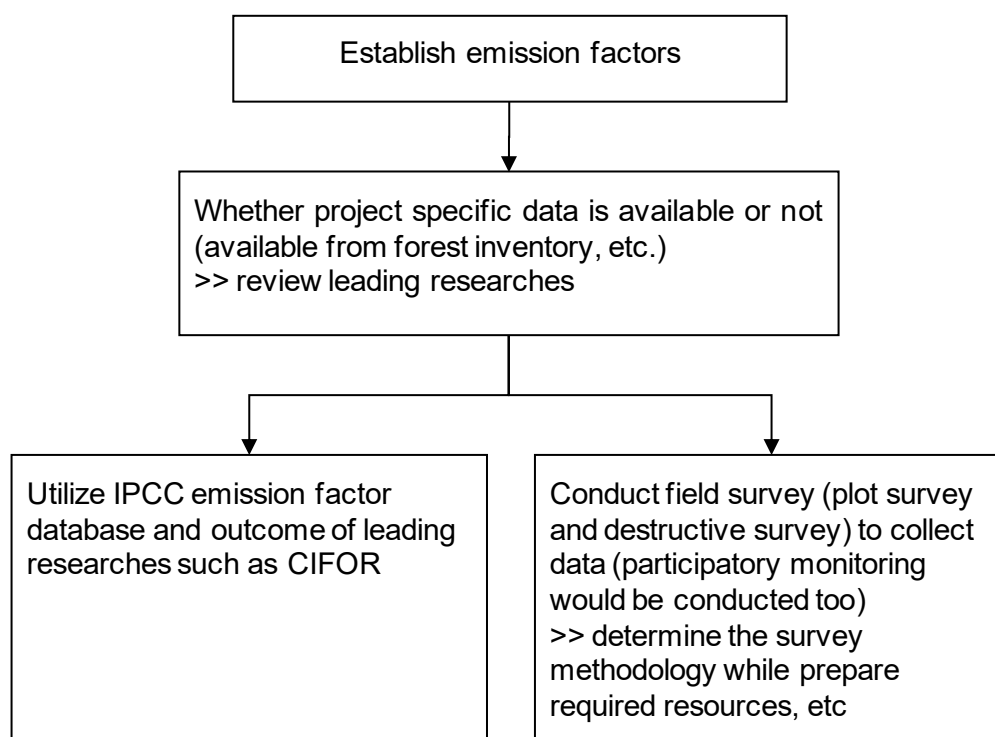


Figure 67 Developing methodology of emission coefficient

Activity 2-6 Conduct baseline survey on biodiversity and community livelihood.

1. Baseline survey on community livelihood

Socio-economic survey aimed to implement to identify drivers of deforestation and forest degradation in GPNP and its Landscape. Before the survey, we could assume that human pressures on forest resources (e.g. illegal logging) and land-use change from forest to cropland (agricultural land) were key activities to be addressed in this survey. Therefore, after collecting basic data and information on villages located in around GPNP (i.e. village profile survey), we moved to next phase which means categorization of each village into some group according to land-use characteristics and/or drivers on deforestation and forest degradation (i.e. household questionnaire survey).

2. Village profile survey

There are 24 villages surrounding GPNP. In general, the village profile survey found that the each village surrounding GPNP consists of two to eight sub-villages (Figure 68). However, there is not enough

information about each village in GPNP and its Landscape. Consulting with counterparts revealed that profile information of villages surrounding GPNP was not organized. The information such as village population and major livelihood activities is basic data for the driver analysis of deforestation and forest degradation, and understanding the socio-economic and natural-environmental aspects of the villages is very important to select villages in which project activities will be undertaken. Taking it into account, this study agreed with the long-term experts of IJ-REDD+ and GPNP officials to organize profile information of each village first and followed by conducting the household survey.

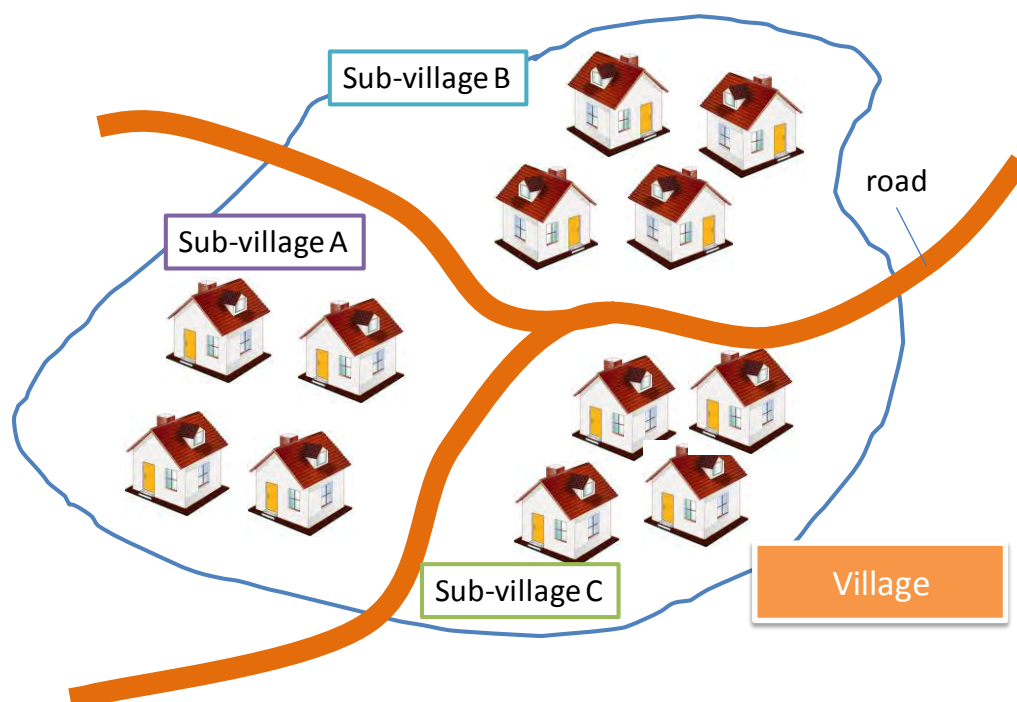


Figure 68 Relationship between village and sub-village

2.1. Preparing questionnaire

Questionnaire sheet was prepared for collecting basic data on each village. To conduct the survey with efficiently, the sheet was assumed to be deposited with each sub-village head.

First of all, draft questionnaires were prepared for village profile and household survey according to discussions with IJ-REDD+ long-term experts, GPNP officials, local staffs and NGOs and key items (i.e. contents) were identified. Moreover, after exchanging opinions with IJ-REDD+ long-term experts, national park officials, local staffs and NGOs, the questionnaire was finalized. The finalized survey items of village profile and household questionnaire are showed in Table 42.

Table 42 Survey items of questionnaires

Survey	Survey Item	Survey Respondents
Household	1. Profile of survey respondents	Each household

Survey	Survey Item	Survey Respondents
questionnaire survey (Conducting pre-survey for the main survey)	2. Property of respondents 3. Satisfaction level of living environment 4. Natural resources use 5. Household budget (income/expenditure) 6. Productivity of agricultural products 7. Changes in means of major livelihood 8. Event history 9. Situation of land-use 10. Recognition of village rules and participation rate of village activities 11. Activities interested in to improve livelihood 12. Situation of receiving supports from outside organizations	

2.2. Holding a training workshop

The training workshop of questionnaire survey was taken place on January 31, 2014, in advance of the commencement of the survey, and 3 GPNP officials and 18 researchers participated in. At the workshop, after explaining the outline of the survey and objectives, participants divided into groups practiced the survey with the actual questionnaires to become familiar with the contents. Based on comments received at the workshop, the questionnaires were reviewed and finalized.

2.3. Conducting survey

The researchers who were counterparts of IJ-REDD+ and IJ-REDD+ staffs were gathering profile information of 20 villages and conducting household questionnaire pre-survey of 24 households in over 28 days started from February 5, 2013. Request letters for participation in the survey had been sent to the each village head from the GPNP office. Some villages have their own village profile and that information was collected as supplement for the survey.

2.4. Monitoring survey

Aiming to ensure the quality of the survey and to study current situation to improve the questionnaires, experts accompanied the researchers and monitored the survey. Although it took time to have access to the data as the village heads were not in, the monitoring confirmed that the village profile survey was mostly carried out smoothly. On the other hand, it seemed difficult to acquire answers for some questions of household questionnaire survey, and it was found that the questionnaire needs to be improved such as revising units or multiple-choice items. For the main survey, recognized agendas are to improve the questionnaire and researchers' survey techniques.

3. Household questionnaire survey

Note that activities under the “Village profile survey” had been implemented by collaboration with village and sub-village heads, especially selection of target households which should be based on characteristics of ethnic group, immigration era and others. Also activities of “Household questionnaire survey” had a role to verify the results of “Village profile survey”.

3.1. Preparing questionnaire

Questionnaire sheet was designed to collect detail information in each household. First of all, draft questionnaires were prepared based on discussions with IJ-REDD+ long-term experts, GPNP officials, local staffs and NGOs and after exchanging opinions with those stakeholders the questionnaire was finalized. The finalized survey items of household survey are showed in Table 43.

Table 43 Survey items of questionnaires

Survey	Survey Item	Survey Respondents
Household questionnaire survey (Conducting pre-survey for the main survey)	13. Profile of survey respondents 14. Property of respondents 15. Satisfaction level of living environment 16. Natural resources use 17. Household budget (income/expenditure) 18. Productivity of agricultural products 19. Changes in means of major livelihood 20. Event history 21. Situation of land-use 22. Recognition of village rules and participation rate of village activities 23. Activities interested in to improve livelihood 24. Situation of receiving supports from outside organizations	Each household

3.2. Holding a training workshop

Before implementing survey of “Household questionnaire survey”, the Consultants team and IJ-REDD+ Project team held training workshop with three days from 13 to 15 on May 2014. There were 8 participants from GPNP office and 22 participants from cooperated survey team. During workshops, all of participants shared objectives and methodologies of the survey to keep consistency of the survey process. Also all of participants did demonstration survey in the actual village (Figure 69). The study team was formed Forum Hurtan Desa, and the NGO members. Forum Hurtan Desa is a youth group organized by NGO in Laman Satong village located around the GPNP. It was thought that it led to the

improvement of the quality and accuracy of the survey result since the local community who know local conditions well had carried on the survey.



Recognizing details of questionnaire



Demonstration of the survey

Figure 69 Training workshop for “Household questionnaire survey”

3.3. Conducting survey

From results of village profile survey, we decided to eliminate 2 villages in household questionnaire survey. It was because that eliminated villages were located in remote area and human activities (livelihoods) in their villages were not related to forest resources of GPNP. Then we selected totally 1,275 households from 18 villages in this household questionnaire survey and the survey was carried out from mid-May 2014 to the end of July 2014. Target households were selected by the Stratified Sampling which based on 4 indicators of ethnic group, livelihood, on-farm types and immigration era, then selection of households were supported by village and sub-village heads. Selected households were from 10 to 40 in each sub-village. Number of selected households were considered by total household in each sub-village and characteristics of them. Also the recommendation letter from GPNP was distributed into each sub-village.

3.4. Result of Socio-economic survey

The main results of the implemented Household Questionnaire Survey are outlined as follows for each question item. Profile of survey respondents

The Household Survey covered 18 villages, 51 communities and 1,275 households around the Gunung Palung National Park area. The table below shows the number of samples and an outline of the survey subjects in each village. Villages consist of 2~5 sub-villages, and 10-30 household samples were selected and surveyed from each community from the perspective of diversity of living conditions and livelihoods.

Table 44 Outline of survey subjects

Village	Sample	Average Age	Male	Female	Family No.	Migrant (%)
Riam Berasap	60	43	46	14	4.3	61.7
Simpang Tiga	30	45	19	10	4.5	16.7
Sejahtera	70	42	39	31	4.5	17.1
Pampang Harapan	80	38	54	26	4.5	20.0
Pangkalan Buton	120	44	106	14	3.6	7.5
Sutera	40	44	31	8	4.0	20.0
Gunung Sembilan	60	39	42	18	3.7	21.7
Benawai Agung	70	48	51	19	3.5	28.6
Sedahan Jaya	120	42	94	25	4.1	38.3
Rantau Panjang	60	43	52	8	4.4	70.0
Batu Barat	120	44	71	49	4.3	27.5
Matan Jaya	90	39	74	16	4.2	36.7
Teluk Bayur	40	41	40	0	3.8	20.0
Sempurna	80	41	63	17	3.8	18.8
Jago Bersatu	25	38	24	1	3.7	16.0
Penjawaan	30	44	27	3	3.6	13.3
Pangkalan Telok	90	40	62	28	3.7	11.1
Laman Satong	90	38	56	34	4.1	21.1
Padu Banjar	20	44	19	1	4.4	35.0
Pemangkat	20	51	19	1	4.3	70.0
Pulau Kumbang	20	53	20	0	4.8	60.0
Nipah Kuning	20	47	20	0	4.7	50.0

The ages of many of the survey subjects fell in the generation of late 30s to late 40s, and although the ratio of males was slightly higher than that of females, responses were obtained from females in all villages apart from Teluk Bayur. The average value of family members per household was 3 to 5 persons, and there was no significant scattering in each village. The ratio of migrants varied from village to village, with Riam Berasap (61.7%) and Rantau Panjang (70.0%) having high migrant ratios.

(1) Property of respondents

Information was collected regarding drinking water, water for daily living, power sources, numbers of livestock raised, and ownership of sites for each type of land use. With regards to drinking water and water for daily living, it was confirmed that there were villages (Simpang Tiga, Jago Bersatu, Penjawaan) where none of the households had water supply constructed. It was understood that in such

villages, or villages with a low tap-water diffusion rate, river water, well water or water drawn from wooded land is used (Table 45). In terms of sources of heat for cooking, it was ascertained that many households use both propane gas and fuel wood (Table 46). From this, it was confirmed that in villages around the National Park there are still many households reliant on natural resources for everyday living.

Table 45 Sources of drinking water

Village	Water Supply	Well	River water	Water from forest area	Bottled water	Others
Riam Berasap	50.0%	55.0%	6.7%	25.0%	8.3%	43.3%
Simpang Tiga	0.0%	0.0%	3.3%	63.3%	13.3%	100.0%
Sejahtera	42.9%	12.9%	0.0%	22.9%	0.0%	30.0%
Pampang Harapan	71.3%	0.0%	3.8%	56.3%	0.0%	0.0%
Pangkalan Buton	91.7%	0.0%	0.0%	4.2%	9.2%	0.0%
Sutera	100.0%	0.0%	2.5%	27.5%	0.0%	0.0%
Gunung Sembilan	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Benawai Agung	44.3%	0.0%	1.4%	62.9%	2.9%	11.4%
Sedahan Jaya	99.2%	0.0%	0.0%	47.5%	0.0%	0.0%
Rantau Panjang	60.0%	0.0%	0.0%	0.0%	16.7%	98.3%
Batu Barat	0.8%	15.0%	18.3%	0.8%	21.7%	95.0%
Matan Jaya	92.2%	10.0%	13.3%	8.9%	1.1%	15.6%
Teluk Bayur	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sempurna	2.5%	3.8%	40.0%	61.3%	0.0%	0.0%
Jago Bersatu	0.0%	100.0%	0.0%	4.0%	0.0%	0.0%
Penjawaan	0.0%	43.3%	96.7%	0.0%	0.0%	0.0%
Pangkalan Telok	31.1%	56.7%	31.1%	4.4%	0.0%	0.0%
Laman Satong	43.3%	12.2%	56.7%	32.2%	1.1%	1.1%
Padu Banjar	30.0%	50.0%	0.0%	0.0%	5.0%	175.0%
Pemangkat	0.0%	10.0%	0.0%	20.0%	20.0%	155.0%
Pulau Kumbang	55.0%	0.0%	0.0%	5.0%	0.0%	185.0%
Nipah Kuning	45.0%	25.0%	0.0%	5.0%	0.0%	175.0%

Table 46 Sources of heat for cooking

Village	Fuel wood	Charcoal	Electricity	Propane gas	Kerocene
Riam Berasap	85.0%	0.0%	0.0%	80.0%	0.0%
Simpang Tiga	96.7%	0.0%	10.0%	60.0%	0.0%

Village	Fuel wood	Charcoal	Electricity	Propane gas	Kerocene
Sejahtera	88.6%	0.0%	7.1%	47.1%	0.0%
Pampang Harapan	91.3%	0.0%	0.0%	50.0%	2.5%
Pangkalan Buton	56.7%	0.0%	17.5%	85.8%	0.8%
Sutera	40.0%	0.0%	60.0%	95.0%	0.0%
Gunung Sembilan	95.0%	0.0%	0.0%	75.0%	0.0%
Benawai Agung	57.1%	1.4%	0.0%	65.7%	0.0%
Sedahan Jaya	87.5%	0.0%	0.0%	93.3%	0.8%
Rantau Panjang	95.0%	0.0%	1.7%	83.3%	1.7%
Batu Barat	86.7%	0.0%	1.7%	64.2%	0.0%
Matan Jaya	91.1%	0.0%	0.0%	71.1%	1.1%
Teluk Bayur	30.0%	0.0%	0.0%	30.0%	0.0%
Sempurna	57.5%	1.3%	1.3%	41.3%	0.0%
Jago Bersatu	68.0%	0.0%	0.0%	72.0%	0.0%
Penjawaan	50.0%	0.0%	0.0%	50.0%	0.0%
Pangkalan Telok	96.7%	0.0%	1.1%	25.6%	0.0%
Laman Satong	91.1%	0.0%	0.0%	65.6%	0.0%
Padu Banjar	85.0%	0.0%	0.0%	90.0%	0.0%
Pemangkat	90.0%	0.0%	0.0%	85.0%	0.0%
Pulau Kumbang	95.0%	0.0%	0.0%	90.0%	0.0%
Nipah Kuning	95.0%	0.0%	0.0%	85.0%	0.0%

In terms of the ratio of households raising livestock, the ratio of chicken-raising households was high overall, at around 50% of the household subjects, followed by ducks and cows (Table 47). As for the average value of total amount of livestock, villages such as Sutera and Penjawaan showed high results, and a trend towards a high total amount could be seen in households raising cows.

Table 47 Ratios of households raising livestock

Village Name	Buffalo	Cow	Pig	Chicken	Duck	Fish
Riam Berasap	0.0%	8.3%	0.0%	50.0%	8.3%	3.3%
Simpang Tiga	0.0%	0.0%	0.0%	56.7%	10.0%	0.0%
Sejahtera	0.0%	7.1%	1.4%	48.6%	18.6%	0.0%
Pampang Harapan	0.0%	11.3%	0.0%	58.8%	28.8%	3.8%
Pangkalan Buton	0.0%	28.3%	0.0%	55.8%	20.8%	0.0%
Sutera	0.0%	32.5%	0.0%	50.0%	32.5%	0.0%
Gunung Sembilan	0.0%	16.7%	0.0%	40.0%	35.0%	0.0%
Benawai Agung	0.0%	1.4%	4.3%	67.1%	25.7%	0.0%

Village Name	Buffalo	Cow	Pig	Chicken	Duck	Fish
Sedahan Jaya	0.0%	6.7%	17.5%	55.8%	17.5%	9.2%
Rantau Panjang	0.0%	5.0%	1.7%	80.0%	11.7%	0.0%
Batu Barat	0.0%	8.3%	0.0%	51.7%	15.0%	0.8%
Matan Jaya	0.0%	6.7%	0.0%	14.4%	3.3%	0.0%
Teluk Bayur	0.0%	2.5%	0.0%	57.5%	0.0%	10.0%
Sempurna	0.0%	3.8%	0.0%	55.0%	7.5%	0.0%
Jago Bersatu	0.0%	0.0%	0.0%	40.0%	8.0%	8.0%
Penjawaan	0.0%	20.0%	0.0%	60.0%	10.0%	0.0%
Pangkalan Telok	0.0%	1.1%	0.0%	44.4%	6.7%	2.2%
Laman Satong	0.0%	3.3%	63.3%	47.8%	3.3%	0.0%
Padu Banjar	0.0%	0.0%	0.0%	75.0%	10.0%	0.0%
Pemangkat	0.0%	10.0%	0.0%	80.0%	15.0%	0.0%
Pulau Kumbang	0.0%	10.0%	0.0%	70.0%	5.0%	0.0%
Nipah Kuning	0.0%	5.0%	0.0%	70.0%	10.0%	0.0%

(2) Natural resources use

With regard to the use of natural resources in the area around the National Park, it was ascertained that many households (60-90 % and higher) gather fuel woods. In villages such as Matan Jaya and Gunung Sembilan, there are high ratios of collection of durian (Table 48).

Table 48 Ratios of natural resources use

Village	Fuel woods	Durian	Mushroom	Banana	Honey	Bamboo shoot	Others
Riam Berasap	86.7%	23.3%	1.7%	0.0%	0.0%	0.0%	0.0%
Simpang Tiga	93.3%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Sejahtera	85.7%	15.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Pampang Harapan	93.8%	36.3%	0.0%	6.3%	0.0%	36.3%	13.8%
Pangkalan Buton	60.0%	15.0%	0.0%	2.5%	0.0%	6.7%	1.7%
Sutera	37.5%	20.0%	0.0%	0.0%	0.0%	5.0%	0.0%
Gunung Sembilan	93.3%	45.0%	0.0%	15.0%	1.7%	8.3%	11.7%
Benawai Agung	68.6%	20.0%	0.0%	2.9%	0.0%	11.4%	8.6%
Sedahan Jaya	89.2%	29.2%	8.3%	4.2%	0.0%	53.3%	10.8%
Rantau Panjang	95.0%	8.3%	0.0%	0.0%	0.0%	0.0%	53.3%
Batu Barat	94.2%	3.3%	0.0%	2.5%	0.0%	7.5%	17.5%
Matan Jaya	87.8%	71.1%	0.0%	0.0%	0.0%	52.2%	1.1%
Teluk Bayur	67.5%	7.5%	0.0%	0.0%	0.0%	2.5%	0.0%

Village	Fuel woods	Durian	Mushroom	Banana	Honey	Bamboo shoot	Others
Sempurna	60.0%	11.3%	0.0%	0.0%	0.0%	0.0%	1.3%
Jago Bersatu	68.0%	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%
Penjawaan	50.0%	6.7%	0.0%	0.0%	0.0%	40.0%	0.0%
Pangkalan Telok	97.8%	11.1%	0.0%	1.1%	5.6%	23.3%	3.3%
Laman Satong	92.2%	10.0%	0.0%	4.4%	0.0%	67.8%	1.1%
Padu Banjar	95.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pemangkat	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pulau Kumbang	85.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Nipah Kuning	95.0%	0.0%	0.0%	0.0%	0.0%	75.0%	0.0%

(3) Productivity of agricultural products

In terms of crop production, planted area and production output were surveyed for corn, cassava, wet land rice, dry land rice, coconut, durian, banana, leaf vegetables, rubber, coffee and mango, etc. From the results of the Household Survey, it was understood that the main crops produced in the surveyed area are the four items of wet land rice, dry land rice, durian and rubber. The planted area and production amount of these four main items have been compiled in the table below (Table 49).

Table 49 Planted areas and production output of main planted crops

Village	Wet land paddy		Dry land paddy		Durian		Rubber	
	Area (ha)	Production(kg)	Area (ha)	Production(kg)	Area (ha)	Production(kg)	Area (ha)	Production(kg)
Riam Berasap	6.51	6,240	6.49	4,630	3.75	5,560	12.93	4,090
Simpang Tiga	9.93	8,266	0.00	0	0.70	800	13.78	11,758
Sejahtera	26.55	12,810	0.00	0	5.02	3,000	20.19	30,657
Pampang Harapan	31.81	18,486	1.00	1,200	18.76	12,115	11.00	7,275
Pangkalan Buton	32.75	97,074	0.50	480	1.13	8,800	13.25	9,880
Sutera	6.94	18,826	0.00	0	0.00	0	0.40	800
Gunung Sembilan	8.09	20,609	0.00	0	32.61	10,925	0.00	0
Benawai Agung	30.75	65,640	3.48	4,475	26.85	2,185	14.12	19,220
Sedahan Jaya	121.43	315,670	0.00	0	1.00	950	1.45	0
Rantau Panjang	18.89	5,073	0.50	216	0.01	125	63.24	52,738
Batu Barat	17.82	16,279	21.98	19,688	0.78	15,077	51.84	40,822
Matan Jaya	2.18	1,203	11.31	6,690	15.60	24,352	55.23	5,225
Teluk Bayur	22.20	13,100	0.00	0	6.00	4,000	63.80	113,564
Sempurna	25.96	9,844	3.72	980	1.00	150	92.37	174,490
Jago Bersatu	19.50	6,500	1.00	450	0.00	0	33.50	51,340

Village	Wet land paddy		Dry land paddy		Durian		Rubber	
Penjawaan	0.00	0	0.00	0	0.00	0	85.00	31,869
Pangkalan Telok	2.00	384	0.00	0	0.00	0	58.50	60,406
Laman Satong	16.29	10,148	8.00	2,000	4.30	4,000	39.60	30,614
Padu Banjar	0.00	0	8.65	2,737	0.00	0	0.87	3,200
Pemangkat	0.00	0	3.01	5,902	0.00	0	6.16	180
Pulau Kumbang	0.00	0	11.18	0	0.00	0	15.96	0
Nipah Kuning	0.00	0	0.00	0	0.00	0	0.52	0

It was ascertained that wet land rice production has a large planted area and production amount in Sudahan Jaya, while dry land rice production is largest in Batu Barat. It was also found that durian collection in terms of volume is led by the villages of Matan Jaya, Batu Barat, Pampang Harapan and Gunung Sembilan, and that the largest rubber harvests are in Sempruna and Teluk Bayur.

4. Interview/workshop for selecting demonstration activities

From categorized 6 groups, the IJ-REDD+ team proceed to identify suitable REDD+ activities to reduce deforestation and forest degradation in the target area. As for selection of around 2 villages, we considered situation of village management and collaboration among villagers and had interview survey to verify the questionnaire survey. The progress on facilitation training conducted by i-i net Consulting was also considered. The interview details compiled in “ Supplemental document 1”.

5. Results of socio-economic survey in 4 villages around a Protection Forest

Results of a socio-economic survey of 4 villages around a Protection Forest have been compiled as follows (refer to Supplemental Document 2 for details).

(1) Basic Information of 4 Villages

The rate of migrants and ratios of ethnic groups in target villages are shown in the table below (Table 50). In terms of ethnicity in the 4 target villages, the Melayu ethnic group accounts for the majority, but in Pangeran Jaya of the Pemangkat village there was a higher ratio of Javanese (40%) than in other sub-villages. Since the same sub-village also has a high rate of migrants, it is possible that this is an emigrant village. The rate of migrants in other sub-villages was also 30-60%, showing a trend for slightly higher rates of migrants than the GPNP.

Table 50 Foundation data of target households

Village	Sub-Village	No. of Family	Migrant	Ethnic Group							
				Dayak	Javanese	Melayu	Balinese	Chinise	Bugis	Madura	Others
Padu Banjar	Sutra B 1	4.2	40.0%	0.0%	10.0%	80.0%	0.0%	0.0%	0.0%	0.0%	10.0%
	Sutra A 4	4.6	30.0%	0.0%	10.0%	90.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pemangkat	Pangeran Jaya	4.1	80.0%	0.0%	40.0%	50.0%	0.0%	0.0%	0.0%	0.0%	10.0%
	Penyekam Ray	4.4	60.0%	0.0%	0.0%	90.0%	0.0%	0.0%	10.0%	0.0%	0.0%
Pulau Kumbang	Pebahan Raya	4.2	60.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Karya Bumi	5.4	60.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Nipah Kuning	Sinar Utara	4.0	40.0%	0.0%	0.0%	90.0%	0.0%	0.0%	0.0%	10.0%	0.0%
	Sinar Karya	5.4	60.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%

(2) Utilization of natural resources

The conditions of use of water resources and natural resources in target villages were ascertained. In terms of features of the use of water resources, it was found out that water supply facilities are not prepared for target households in the SutraA4 sub-village of Padu Banjar village, Pemangkat village, and Sinar Karya sub-village of Nipah Kuning village. Others was taken as water used for everyday life, but from interviews with locals it was found that this referred to accumulating water in large tanks that had been purchased. From these results, it was ascertained that while there were many sub-villages in the GPNP using river water or water from forest areas, the water resources that can be used by the target villages was limited (Figure 70). It was also identified that in terms of energy supply sources there are many sub-villages using both propane gas and fuelwood. It was confirmed that fuelwood was used in 80% or more of all sub-villages, and it was surmised that there is a high degree of dependence on forest resources even if propane gas has been introduced (Figure 71). Use of non-timber forest products was also surveyed, however there was no collection of durian, etc. As seen in villages around the GPNP, and it stopped at collection of bamboo shoots in 15 of the 80 households surveyed, with no responses received concerning active use of non-timber forest products.

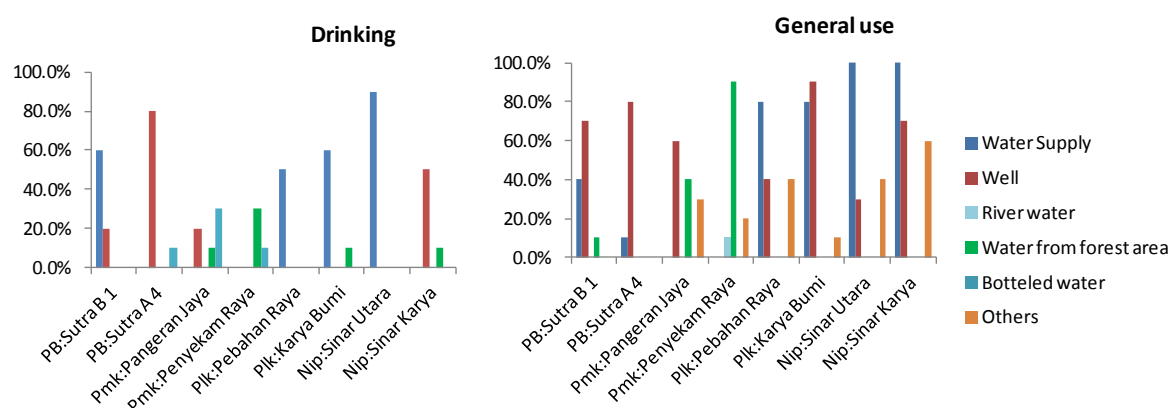


Figure 70 Water Resources

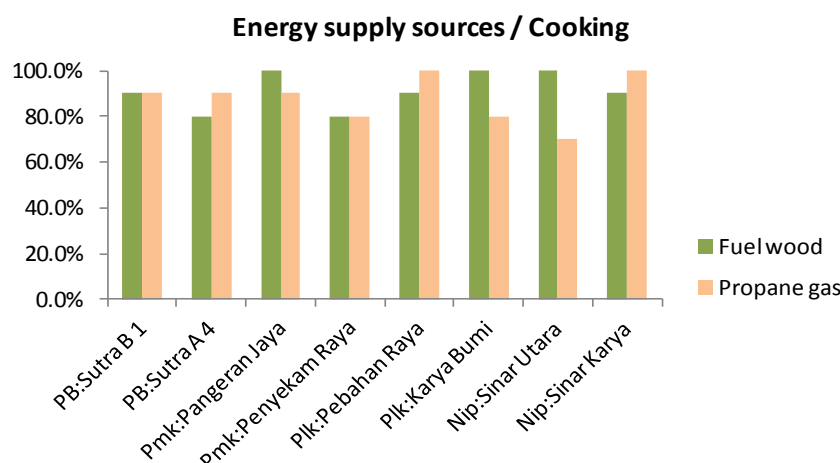


Figure 71 Energy supply sources for cooking

(3) Community livelihood

Following Table 51 shows the means of livelihood of households according to on-farm income and off-farm income, Figure 72 shows the respective totals for on-farm income and off-farm income, and Figure 73 shows permanent and temporary work within off-farm income. Although there appears to be much off-farm income from Figure 73, many of the households responding that they have off-farm income are engaged in fishing (as fishermen) or coconut-related industry, suggesting means of livelihood that are strongly linked to primary industry.

Table 51 Means of livelihood of households (Per household, unit:Rp.)

Village	Sub-Village	On-farm income Wetland and paddy	On-farm income Dryland and paddy	On-farm income Other vegetables	On-farm income Livestock	On-farm income Selling NTFP	On-farm income Selling Fuel woods	On-farm income Selling timber
Padu Banjar	Sutra B 1	0	2,950,000	0	0	8,400,000	0	0
	Sutra A 4	1,050,000	3,200,000	18,000,000	0	0	0	0
Pemangkat	Pangeran Jaya	0	0	3,237,444	0	0	0	0
	Penyekam Raya	0	5,593,750	4,092,500	0	0	0	0
Pulau Kumbang	Pebahan Raya	0	0	0	13,540,000	0	0	0
	Karya Bumi	0	4,500,000	0	0	0	20,000,000	0
Nipah Kuning	Sinar Utara	0	1,300,000	12,000,000	0	0	0	96,000,000
	Sinar Karya	0	1,681,250	20,000,000	0	0	360,000	0

Village	Sub-Village	On-farm income Selling Rubber	Off-farm income Permanent Oil palm	Off-farm income Permanent farming	Off-farm income Permanent Others	Off-farm income Temporary Oil palm	Off-farm income Temporary farming	Off-farm income Temporary Others	Off-farm income Private business	Off-farm income Loan	Off-farm income Remittance	Off-farm income Others
Padu Banjar	Sutra B 1	6,582,857	0	625,000	11,187,500	4,250,000	2,786,667	9,150,000	0	0	3,850,000	1,250,000
	Sutra A 4	5,670,000	0	0	16,188,889	1,300,000	3,262,500	0	0	11,000,000	0	0
Pemangkat	Pangeran Jaya	12,825,000	30,000,000	0	14,760,000	0	0	6,000,000	3,080,000	0	0	0
	Penyekam Raya	2,608,857	2,400,000	5,040,000	18,500,000	0	0	7,200,000	0	0	0	12,000,000
Pulau Kumbang	Pebahan Raya	9,468,000	0	2,000,000	9,335,250	0	4,600,000	7,250,000	20,000,000	0	200,000	6,100,000
	Karya Bumi	9,203,333	0	8,000,000	7,033,333	2,200,000	0	5,720,000	0	0	2,100,000	4,173,333
Nipah Kuning	Sinar Utara	5,760,000	14,544,000	10,400,000	4,445,714	0	0	7,700,000	0	0	2,400,000	4,550,000
	Sinar Karya	23,820,000	27,600,000	5,775,000	16,571,429	0	300,000	20,100,000	0	0	0	27,800,000

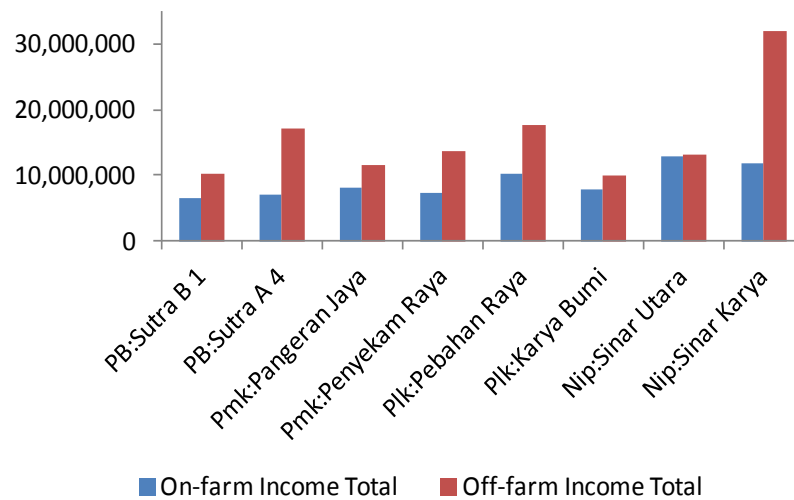


Figure 72 On-farm Income Total and Off-farm Income Total

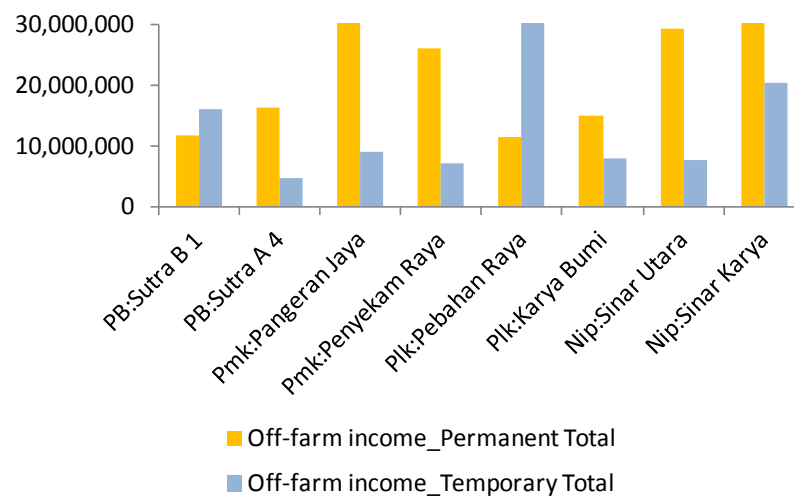


Figure 73 Ratio of permanent/temporary employment

Although there was scattering within on-farm income, it was ascertained that there was little income from rice paddies compared with around the GPNP, and that livelihood consists mainly of other vegetables and selling rubber (Figure 74).

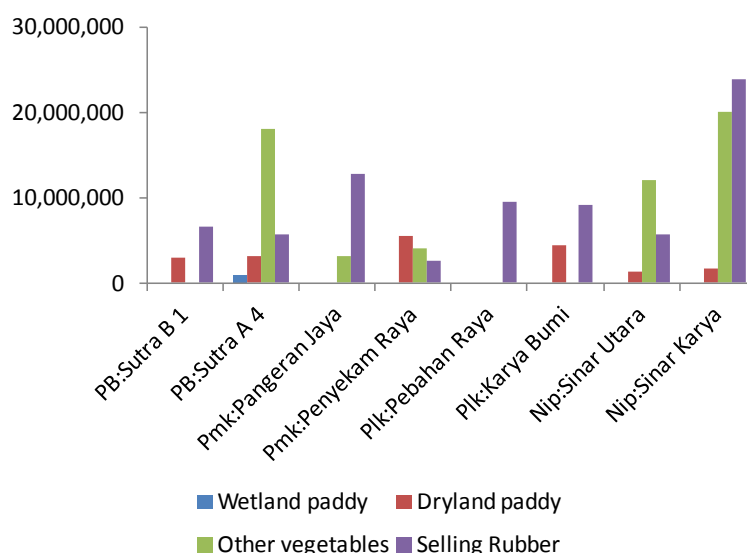


Figure 74 Types of on-farm income

Activity 2-7 Facilitate stakeholders to make agreement on resource management rules.

This activity has been not assigned work of this “Consultants Team (authors of this report)”, however some activities have carried out as the part of planning study.

1. Concept of support for developing forum

In order to continuously conserve natural resources inside and surrounding the GPNP and its Landscape area while protecting the livelihoods of community people, it will be necessary to promote collaborative management by multiple stakeholders.

In this study, interviews were conducted with multiple organizations participating in the stakeholder organization (forum) for collaborative management proceeding with installation under the leadership of national staff from IJ-REDD+ Ketapang, and the current situation was outlined.

2. Conducting Interviews

In order to ascertain the activities of stakeholders around the GPNP area, and the issues they think of, interviews were held with three NGOs, an oil palm company, forestry company and pulp company active in the GPNP area, and the planning department of the district. Interviews were held in May 2015, and the IJ-REDD+ Long-term Expert Term and Consultant Team also participated. Interview results were compiled as follows from the aspects of forest management and stakeholder collaboration.

At the time of activities in West Kalimantan, attention must be given to the handling of trees connected to the historical customs of tribes. It is important to respect the rights of indigenous people so as to avoid trouble.

NGOs have formed communication and networks with community people through periodic meetings.

A calculation shows that NGOs have devoted about 400 hours to building relationships with residents thus far, and there is the sense that much time is required.

Details ascertained through these interviews were perceived as being underlying causes of deforestation/degradation, and were described as underlying causes in the PDD proposal together with direct deforestation/degradation drivers. This suggested that going forwards it would be necessary deal with these underlying issues when proceeding with REDD+ activities. Forum activities are participated in by the province forest department and all GPNP administrations, and stakeholders involved with forest management, such as NGOs active in the GPNP and its Landscape, cooperating with the aim of collaborative management, and the importance of the forum has been confirmed as a stimulus for resolution of issues.

3. Sharing the Information and its Practical Use

This socio-economic survey was implemented in order to identify drivers and agents of deforestation and forest degradation. The collecting information by this survey has been also utilized for developing rules for natural resources management among multi stakeholders around the GPNP.

1. Utilization as reference data for developing the National Park 20-year management plan (2015-2035)
2. Utilization by NGO in Protection Forest management activities through cooperative management with communities in Kayong Utara District
3. Enhance awareness of conservation in communities around the National Park through results share
4. Utilization as baseline data when measuring or monitoring the effectiveness of the project activities
5. Utilization as base data when developing on landscape management plans in the forum made up of stakeholders from around the National Park

Activity 2-8 Conduct safeguard/co-benefit activities on the improvement of livelihood, biodiversity conservation and the provision of environmental services.

1. Concept of conducting safeguard/co-benefit activities on the improvement of livelihood

In implementing REDD+, environmental and social safeguards are necessarily taken into account to determine how to share its benefit. When conduct substantiation or trial surveys to integrate safeguards into REDD+ implementation by IJ-REDD+, knowledge and experiences gained through this study will be utilized, yet Indonesia has been developing such as a guideline for safeguards as described above. In the first year, with cooperation with the IJ-REDD+ long-term expert team, this study was exploring the current status through interviewing and exchanging opinions with NGOs carrying out community forestry activities aiming environment conservation and REDD+, and visiting those sites.

2. Grasping the activities of relevant stakeholders

Interviews and exchanging opinions with institutions and organizations undertaking activities in the area around GPNP were conducted Table 52 and the summary of each organization's activities were shown in Table 52.

Table 52 Activities in the area around GPNP

Organizations	Activity areas	Summary of activities
USAID (United States Agency for International Development)	Six villages around GPNP	Implement RAPI (Action Plan for Climate Change), complying with Community Conservation and Livelihood Agreement (CCLA), and develop a action plan for each village. Eventually, it will be put into action in 15 villages.
IAR (International Animal Rescue)	Orangutan habitats around Gunung Tarak (Southwest of GPNP)	Restore orangutan habitats and carry out awareness building activities mainly in Pangkalan Teluk. As the development of oil palm plantations causes the fragmentation of orangutan habitats in recent years, IAR has worked on orangutan relocation, etc.
FFI (Fauna Flora International) and Forum Hutan Desa	Several villages including Laman Satong	Organize local people, putting young people in the center, based on activities in Hutan Desa (community forest) as well as applying Plan Vivo. Undertake forest monitoring activities. Once credits are issued, the management department of the community forest will receive the 70% of the benefit.
Yayasang Palung	Several villages including RiamBerasap and Panpang Harapan	Carry out awareness building activities with collaboration with USAID and IAR, and activities in the field of transferring agriculture technology (organic farming), environmental education, and improving livelihood activity (handicrafts).

In the areas nearby GPNP, some institutions and organizations have been undertaking environmental conservation and building community people's awareness for natural resource management. To address the safeguards and benefit sharing, this study was arbitrarily having discussions with those NGOs, reviewing safeguards related to REDD+, which is under consideration by the central government and so forth.

3. REDD+ activities proposed based on socio-economic survey results

The REDD+ activities being implemented to counteract the drivers of the aforementioned deforestation are divided and listed between those for the entire project area (landscape level) and those for individual agents.

As mentioned above, the landscape level has multi agents and drivers, and multi underlying causes for deforestation and forest degradation. Thus the REDD+ activities shall be implemented through the two scales to avoid the baseline deforestation and forest degradation. One is small scale activity which carried out by the NGOs in order to approach multi agents and drivers in each village level. The other is wide scale to handle with the underlying causes. This approach ensures that the communities are undertaking activities or benefiting from the inputs that are well suited to their circumstances and needs, and are more likely to succeed since the forest governance condition will be put into place (Figure 75).

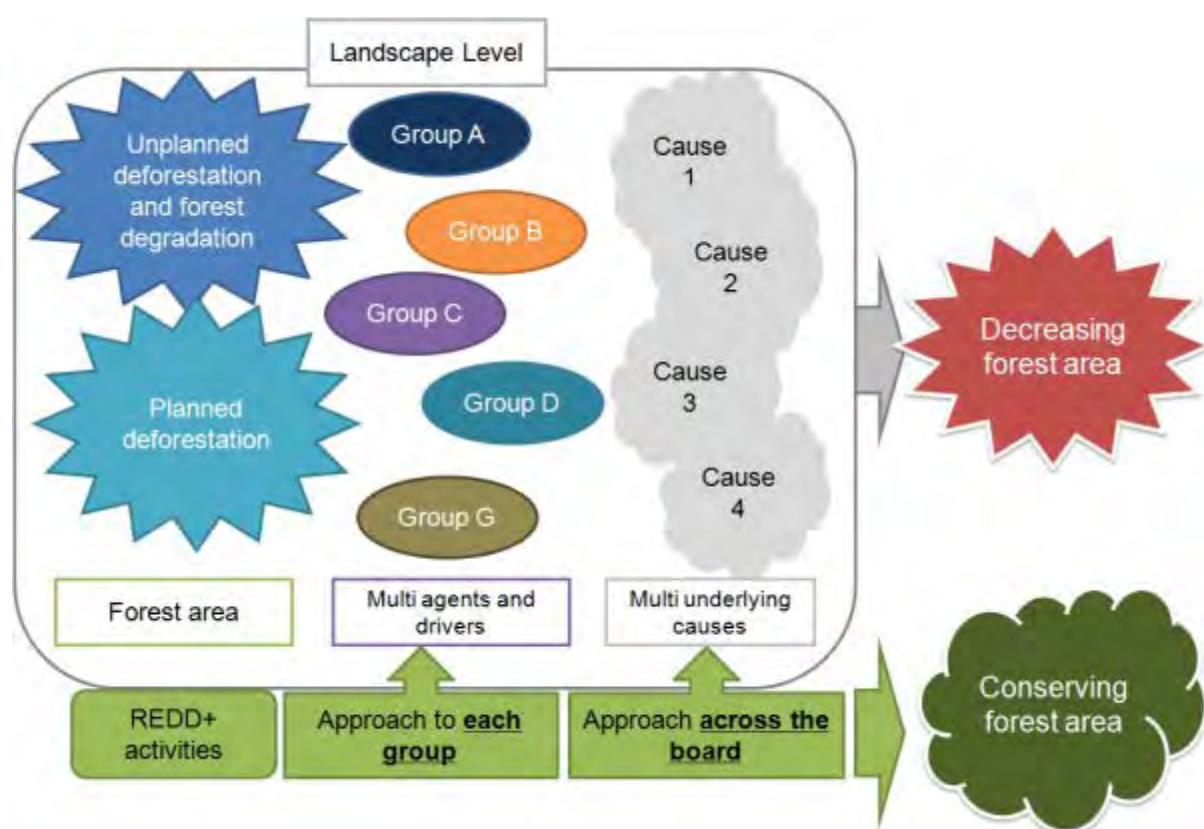


Figure 75 REDD+ approach to landscape level

3.1. Activities for landscape level

(1) Facilitation training for collaborative management

As the relationship in the target area between the government agency (the National Park Office in the case of the National Park, and District Forest Departments in the case of HL) responsible for forest management and the communities residing in the forest areas has not been properly built up, illegal

logging has been taking place in the GPNP, and forest development is progressing in HL due to the cultivation of new farming areas, which confirms that forest management is currently lacking. As for there are some uncertainties in the community regarding government activities (unilateral changes to GPNP boundaries, etc.), there is some tension between certain communities, and the relationship between the government and the communities has become a problem of conserving the forests in the target area and managing protection area, etc.

By implementing Facilitation Training in order to construct cooperative management systems in this project, the management abilities of GPNP staff and the relationship between government personnel and the community will be strengthened. In addition to such direct effects, it is expected that the importance of community resource use will be recognized, taught and spread through the kind of potential analysis named “Arumono Sagashi” feature of Facilitation Training

(2) Enhancing forest governance structure through the activities under the Forum

In addition to the above-mentioned communication difficulties between government and local communities, there is little cooperation between the government and the District Forest Department, which is responsible for GPNP and HL forest management, and regional forest management systems have not been constructed. Numerous NGOs are carrying out forest preservation and biodiversity conservation activities with local residents in project target areas, however, while there are many village-level activities, smoother cooperation between the government and NGOs is required in order to expand the effectiveness of the activities throughout the area.

Relationship-building between officials has been promoted through Forum activities in order to strengthen landscape level forest management governance in this project.

(3) Introducing spatial zoning

A concept note (management plan) for natural resource management has been developed in the USAID IFACS project in Kayong Utara district. The concept note recommends community level Land Zoning in order to achieve the sustainable use of natural resources. The government can properly manage forest resources in conservations and sanctuaries by implementing spatial zoning with the agreement of the community, which will ensure the community has the right of access to natural resources in the future.

The ability to use land and resources is to be improved through community forestry (Hutan Desa: HD) activities in the HL and HP area by establishing protected areas and resource use areas, promoting their proper management, and by increasing community ownership.

(4) Introducing natural resource management rules and enforcing the rule

With regard to customary rules for the management of natural resources such as forest resources and water for irrigation in the surveyed area, the groups were divided into 1) groups with customary rules that have a high level of recognition these rules, 2) groups that lack familiarity with the existing

customary rules, and 3) groups that do not have customary rules related to natural resource management. Villages with a high level of recognition customary rules were the groups that had a high frequency of NTFP use, grew rice in wet paddy fields, and had a high production amount of rice. On the other hand, villages with a low level of familiarity with customary rules were the groups that grew rice inside the GPNP and HL by means of slash-and-burn farming, etc. In the socio-economic survey, 39% of the surveyed villages owned farming areas inside the GPNP, and 51% of the surveyed villages owned plantations inside the GPNP. Although approval was given for the partial use of special zones that were set up inside the GPNP for villages that had been using land within the borders of the GPNP before its establishment, some issues remain with regard to related management systems, and it has been confirmed that forests are in decline due to the cultivation of new land inside the GPNP by some villages.

These issues are to be processed by constructing the above-mentioned cooperative management systems, and by making rules and agreements with local residents regarding the use of resources and the GPNP, and by introducing initiatives for spreading an awareness of those rules. Specifically, in the GPNP area, in addition to introducing spatial zoning mentioned in (3), rules are to be established regarding sanctuary monitoring and usage methods for resource use areas. Documentation for the planning of the implementation of Hutan Desa in HL areas is to include a stipulation of the rules of resource management and an agreement with residents regarding those rules.

(5) Enhancing awareness raising of forest resource management through environmental education

Introducing environmental education in the community and deepening/ raising the awareness of forest resources and biodiversity is expected to create a better understanding of resource management and to further increase the ripple effects of REDD+ activities. Long-term environmental education from the NGO Yayasan Palung has been also taking place in the project areas. Yayasan Palung is “gaining a quantitative understanding of the positive effects on adult thinking from the participation of children in these activities based on the experiences up to this point,” thus these public awareness activities are focused on the forest management agencies of the future.

3.2. Activities for each drivers agent

(1) Oil palm plantation settler

Using the Forum to strengthen cooperation with stakeholders and build monitoring systems.

In the oil palm plantation area, building monitoring systems through cooperation with Forum participants and other stakeholders will enable oil palm companies to properly manage the preservation area inside the concession.

(2) Subsistence small scale farmer without irrigation system (rice production in dry paddy)

- Improvement/advancement of farming technology, and review of land use methods

Initiatives such as organic composting and the improvement of agricultural technology, etc., are to be introduced. Improving production volume per unit area from these initiatives will limit deforestation by expanding the farming area and contribute to the improvement of livelihoods in the community. In addition, in order for local residents to carry out sustainable farming activities, it is important that a framework is created for activities that can be implemented using resources available to the community. The introduction of organic agricultural technology is to be implemented.

- Introduction of alternative livelihoods

Although the livelihoods of residents of oil palm plantations and the adjacent villages are reliant on work at plantations, it is not clear whether there is the potential for continuous work, and this situation is likely to produce disparity due to the differences in working conditions between villages and households. Moreover, as farming areas have been reduced due to the development of plantations, there is the potential for the forest to be newly converted to farming areas by who has lost their farming area. Reducing the uncertainty of work at oil palm plantations and increasing the options for off-farm income by, for example, introducing ecotourism, producing and selling handicrafts, and ensuring new places of work are activities that will reduce the impact on the forest and will lead to safeguarding the protection of the rights of residents.

(3) Natural resource users in forest area (non timber forest products)

Rules for resource management are to be established and sustainable resource use is to be agreed on by the relevant officials. In addition to establishing rules, the livelihoods of local residents can be stabilized by reclaiming markets with added value NTFP and markets where NTFP is traded at a suitable price.

(4) Small scale loggers

As of 2013, illegal logging is on a downward trend, and small scale logging limited to inside community and domestic use is thought to have only a small effect on deforestation. On the other hand, as brought out in interviews with NGOs, completely regulating logging may restrict the lives of local residents, thus it is important to create a sustainable environment by approving some use of resources by means of zoning, etc.

In addition to spatial zoning, NGOs and government agencies that monitor logging are to cooperate with each other and to build monitoring systems and other systems for accurate real-time awareness of the situation. As the construction of resident participation-type monitoring systems is preferred in REDD+, residents' understanding of forest resource management can be increased and cooperation among agencies can be strengthened by implementing resident participation-type monitoring systems.

Activity 2-9 Collect and assess data on land use change and carbon stock, biodiversity conservation and community livelihood.

1. Land cover change around GPNP and its landscape

The target area in this REDD+ program is Sukadana and Simpang Hilir sub-districts in Kayong Utara district (Figure 76). Forest change around GPNP and its Landscape was mapped and its area is calculated. Figure 77 shows overview of forest situation around GPNP and its Landscape based on hearing survey.

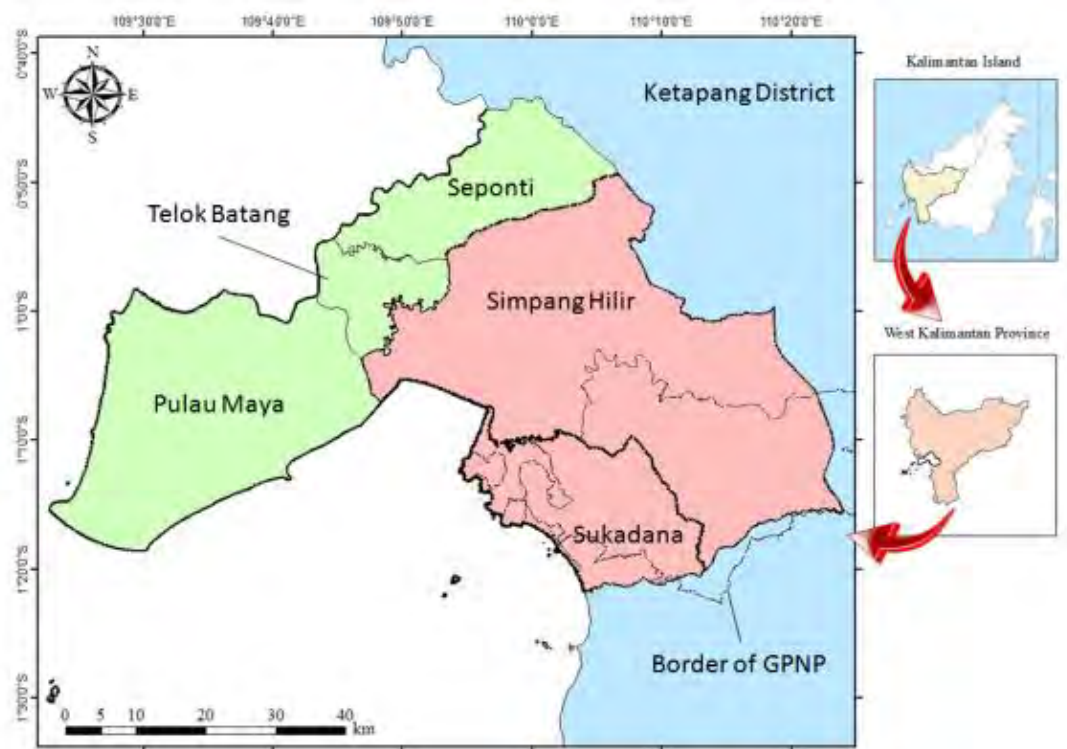
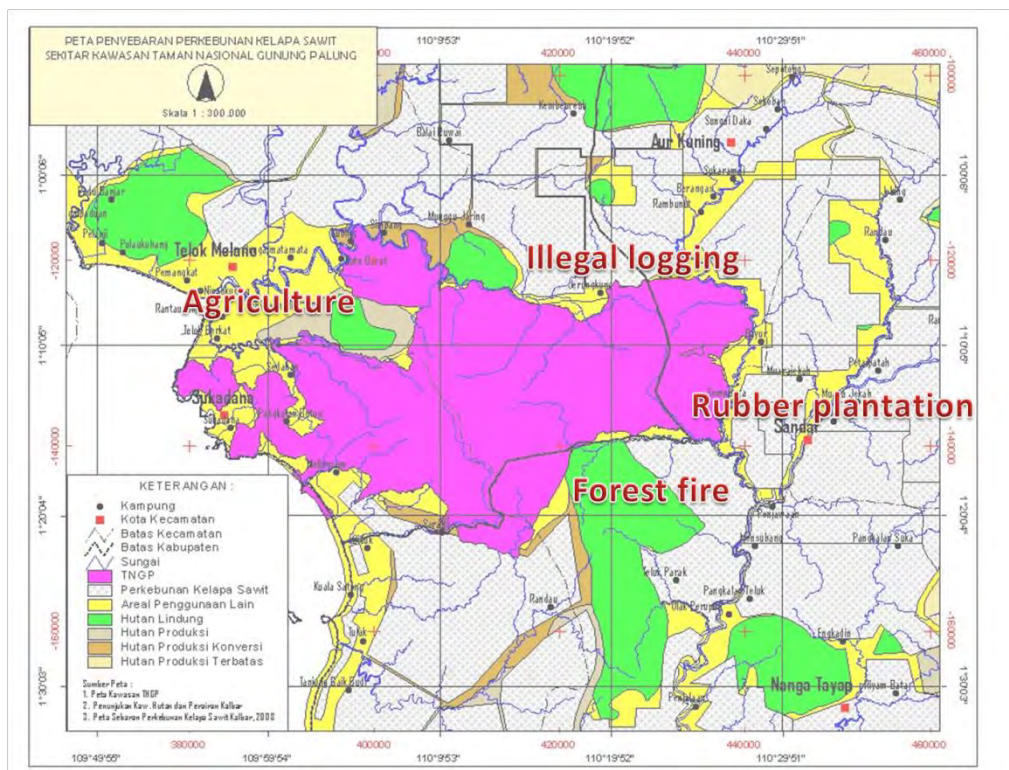


Figure 76 Location of both of Sukadana and Simpang Hilir sub-districts



Note: Pink colored area shows GPNP, grey shows plantation, light green shows protection forest, chocolate shows production forest and yellow shows others

Figure 77 Cause of deforestation around the GPNP based on hearing survey

1.1. Basic concept and trial analysis

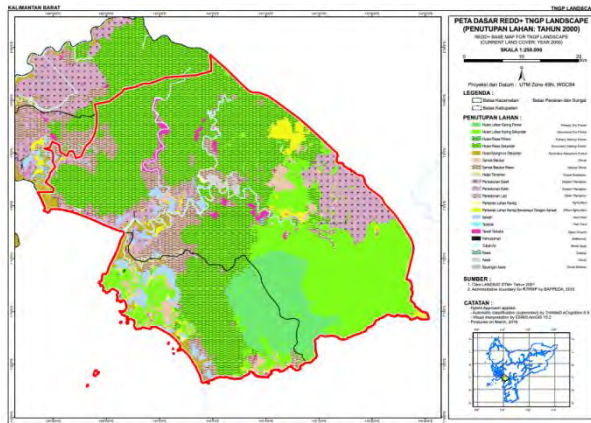
In the early phase of this activity, more detail land cover map which is capable to observe the historical and spatial trend of forest degradation in carbon stock was planned to be produced for this region. In this context, SPOT6 high resolution satellite images were introduced and trial land cover classification and field survey were conducted in 2014.

The result of trial classification has revealed that it is difficult to differentiate forest degradation area clearly by visual interpretation software even using SPOT6 because of the gradual and small scale of forest degradation in carbon stock.

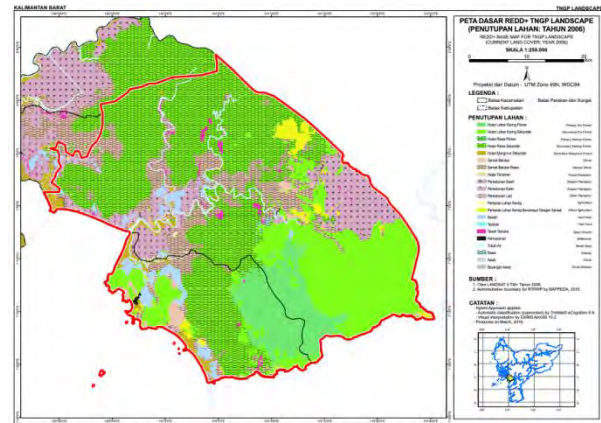
1.2. Land cover change around GPNP and its Landscape

Following figures show land cover and its change between 2000 and 2013 (see Figure 78) around GPNP and its Landscape in LCM Ver. 6.

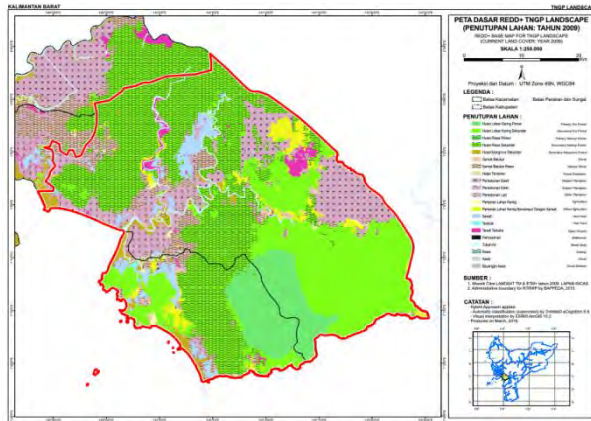
The total forested area is almost constant in Figure 79. It was suggested intense and organized illegal logging has already stopped based on this result. Figure 80 shows the trend of each land cover classes. Primary forest in the south of this landscape is protected by GPNP. But oilpalm plantation was accelerated in between 2006 and 2009 period.



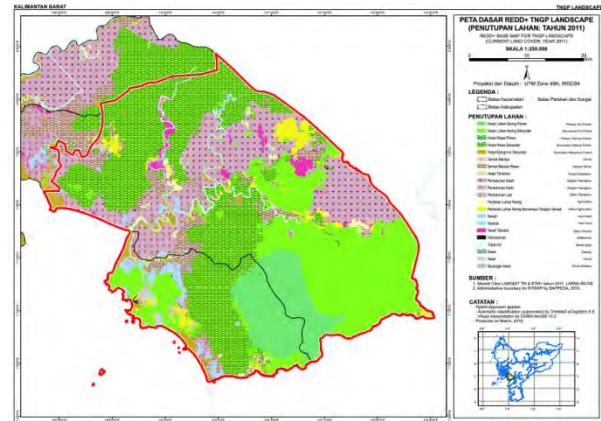
(a) 2000



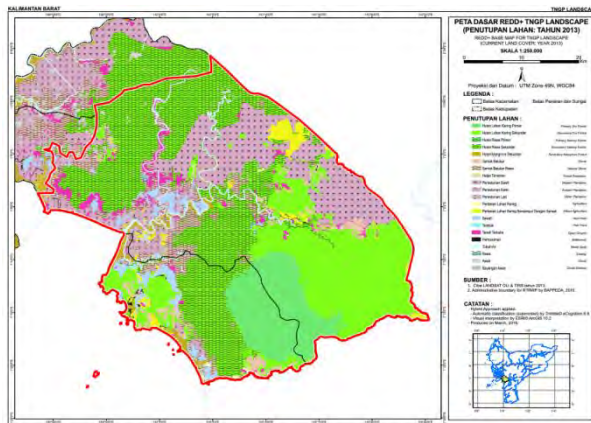
(b) 2006



(c) 2009



(d) 2011



(e) 2013

Figure 78 Historic LCMs of 2 sub-districts (LCM Ver. 6)

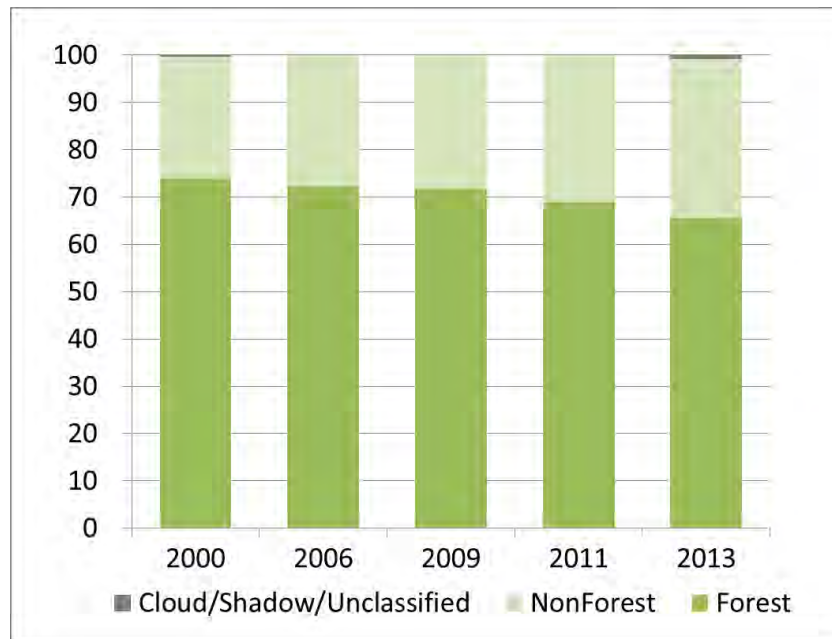


Figure 79 Forest dynamics of targeted 2 sub-districts (LCM Ver. 6) (Unit: %)

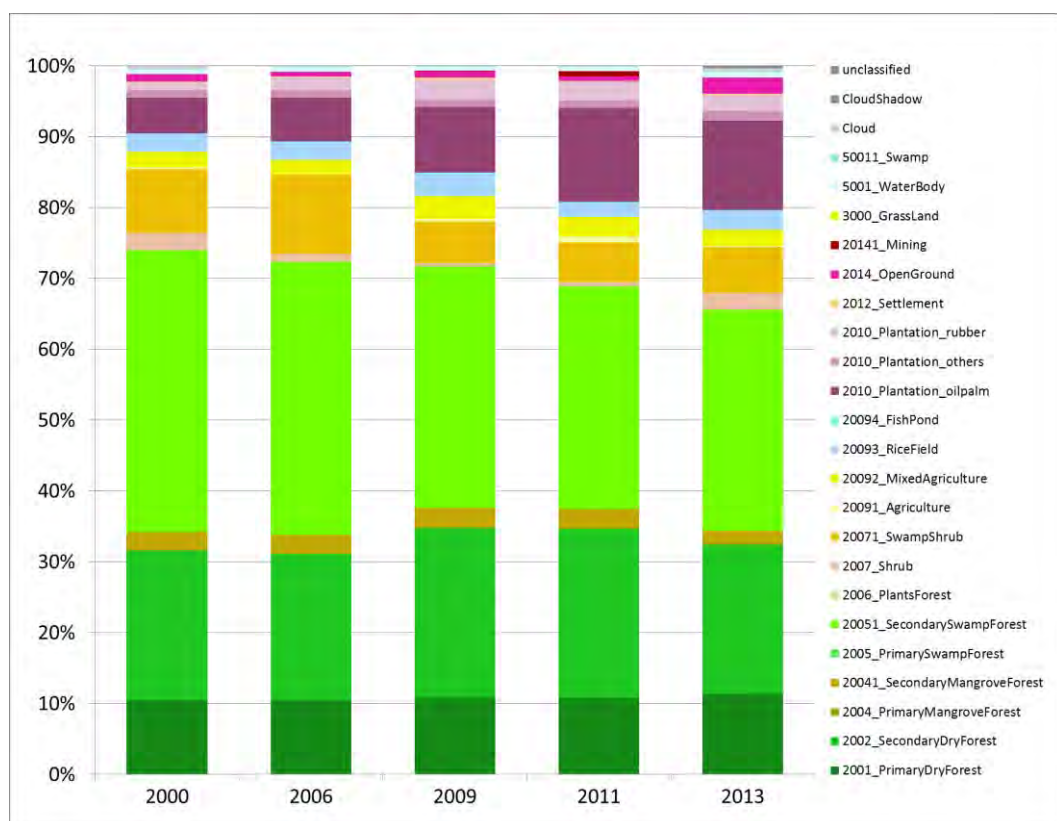


Figure 80 Land cover change of the 2 sub-districts (LCM Ver. 6) (Unit: %)

2. Trial developing drainage canal / canal map

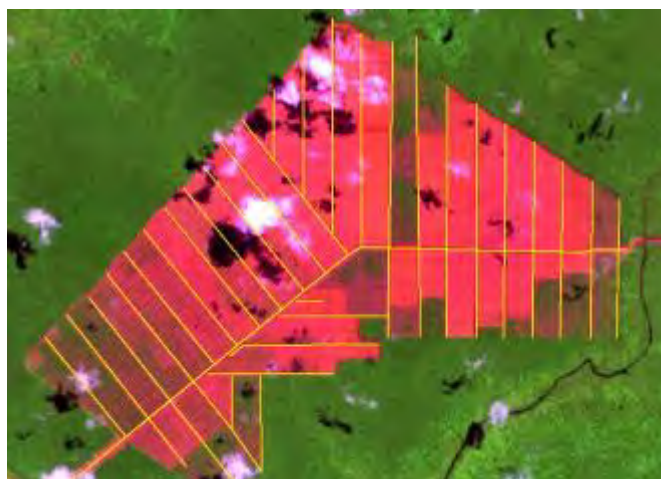
Map of drainage canal/canal was prepared for further analysis by digital delineation using GIS software. Because of resolution of LANDSAT imagery (30 m), all of drainages is not interpreted especially majority of small scale drainages can not be interpreted. Because of this difficulty, on-line Google Earth - partly higher resolution images were available - The result is shown in Figure 81 and Figure 82.



Figure 81 Result of digital delineation of drainages (Scale 1:1,000,000)



Scale 1:200,000



Scale 1:50,000

Figure 82 Detail results of digital delineation of drainage (estate crop area)

3. Forest survey around GPNP to applicability of existing emission factor

This survey was focused on the area that has experienced illegal logging activities. And tree measurement have been conducted with GPNP staffs and above ground tree biomass (AGB) was estimated. The history - forest usage, disturbance and its cause - was also discussed and recorded in the field for later analysis. The distribution of surveyed plots was shown in Figure 83. Also Figure 84 shows close-up of the peat swamp forest along the west border of GPNP. According to the location (Figure 84) and AGB estimation (Table 53), North-western part of GPNP (GT01, GT02, GT03) has smaller biomass and south-western part (GT05, GT06, GT20) is relatively larger biomass. These larger AGB is more similar to AGBs in RAD-GRK or National FREL. It is not clear why inland GT20 has smaller biomass than GT06 which located in the edge of the forest area. More intense survey will be needed for more detail comparison. The scenery of forest survey was shown in Figure 85.

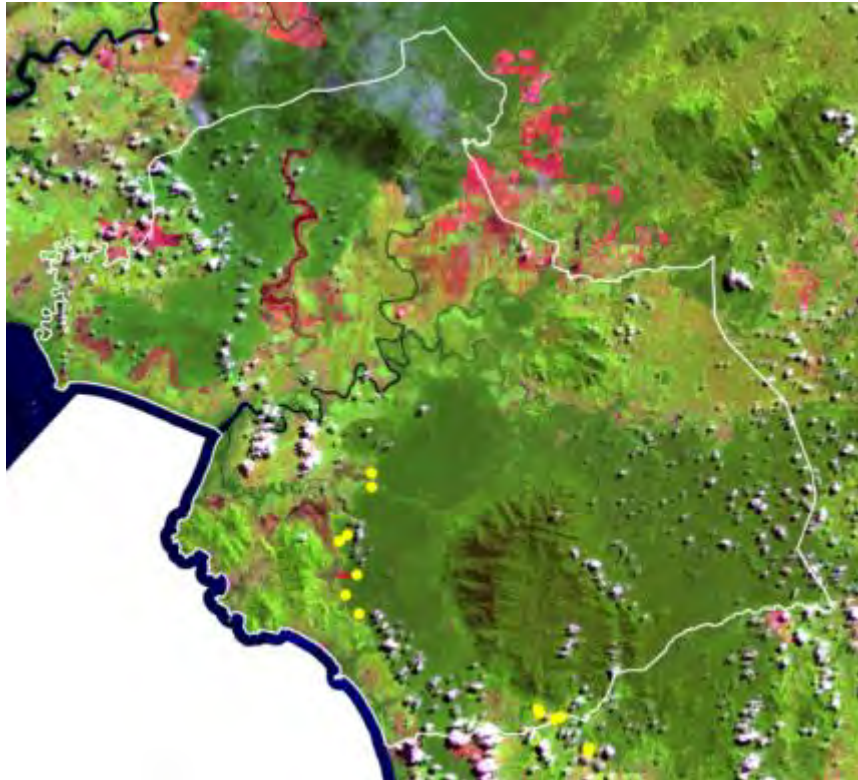


Figure 83 Distribution of forest survey plots (overview)

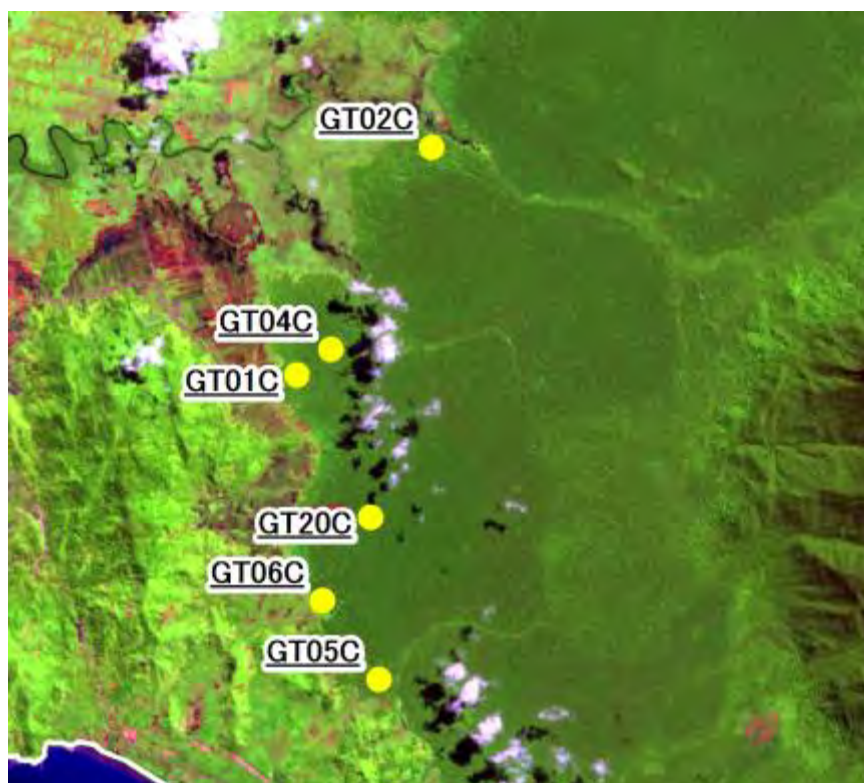


Figure 84 Distribution of forest survey plots (detail)



Circular plot setting by Vertex



Measuring & Identifying Trees

Figure 85 Scenery of forest survey

4. Carbon stock estimation

For calculating AGB, “Monograph Allometric Models for Estimating Tree Biomass at Various Forest Ecosystem Types in Indonesia” by FORDA (FORDA, 2012) was referred. The comparison of AGB estimation with the emission factor described in RAD-GRK and National FREL is shown in Table 53 and Figure 86.

Table 53 AGB estimation, comparison by formula. (tC/ha)

Plot ID	PSF 1)	PSFs (post-fire) 2)	PSFs (post-logging) 3)	RAD-GRK West Kalimantan	National FREL 4) (Kalimantan)	National FREL 4) (Indonesia)
GT01	62.26	68.95	108.16	155	170.5	159.3
GT02	83.51	89.04	142.84			
GT04	40.74	44.71	70.50			
GT05	108.89	113.72	184.66			
GT06	145.94	152.82	247.81			
GT20	136.55	144.80	233.05			

1) PSF(Peat Swamp Forest): $W=0.107D^{2.486}$

2) PSFs(post fire): $W=0.153108D^{2.4}$

3) PSFs(post-logging): $W=0.206284D^{2.4511}$

4) National FREL: National Forest Reference Emission Level for Deforestation and Forest Degradation, MoEF 2015

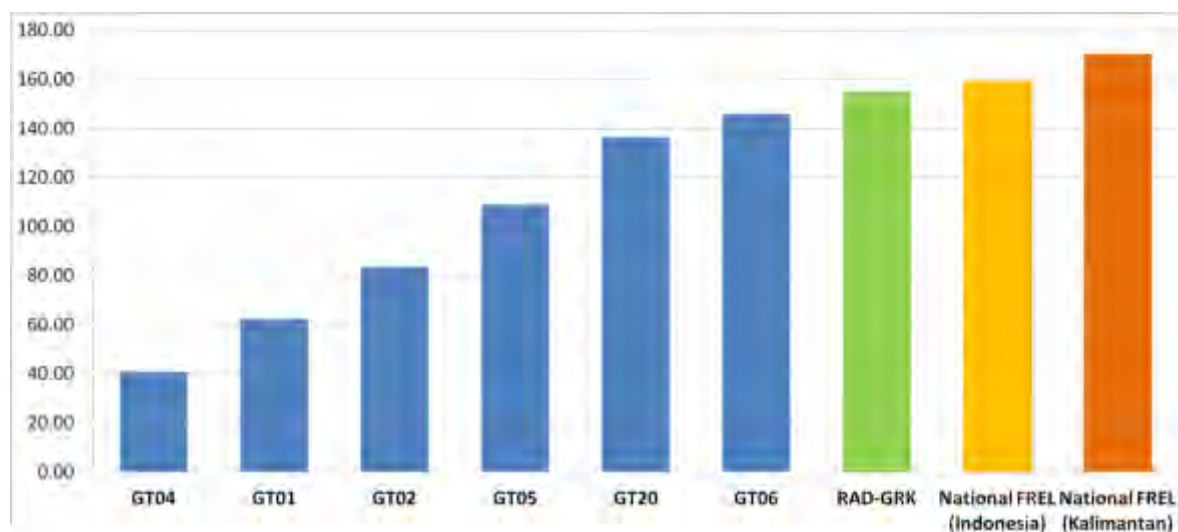


Figure 86 AGB estimation in Peat Swamp Forest around GPNP. (tC/ha)
(Without post fire or illegal-logging)

Plot survey was conducted by circular shape which has 0.071ha of its area (diameter=15m). The team was consisted of 4 persons and it took approximately 90 munities/plots in secondary swamp forest. Time for approaching to the site is depended on the accessibility of target site or season which survey was conducted.

Table 55 describes the overview of this survey.

Table 54 Composition and role of survey team

	Role	Number of persons
Chief surveyor	- Plot setting with field worker - Tree height measurement - Diameter measurement (additional)	1 person
Surveyor	- Diameter measurement	1 person
Botanist	- Species identification - Data recording	1 person
Local guide	Supportive field worker	1 person
Total		4 persons

Table 55 Duration for circular plot survey on the site

Activities	Members engaged in	Duration (munities)
Approaching target site	All of the team members	(Depends on the accessibility)
Plot setting with field worker	Chief surveyor & field worker	20
Diameter measurement, species identification	Surveyor & Botanist	50*

Activities	Members engaged in	Duration (minutes)
Tree height measurement	Chief surveyor & field worker	20
Total		90

* 3. Diameter measurement, species identification can be started in line with plot setting.

5. Collect and assess data on community livelihood⁶⁶

5.1. Implementing methods

This study collected and analyzed information relating to the livelihoods of communities based on the socio-economic survey conducted in activity 2-2. The survey subjects were 1,275 households from 18 villages around the GPNP and 80 households in four villages in Simpang Hilir county. In ascertaining the livelihoods of communities, income from farming or use of natural resources was treated as “on-farm” and off-farm income from oil palm plantations and self-employment, etc. was treated as “off-farm”.

5.2. Collecting and assessing data on community livelihood

The table below shows the drivers and agents of deforestation and livelihoods of communities in PDD proposals based on the survey results of activity 2-2, relating to the socio-economic survey. Numerical values were shown with the ratio of household subjects gaining income from the items raised.

Income sources derived from farming and natural resources were as follows: wetland paddies, upland dry paddies, livestock, NTFP, and rubber. Income from rice production in wetland paddies was led by Sudahan Jaya, while income from rice production in upland dry paddies was led by Sutera, Penjawaan and Pampang Harapan. It was also confirmed that there are many households gaining income from rubber production in villages located on the east side of the park (Sempurna, Teluk Bayur, Penjawaan) and villages located in Simpang Hilir county (Rantau Panjang, Padu Banjar, Pulau Kumbang). Furthermore, although there were low ratios in the villages of Pangkalan Buton, Gunung Sembilan, Benawai Agung, Matan Jaya, Penjawaan, Pangkalan Telok and Laman Satong, it was found that incomes are also being gained from timber sales (Table 56).

Off-farm income was found to mainly come from livelihoods with wage income from work at oil plantations or in the mining of minerals, etc. (Table 57)

Table 56 Income sources derived from farming and natural resources

Village	Wetland paddy	Upland dry paddy	Vegetable	Livestock	Hunting	NTFP	Fuel wood	Timber	Rubber
Riam Berasap	0.0%	10.0%	5.0%	10.0%	0.0%	21.7%	0.0%	0.0%	11.7%
Simpang Tiga	80.0%	0.0%	0.0%	16.7%	0.0%	6.7%	3.3%	0.0%	66.7%
Sejahtera	58.6%	0.0%	0.0%	4.3%	0.0%	4.3%	0.0%	0.0%	31.4%

⁶⁶ The detail result of socio-economic survey compiled as a report (see Appendix 6)

Village	Wetland paddy	Upland dry paddy	Vegetable	Livestock	Hunting	NTFP	Fuel wood	Timber	Rubber
Pampang Harapan	43.8%	18.8%	45.0%	26.3%	0.0%	30.0%	0.0%	0.0%	11.3%
Pangkalan Buton	55.8%	1.7%	18.3%	59.2%	3.3%	22.5%	3.3%	1.7%	11.7%
Sutera	40.0%	2.5%	25.0%	55.0%	0.0%	20.0%	0.0%	0.0%	2.5%
Gunung Sembilan	50.0%	0.0%	8.3%	51.7%	0.0%	51.7%	0.0%	6.7%	0.0%
Benawai Agung	64.3%	12.9%	4.3%	47.1%	0.0%	24.3%	2.9%	1.4%	22.9%
Sedahan Jaya	89.2%	0.0%	5.8%	52.5%	0.8%	40.8%	0.8%	0.0%	0.0%
Rantau Panjang	35.0%	0.0%	38.3%	43.3%	0.0%	53.3%	0.0%	0.0%	83.3%
Batu Barat	31.7%	27.5%	0.0%	10.8%	0.0%	7.5%	0.0%	0.0%	31.7%
Matan Jaya	6.7%	50.0%	2.2%	2.2%	1.1%	14.4%	0.0%	2.2%	8.9%
Teluk Bayur	47.5%	7.5%	0.0%	22.5%	0.0%	10.0%	7.5%	0.0%	62.5%
Sempurna	56.3%	16.3%	0.0%	5.0%	0.0%	2.5%	0.0%	0.0%	88.8%
Jago Bersatu	52.0%	4.0%	0.0%	8.0%	0.0%	8.0%	4.0%	0.0%	60.0%
Penjawaan	0.0%	36.7%	0.0%	10.0%	0.0%	3.3%	0.0%	3.3%	80.0%
Pangkalan Telok	3.3%	61.1%	2.2%	17.8%	3.3%	4.4%	0.0%	8.9%	51.1%
Laman Satong	22.2%	31.1%	3.3%	14.4%	4.4%	8.9%	0.0%	3.3%	25.6%
Padu Banjar	20.0%	25.0%	5.0%	0.0%	0.0%	5.0%	0.0%	0.0%	75.0%
Pemangkat	0.0%	20.0%	85.0%	0.0%	0.0%	0.0%	0.0%	0.0%	55.0%
Pulau Kumbang	0.0%	5.0%	0.0%	10.0%	0.0%	0.0%	5.0%	0.0%	70.0%
Nipah Kuning	0.0%	20.0%	10.0%	0.0%	0.0%	0.0%	5.0%	5.0%	35.0%

(Green: values of 20% or higher)

Table 57 Off-farming income (income by salary)

Village	Perma nent oil palm	Perma nent farmin g	Perma nent mining	Perma nent others	Temp orary oil palm	Tempo rary farmin g	Tempo rary mining	Going outside to work	Tempo rary others	Private busine ss
Riam Berasap	38.3%	1.7%	0.0%	46.7%	3.3%	1.7%	0.0%	0.0%	31.7%	6.7%
Simpang Tiga	16.7%	3.3%	0.0%	40.0%	10.0%	3.3%	0.0%	3.3%	30.0%	6.7%
Sejahtera	5.7%	2.9%	0.0%	61.4%	1.4%	1.4%	0.0%	0.0%	41.4%	2.9%
Pampang Harapan	3.8%	10.0%	2.5%	35.0%	1.3%	16.3%	6.3%	8.8%	22.5%	1.3%
Pangkalan Buton	0.0%	3.3%	5.8%	52.5%	0.0%	6.7%	1.7%	0.8%	29.2%	9.2%
Sutera	0.0%	2.5%	2.5%	77.5%	0.0%	0.0%	0.0%	0.0%	40.0%	10.0%
Gunung Sembilan	3.3%	6.7%	1.7%	61.7%	0.0%	3.3%	1.7%	0.0%	36.7%	6.7%
Benawai Agung	4.3%	8.6%	4.3%	24.3%	0.0%	14.3%	5.7%	0.0%	37.1%	14.3%
Sedahan Jaya	1.7%	7.5%	0.8%	27.5%	0.0%	32.5%	1.7%	0.8%	27.5%	9.2%
Rantau Panjang	8.3%	10.0%	1.7%	53.3%	8.3%	5.0%	1.7%	0.0%	26.7%	0.0%
Batu Barat	46.7%	2.5%	0.0%	56.7%	8.3%	0.0%	0.0%	0.8%	26.7%	3.3%
Matan Jaya	52.2%	2.2%	6.7%	55.6%	3.3%	0.0%	0.0%	0.0%	36.7%	2.2%
Teluk Bayur	37.5%	2.5%	0.0%	52.5%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%
Sempurna	18.8%	0.0%	0.0%	12.5%	21.3%	1.3%	0.0%	0.0%	16.3%	1.3%
Jago Bersatu	48.0%	0.0%	0.0%	16.0%	0.0%	0.0%	0.0%	4.0%	0.0%	0.0%
Penjawaan	30.0%	0.0%	0.0%	26.7%	13.3%	0.0%	0.0%	0.0%	10.0%	3.3%
Pangkalan Telok	34.4%	1.1%	0.0%	16.7%	6.7%	0.0%	0.0%	0.0%	11.1%	8.9%
Laman Satong	42.2%	0.0%	6.7%	13.3%	20.0%	0.0%	1.1%	0.0%	5.6%	2.2%
Padu Banjar	0.0%	20.0%	0.0%	65.0%	25.0%	35.0%	0.0%	0.0%	10.0%	0.0%
Pemangkat	10.0%	5.0%	0.0%	55.0%	0.0%	0.0%	0.0%	0.0%	10.0%	10.0%
Pulau Kumbang	0.0%	10.0%	0.0%	70.0%	10.0%	5.0%	0.0%	0.0%	65.0%	5.0%
Nipah Kuning	10.0%	40.0%	0.0%	70.0%	0.0%	5.0%	0.0%	0.0%	25.0%	0.0%

(Green: values of 20% or higher)

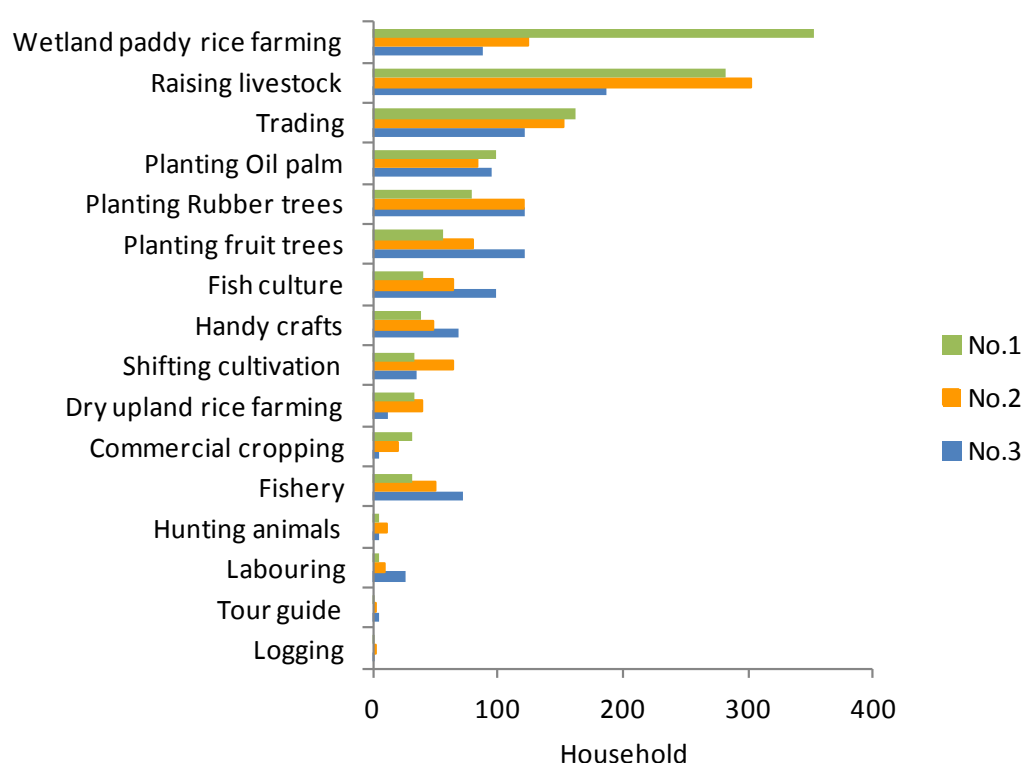


Figure 87 Livelihoods for which introduction is desirable

Although there are many households in the area covered by this study that want to introduce rice crop production using wet paddy cultivation, it is likely that decisions on community livelihoods are affected by geographic causes, natural environment conditions, land use regulations and residents' degrees of recognition (boundaries and all kinds of rules), etc., and when selecting REDD+ activities it will be necessary not only to keep in mind not only community preferences but also the factors behind these preferences.

As seen thus far, there are diverse livelihoods carried out in each village and community around the GPNP. As ascertained in activity 2-2, oil palm plantation development is a likely cause of deforestation on this site, but it was found that there is a wide range of drivers and agents related to diverse livelihoods with large to small impact. Furthermore, it was found that there are also multiple underlying issues surrounding forest management at the relevant business sites, thus it has been ascertained from this survey that the proposed REDD+ activities will be effective if implemented on two levels: overall initiatives that contribute to resolution of underlying problems, and initiatives aiming to improve production and ability at household/community level (Figure 88).

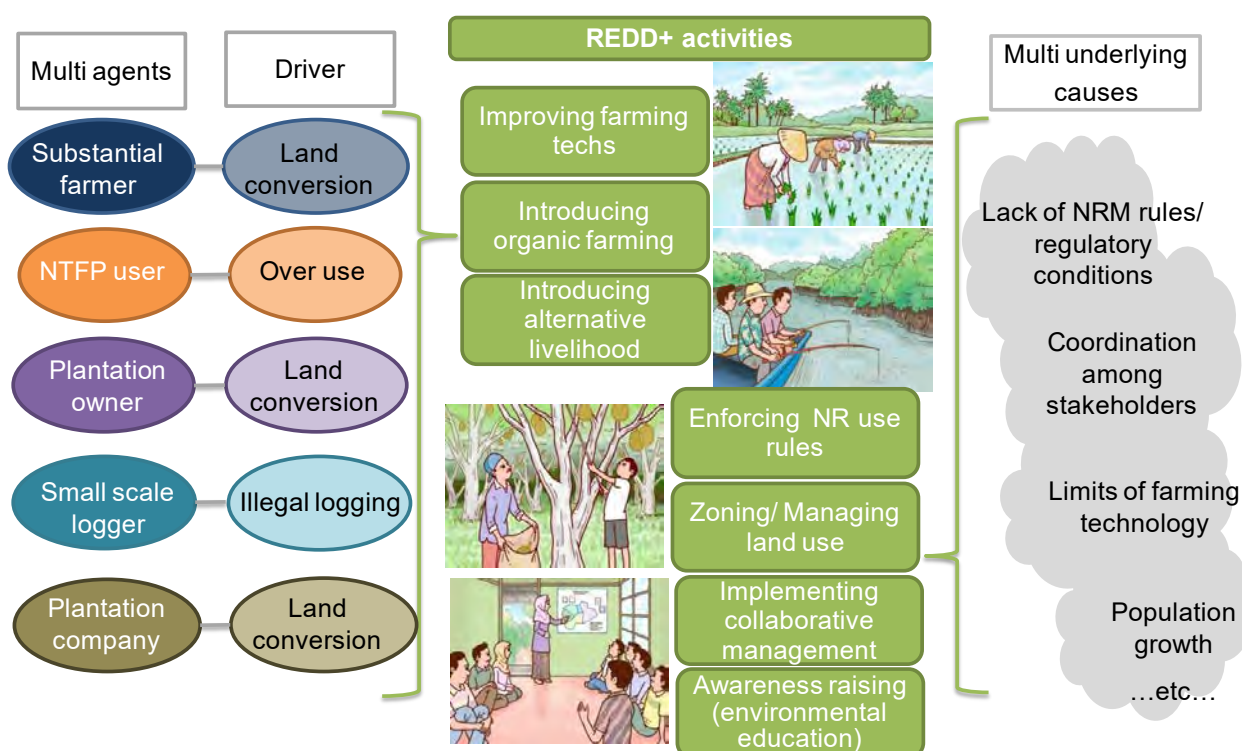


Figure 88 REDD+ activities

Activity 2-10 Draft a REDD+ PDD for GPNP and its Landscape.

1. Concept of the preparation of the Report on REDD+ planning study

In IJ-REDD+ project, all of activities to accumulate outcomes (knowledge or data) were compiled in the report on REDD+ planning study (hereinafter the report) which included some options to be considered and applied after IJ-REDD+ project (2013-2016, as tentative project period).

In order to prepare the report, as one of the appreciated guidelines for the REDD+ project, the Joint Crediting Mechanism (JCM) was picked up. However, the JCM had not been developed even in March 2016, and institutional arrangement and detail modality and procedure for the REDD+ project or program had not been developed under the UNFCCC. Therefore, by discussions with Indonesia's stakeholder, IJ-REDD+ decided to prepare the report which had some directions of geographical boundaries of REDD+ project and was considered international and national REDD+ discussions (e.g. JCM and UNFCCC and) as most credible crediting scheme.

Works for preparing the report were conducted according to the schedule drawn in Figure 89.

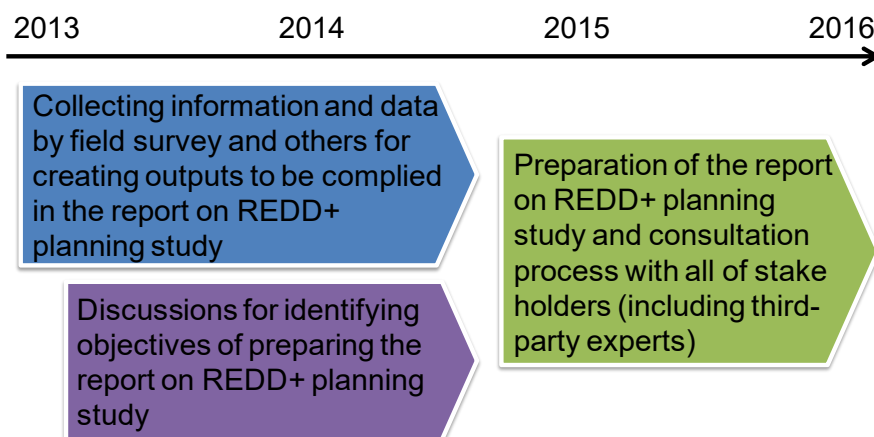


Figure 89 Work flow for preparing the report

In addition to the concept of the report as mentioned above, IJ-REDD+ had been discussed about target site (i.e. conservation target area), and the report was decided to prepare with some options of geographical boundaries through consultation process by using some tentative analysis of IJ-REDD+ outcomes (Figure 90).

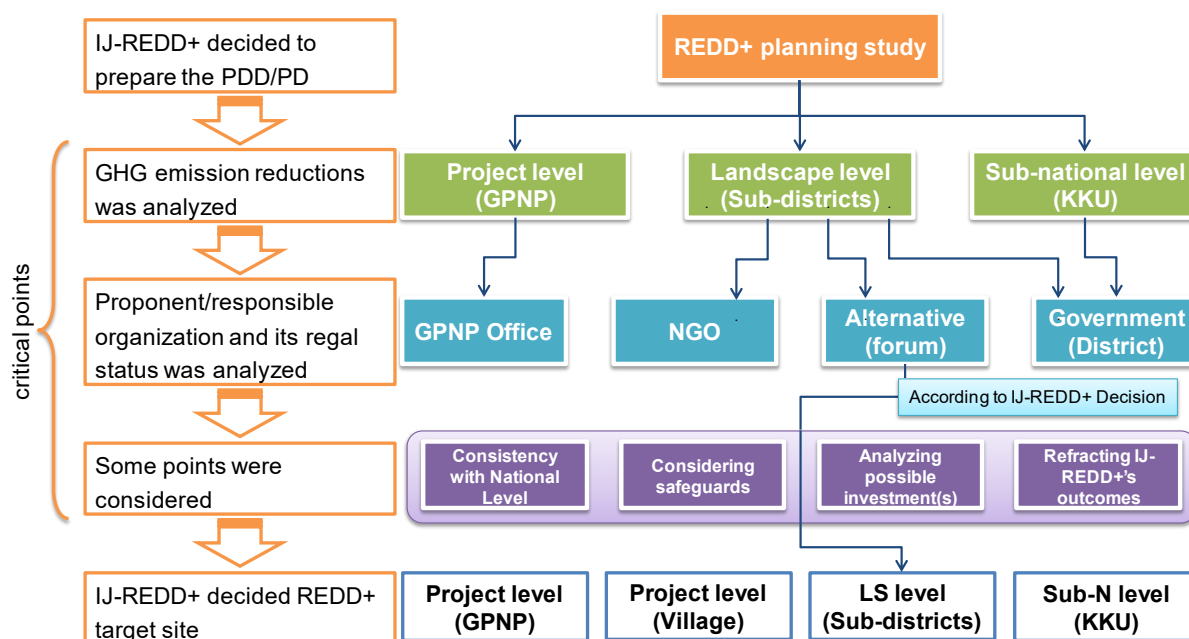


Figure 90 Some consultation points for deciding direction of REDD+ activities

In each critical point mentioned in above Figure 90, following IJ-REDD+ outcomes from Activity 2-2, 2-5, 2-6 and 2-8 were used and analyzed (Figure 91)

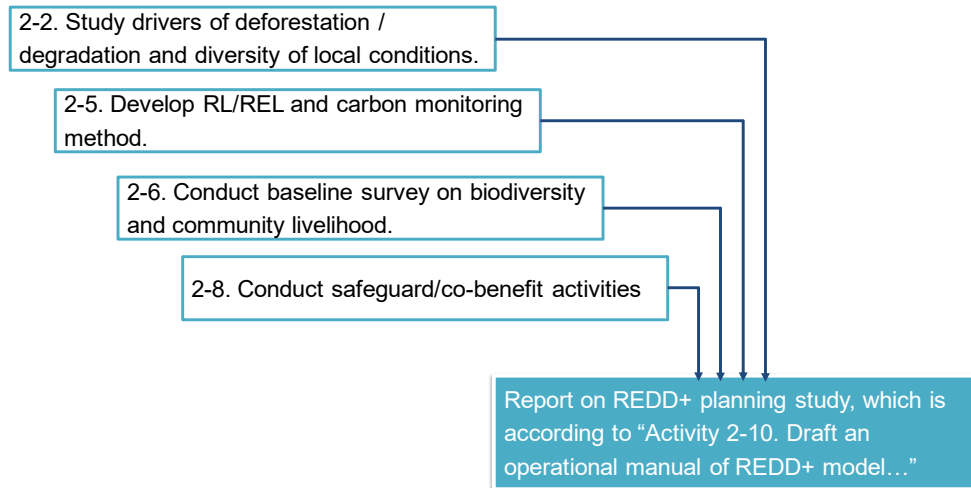


Figure 91 The relationship between the report and IJ-REDD+ activities

Also, as one of example, in case of applying REDD+ scheme of Verified Carbon Standards (VCS) which is as only developed international REDD+ implementation scheme, the relationship between contents of the VCS REDD+ Jurisdictional and Nested REDD+ (JNR) and activities of the IJ-REDD+ was compiled in Figure 92.

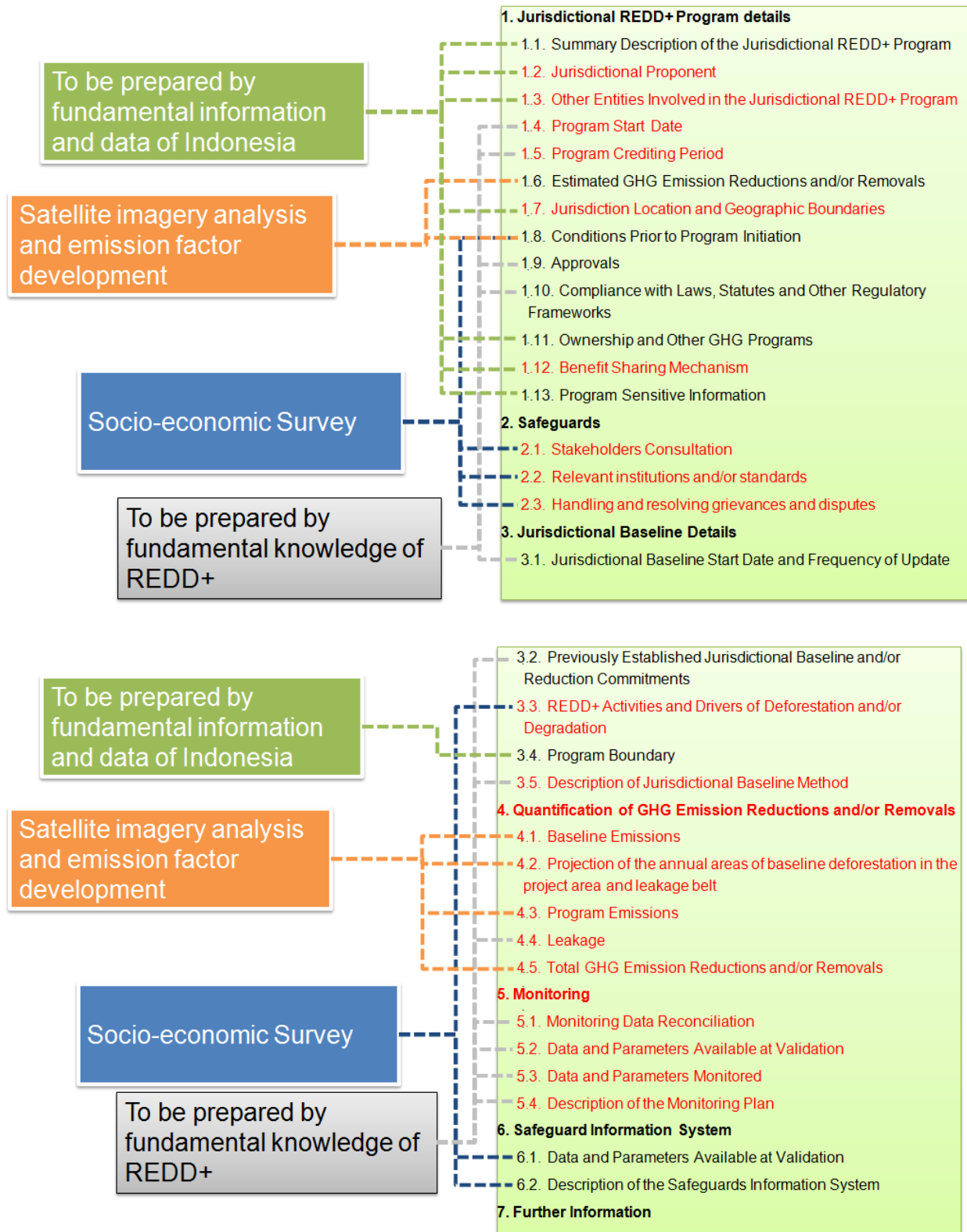


Figure 92 The relationship between the contents of the VCS REDD+ JNR and activities of the IJ-REDD+

2. Discussion process for deciding REDD+ target site (conservation area)

The REDD+ target site had been discussed by stakeholders of IJ-REDD+, and discussion points were mainly 1) GHG emissions reduction potential; 2) feasibility for reducing deforestation and forest degradation; 3) MRV implementing structure; and 4) Legal status of the proponent(s).

From analysis by using tentative results of IJ-REDD+ (up to end of December 2015), the most appreciated REDD+ project was selected from using criteria of “large potential of GHG emissions reduction” (Table 58) and Direction 3 of landscape level REDD+ targeting sub-districts had been intensively analyzed. However the Direction 3 remained some critical points of legal status of the proponent(s) and MRV implementing structure. Therefore it was thought that more intensive activities regarding above points will be required if IJ-REDD+ will support the Direction 3.

Table 58 Analyzed points in 4 cases of REDD+ directions

	Direction 1: Project level (GPNP)	Direction 2: Project level (Village)	Direction 3: LS level (Sub-districts)	Direction 4: Sub-N level (KKU)
Current land and forest condition	Verywell: Already well managed.	General: Some were well managed, while some were not.	General: Not well managed except for some villages	General: Not well managed except for some villages
Feasibility for reducing deforestation	Verywell: GPNP office has ability and enough experiences to implement REDD+	Verywell: Some NGOs have ability and enough experiences in some villages	General: A few experiences. It is needed to build capacity for wide-scale REDD+	General: A few experiences. It is needed to build capacity for huge-scale REDD+
MRV implementing structure	Verywell: GPNP office has capability to implement MRV	Bad: No MRV structure and no information on capability	Bad: No MRV structure and no information on capability	General: Government will has capability to implement MRV
Legal status of the proponent(s)	Verywell: GPNP office has legal status according to Indonesian law	General: Some villages have experiences of Hutan Desa Concession	Bad: No regal status. It is needed to consider this point	General: Government has responsibility in area of “forest”

From consideration of future circumstances of international or national REDD+, other options of Direction 1, 2, and 4 will be remained as candidate of REDD+ target area. If such candidates are selected, additional works for collecting data and developing institutional arrangement are required then such additional works were complied as follows (Table 59)

Table 59 Additional works in cases of other directions of REDD+

	Direction 3: LS level (Sub-districts)	Direction 1: Project level (GPNP)	Direction 2: Project level (Village)	Direction 4: Sub-N level (KKU)
Proponent(s)	Notreachtodecision Criteria of regal status, governance and ability are discussed .	Noadditionalworks GPNP Office should be elected as proponent.	Noadditionalworks Some NGOs should be elected as proponent(s).	Noadditionalworks KKU Government should be elected as proponent.
REDD+ activities	Onprocess Demo-activities are on going, and applicability of each activity are not evaluated.	Noadditionalworks Results of direction 3 should be applied.	Noadditionalworks Results of direction 3 and activity by NGOs should be applied.	Havingadditionalworks Some demo-activities should be implemented.
Safeguards (SGs)	Finish SGs system is developed through forum activities.	Noadditionalworks Results of direction 3 should be applied.	Noadditionalworks Results of direction 3 and activity by NGOs should be applied	Havingadditionalworks Some sub-districts should be reviewed.
MRV structure	Notreachtodecision New structure should be established and build up by supports.	Noadditionalworks GPNP Office already has ability. But additionality is the point to be addressed.	Tobereviewed Some NGOs will have ability, but review is necessary.	Tobereviewed Government will have ability, but review is necessary..
Others	Official decision for implementing REDD+ project should be first point.	PDD is simple. Emission reduction potential and additionality should be addressed.	PDD is simple, but GHG emission reductions and additionality of the project should be addressed	PDD is simple.

Even in March 2016, REDD+ direction under the UNFCCC were still under negotiation and details guidelines had not been developed. But considering current international and national circumstances, outcomes of the IJ-REDD+ will be flexibly used to change direction into small to large geographical boundaries (Direction 1, 2 and 4) in the future.

3. Significant points of the Report

3.1. Identification of the REDD+ target

IJ-REDD+ did not reach to final decision of REDD+ target site and decided to provide some options of REDD+ in the future. One of the appropriate candidates was to apply landscape based approach (Direction 3), and was target both of sub-district of Sukadana and Simpang Hilir Sub-districts in Kayong Utara District. In this case, reference area for developing FREL or baseline was set in allover Kayong Utara District. Leakage belt which are to be managed to reduce leakage activities were set in Telok Batang and Pulau May Sub-districts. In order to set reference area and leakage belt, comments from all of stakeholder, especially from staff of the GPNP were collected and analyzed (see Appendix 7-1)



Figure 93 REDD+ target area and other related area

Regarding identification of the target site, only case of village level (Direction 2) has critical point of

set real geographical boundary, because some village do not have organized geographical boundary. The other options (Direction 1 and 4) will not have critical points to be addressed for identification of geographical boundaries.

3.2. Identification of drivers of deforestation and forest degradation and their counter measures activities

From comparison with other REDD+ programs or projects in Indonesia and other developing counties, we identified that our target area showed very specific condition of very many total number of households and many types of ethnic group (Table 60). Therefore it was assumed that there were many types of drivers of deforestation and forest degradation and many agents who cause some direct and indirect deforestation and forest degradation activities.

Table 60 Comparison among existing REDD+ programs or projects

REDD+ project	Target area (ha)	Number of HH	Main ethnic group
Two sub-districts (this study)	200,000	Over 200,000	Over Seven (Melayu, Dayak, Jawa, Bali, China, Bugis, Madura and others)
Participatory Land and Forest Management Project (Lao PDR_JICA-VCS based)	30,489	App. 400	Two: Khmu and Hmong
The Kasigau Corridor REDD Project - Phase I Rukinga Sanctuary (Kenia_VCS)	30,169	No information	No information
Rimba Raya Biodiversity Reserve Project (Indonesia_VCS)	64,000	No information (10 communities)	No information
Alto Mayo Conservation Initiative Project (Peru_VCS)	182,000	App. 3,000-4,000	No information

It was note that activities for identifying drivers of deforestation and forest degradation are compiled in Activity 2-2, 2-4, but in case of applying sub-national base REDD+ boundaries (Kayong Utara District) (Direction 4), additional works for identifying all of drivers and agents of deforestation and forest degradation should be necessary because IJ-REDD+ had not address outside Sukadana and Simpang Hiril Sub-districts. Also according to drivers and agents of deforestation and forest degradation, applied REDD+ activities (counter-measures/activities) will be necessary to identified. Additionally, REDD+ activities should be implemented in line with consideration of social safeguards.

4. Third-body review process of the draft report on REDD+ planning study

In order to verify quality of developed the report to check the consistency with Indonesian forest management system and REDD+ strategies, IJ-REDD+ had review process by Indonesian experts who were from third-organizations. The review process was implemented by the schedule in Figure 94.



Figure 94 Schedule of third-body review process

From third-body review process of the report was conducted by using a example of REDD+ planning document which is targeting REDD+ project of landscape base (Sukadana and Simpang Hiril Sub-districts in Kayong Utara District), and there were 176 comments in total.

Reviewers comments were separated into 3 categories of; Corrective Action Request (CAR); Clarification Request (CL); and Recommendation (R) (Table 61), and number of each type of comment were 28, 128 and 20 respectively.

Table 61 Categories of comments on draft PD

Requirements	Meanings of Each Requirements
Corrective Action Request (CAR) <i>i.e., It should be improved, if do not so, the PD is not applicable.</i>	in the case that one of the following occurs: a. The project proponents have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions; b. The VCS requirements have not been met; c. There is a risk that emission reductions cannot be monitored or calculated. There is a erroneous description.
Clarification Request(CL)	in the case that information is insufficient or not clear enough to determine whether the applicable.
Recommendation (R)	for better presentation of PD and/or for validation process

Table 62 Summary of the result of third-body review process

Review's comment type		[First step] comments from IJ-REDD+ members and third-body reviews, and [Second step] consultation process		Improved points
Requirements	CAR	28	Requirements to be improved in line with the Indonesian circumstances	28
	CL	128	Typing mistakes and additional explanations to reviews so on	128
	R	20	Additional information on technical words	20

As mentioned in Table 62, review process by third-body reviewers was implemented from February to March in 2016 (2 times meetings in Jakarta). After those, the report reached to eliminate all of issues which were indicated by reviewers (see Appendix 7-1). The report still had important point of selecting proponent(s) and others, but other issues were improved through review process, then the report was considered to show its validity.

5. Other outputs

5.1. Technology development for separating secondary forests by accumulated carbon stock

The flow of the imagery analysis to create land cover map was the same flow as showed in Output 1 “Activity1-3 of Collect data on historical/future land use and carbon stock at the district . The way of developing base-map for the four western districts is basically applied to the method of base-map creation and so forth for GPNP pilot area. Classification method was the same object-based classification as used for the four districts.

In this study, the 23 class of the MoF classification category was referred. In addition, to develop more reliable RL, secondary forests were divided to two classes as normal secondary forests and degraded forests in consideration of carbon stock.

Satellite imageries used to create land cover map of the pilot area is also LANDSAT, middle resolution sensor, which corresponded to the scene P120 R61 and P121 R61 of the imageries shown in Figure 27. In addition, high resolution satellite imageries of SPOT6 were procured. The list of SPOT6 imageries is shown as follows.

Table 63 List of SPOT6 satellite imageries

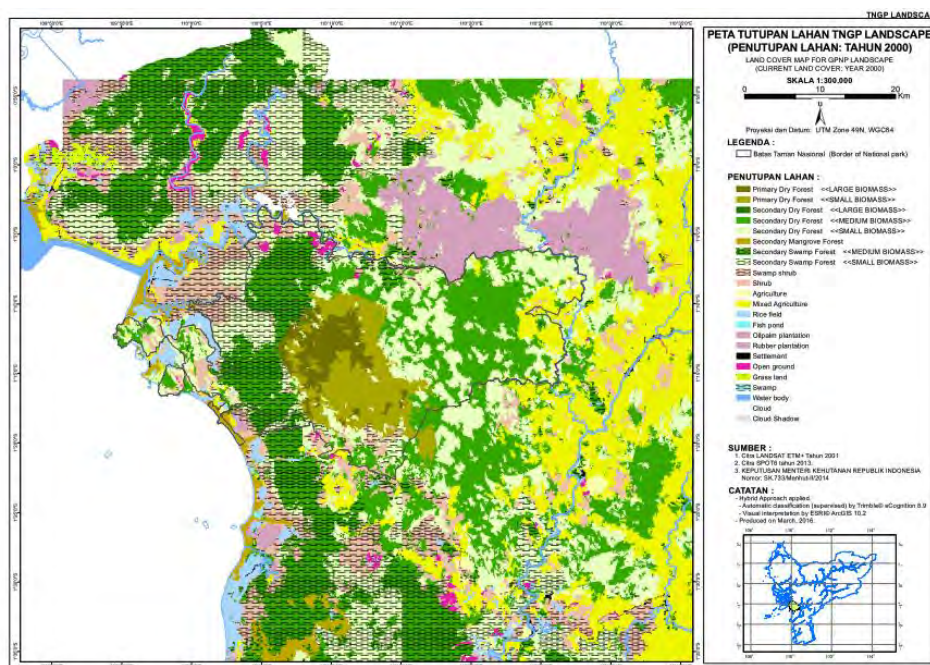
No	ID	Acquired date
1	PO140502_SO14001114-1-01_DS_SPOT6_201310060235006_FR1_FR1_SE1_SE1_E110S02_04956	06-Oct-2013
2	PO140502_SO14001114-1-02_DS_SPOT6_201308010243382_FR1_FR1_SE1_SE1_E110S02_01709	01-Aug-2013
3	PO140502_SO14001114-1-03_DS_SPOT6_201307080228325_FR1_FR1_SE1_SE1_E110S01_04307	08-Jul-2013
4	PO140502_SO14001114-1-04_DS_SPOT6_201306240235567_FR1_FR1_SE1_SE1_E111S02_07635	24-Jun-2013
5	PO140502_SO14001114-1-05_DS_SPOT6_201306220251152_FR1_FR1_SE1_SE1_E110S01_03738	22-Jun-2013

Land cover maps which classified automatically at first and then interpreting visually are shown in Figure 95 (a) year 2000, (b) 2006 and (c) 2013. Boundary of black color shows GPNP. Methodology of classification for secondary dry and swamp forest is interpretation on the basis of the results of field survey as mentioned below.

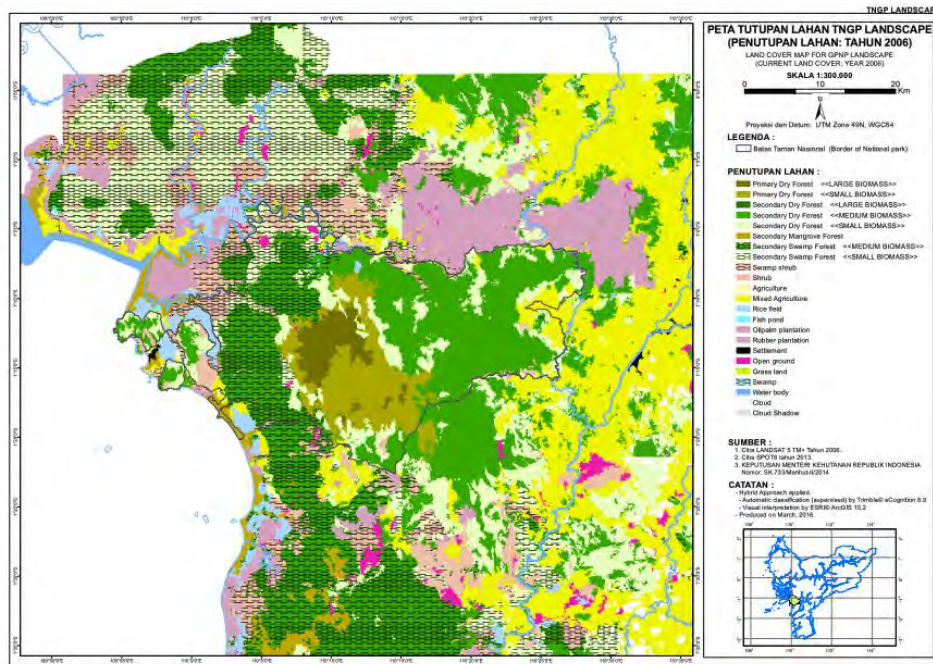
Figure 96 is the comparison of forest/non-forest areal change by the predefined border during 2000 and

2013. In the inside of GPNP border only, no forest area decrease can be observed based on the LCM analysis. But if the area of analysis is enlarged until the border of Sukadana and Simpang Hilir sub-districts in Kayong Utara district, forest area decrease can be observed and it's rate is about 10% of the area of 2 sub-districts.

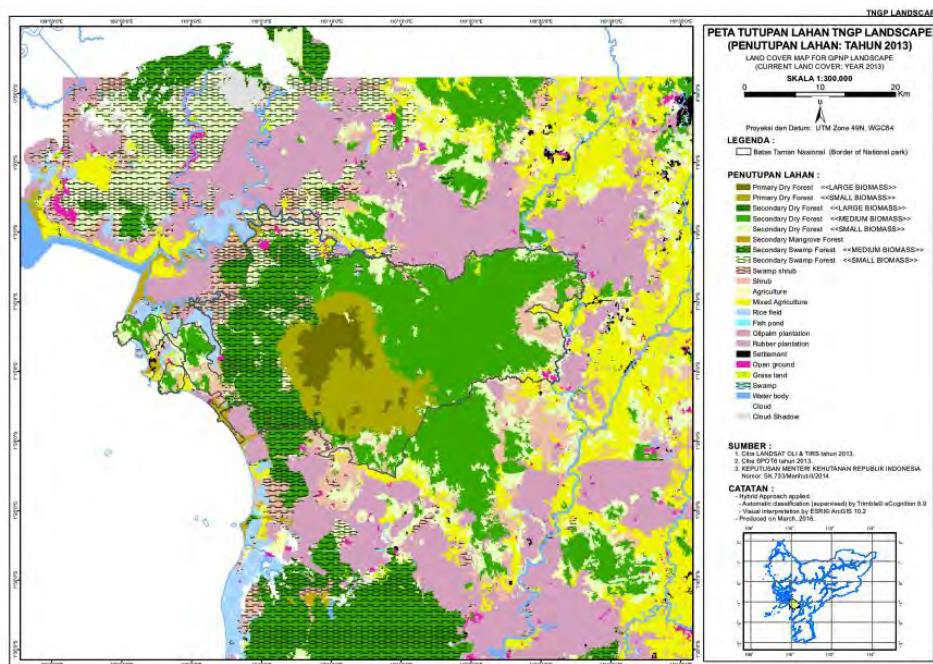
Forest dynamics as land cover class change is shown in Figure 97 and Figure 98. As Figure 97 shows, total area of “Secondary Dry Forest <<MEDIUM BIOMASS>>” is grown and “Secondary Dry Forest <<SMALL BIOMASS>>” is shrink on the contrary between 2000 and 2013. It can be described the forest biomass in GPNP is enriched or grown. In 2 sub-districts, same trend can be observed in Figure 98,, but deforestation has occurred at the outside of GPNP in both swamp forest area classified as “Secondary Swamp Forest <<MEDIUM BIOMASS>>” and “Secondary Swamp Forest <<SMALL BIOMASS>>”. According to LCM in Figure 95, this deforestation is observed in the northern and southern area of GPNP.



a) Year 2000

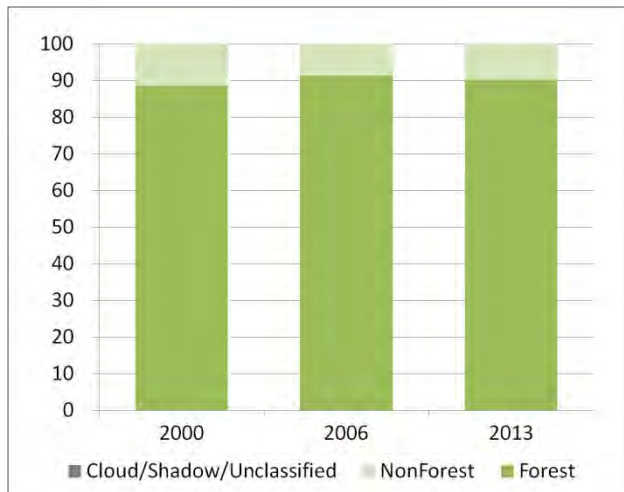


b) Year 2006

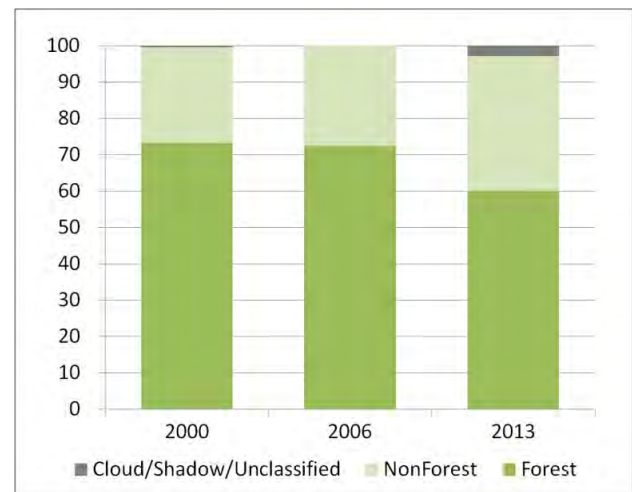


c) Year 2013

Figure 95 Land cover map in GPNP and its Landscape



Inside of GPNP only



GPNP and 2 sub-districts

Figure 96 Comparison of forest area change between “inside of GPNP only”(left) and “GPNP and 2 sub-districts”(right) (Unit: %)

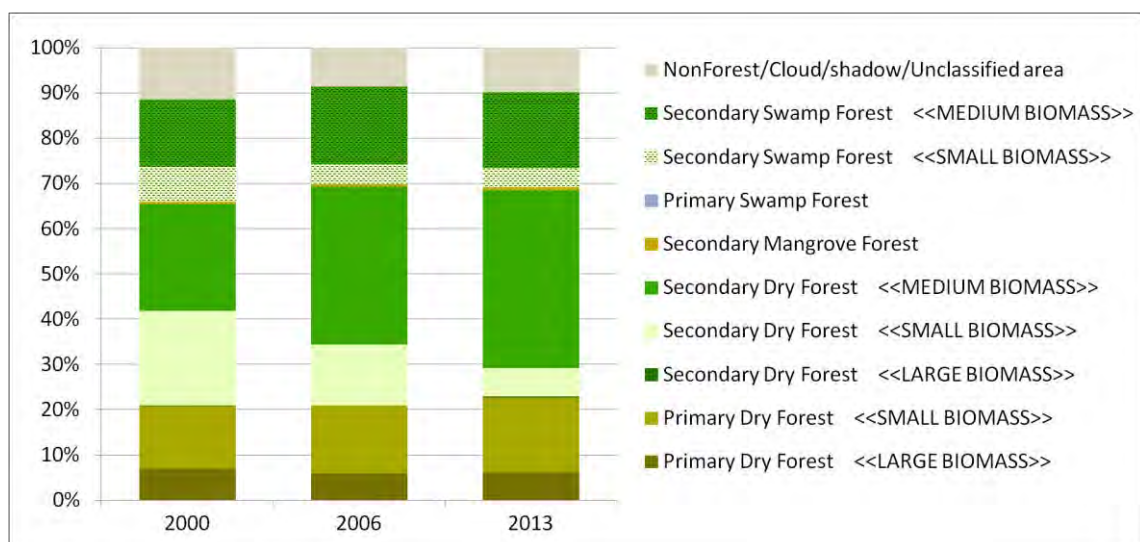


Figure 97 Forest class change inside of GPNP only (Unit: %)

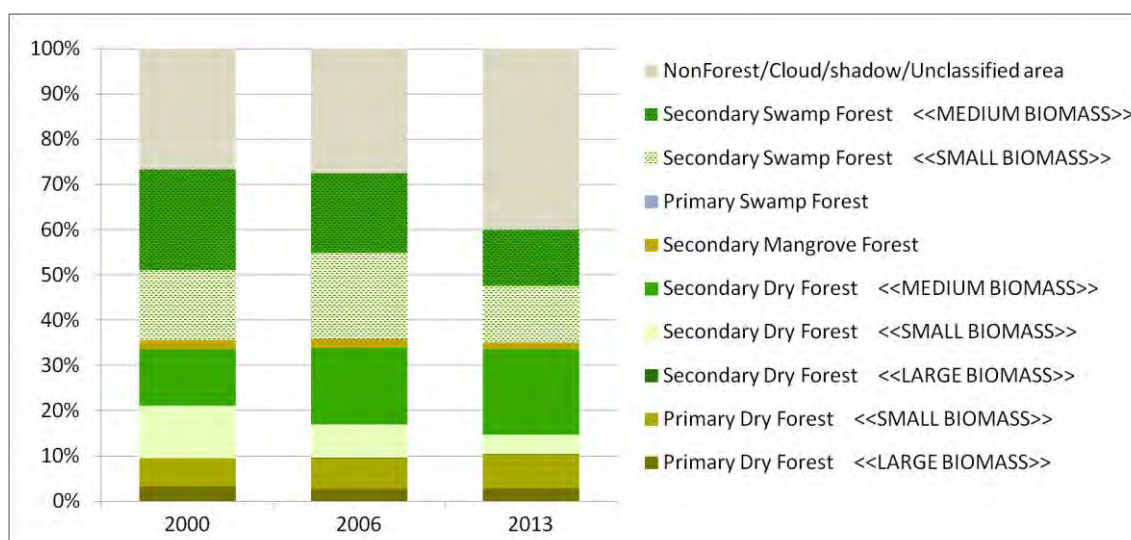
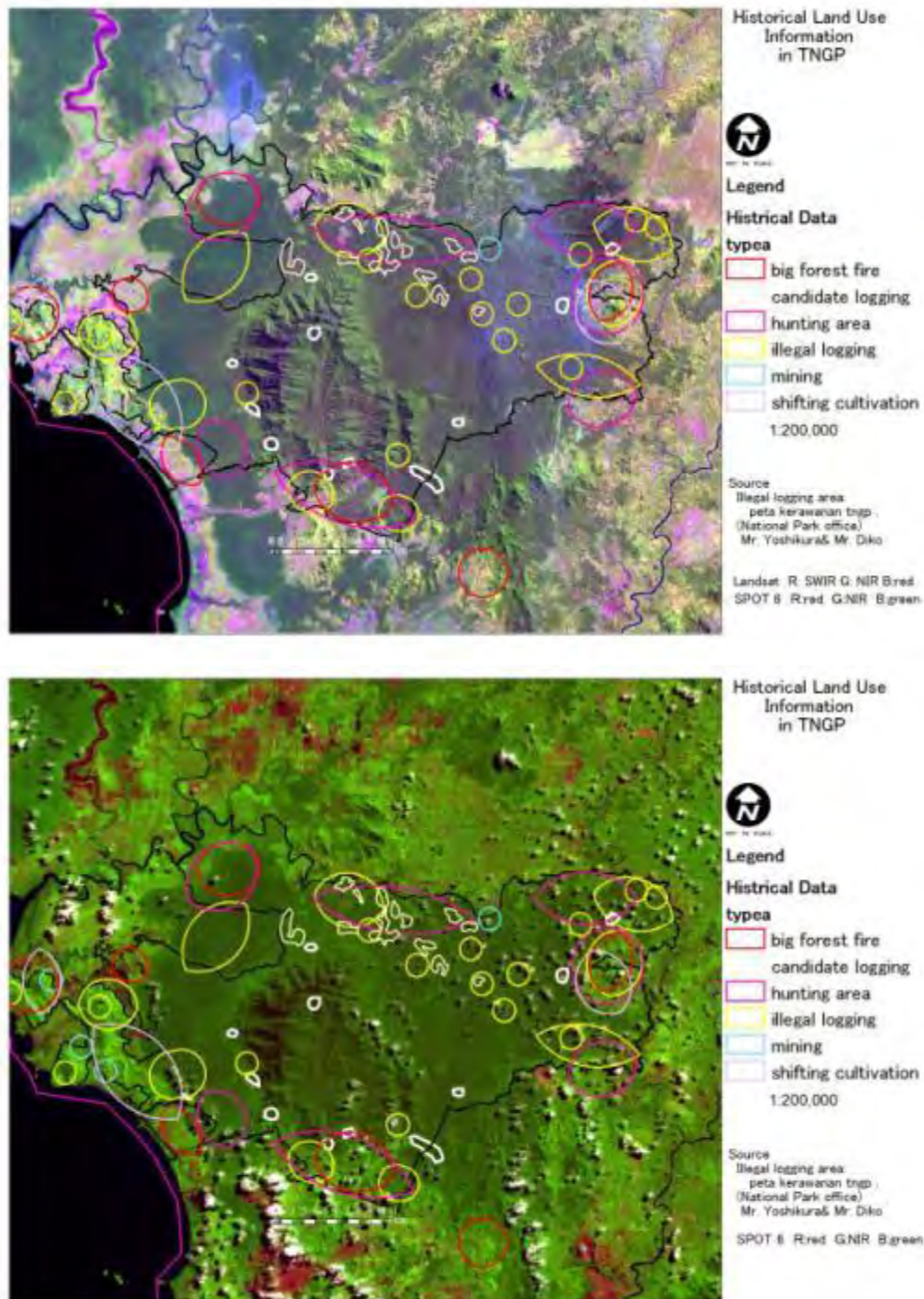


Figure 98 Forest class change in GPNP and 2 sub-districts (Unit: %)

Figure 99 to Figure 101 shows satellite imagery as base image and degradation contributory factor as polygon feature to consider possibility for extraction of past forest degradation affect. Each figure have two time points satellite imagery; (a) year of 2001(LANDSAT imagery) when severe illegal logging was occurred and (b) the latest year of 2013 (SPOT6 imagery).

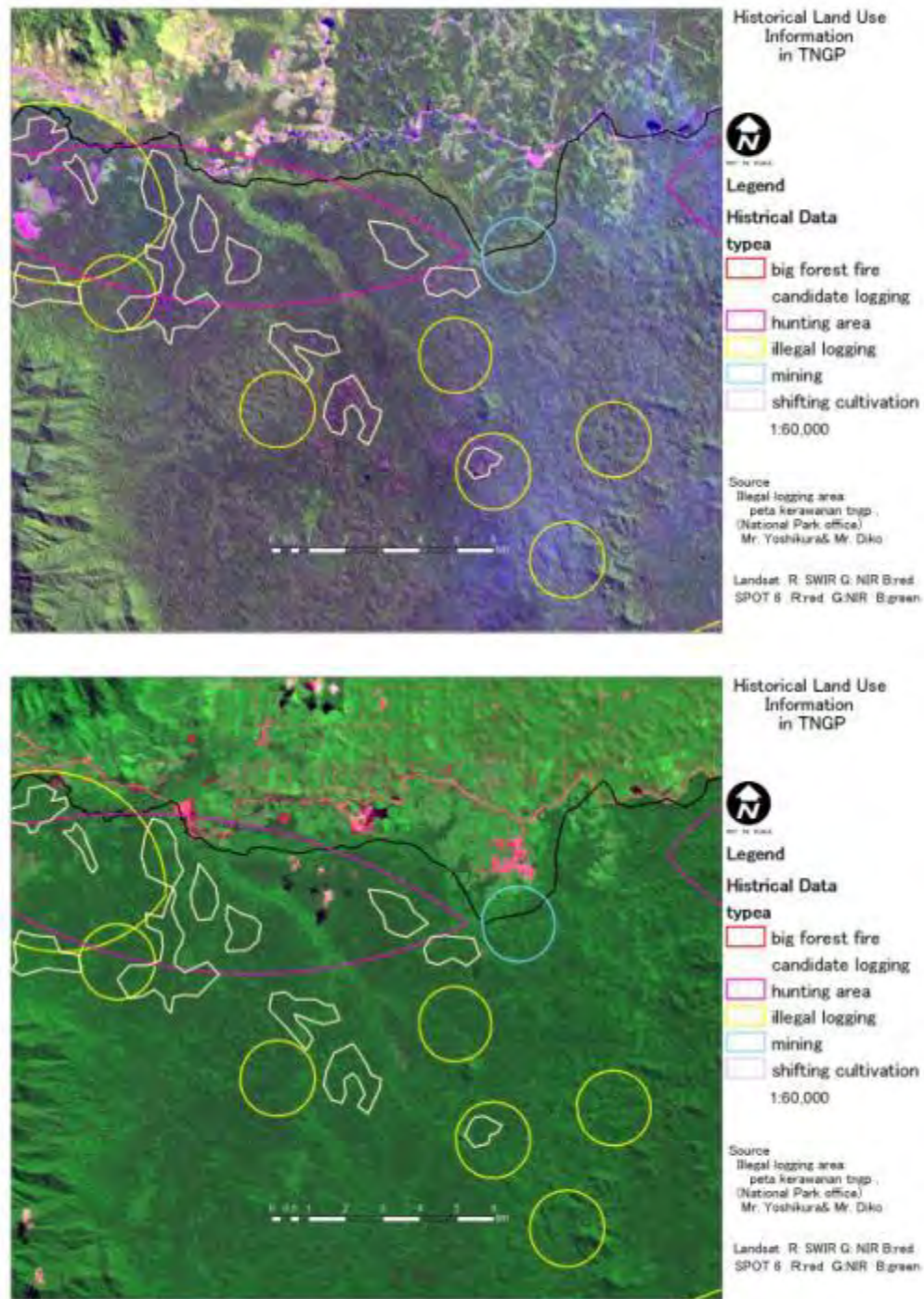
In these figures, the elliptical shapes show area of degradation factor obtained from interview survey by long-term experts of IJ-REDD+ project. Each color shows different factors: “red” shows large-scale forest fire, “yellow” shows illegal logging, “pale blue” shows mining and “light purple” shows shifting cultivation.

Forest degradation was frequently found around the boundary of GPNP while less human impact was seen in the center of GPNP and mountainous area far from the boundary. Figure 100 shows the northern area of GPNP where severe illegal logging occurred, and Figure 101 shows shifting cultivation area located in the western GPNP. In the satellite imagery, a pink colored patches show less vegetation such as bare land, settlements and so on, and green shows vegetation as forest, yellow-greenish color is bush (this includes degradation area), low vegetation area. In northern part, a lot of pink patches in 2001 are found in 2001, compared to 2013. It is estimated these pinkish areas are illegal logging area by collating information from degradation factor polygon. In 2013, it changed to yellow-greenish color. This indicates that vegetation is recovering now. They might be shifting cultivation from shape and strong pink color. 2013 imagery shows less pink patch but it could detect light green color patch. This means these area show bushes or recovering forest area.



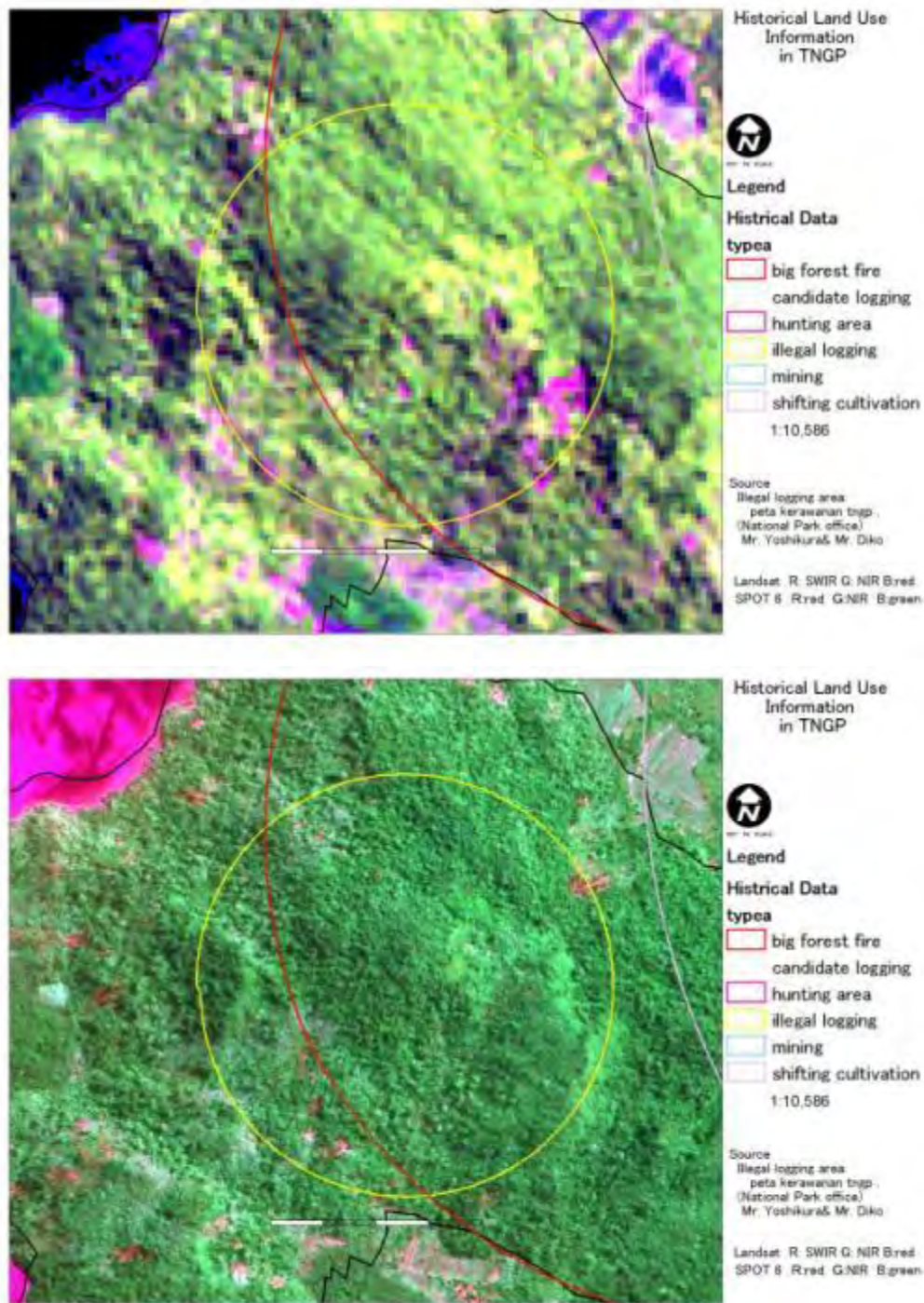
Above: 2001, Below: 2013

Figure 99 Forest degradation area and satellite imagery covered by whole pilot area



Above: 2001, Below: 2013

Figure 100 Forest degradation area and satellite imagery covered by the northern part of GPNP



Above: 2001, Below: 2013

Figure 101 Forest degradation area and satellite imagery covered by the western part of GPNP

5.2. Tree mensuration in Secondary Swamp Forest

Forest survey was focused on the area that have experienced intensive illegal logging activities and targeted small areas supposed degraded forests by interpretation of LANDSAT and SPOT-6 images (Figure 83 and Figure 84). Information about forest usage, the history of disturbances and the cause of




disturbance were also discussed and recorded together with GPNP staffs. At the same time, survey team have conducted plot survey in the target area with GPNP staffs and calculated above ground tree biomass to estimate and compare the tree biomasses between disturbed forests (Table 53 and Figure 86). For calculating above ground tree biomass, “Monograph Allometric Models for Estimating Tree Biomass at Various Forest Ecosystem Types in Indonesia” by FORDA was referred.

As a result, secondary swamp forest could be separated into two sub-classes according their aboveground biomass interpreting using satellite images.

5.3. Tree mensuration in the Secondary Dry Forest

Secondary dry forest class was separated into 3 sub-classes according to color and texture of satellite images (Table 64). Three target areas shown as yellow flames in Figure 102 were selected and forest survey was conducted. As a result, biomass of each target area were estimated shown as Figure 103. Therefore, the secondary dry forest could be separated into three sub-classes according their aboveground biomass interpreting using satellite images.

Table 64 Characters of the secondary dry forest separated according to biomass on satellite images

Biomass amount	LARGE BIOMASS	MEDIUM BIOMASS	SMALL BIOMASS
Character shown in SPOT images	Including trees with large crown diameter 	Crown diameter is smaller than LARGE BIOMASS type. Crown density is high. 	Crown diameter is almost even as MEDIUM BIOMASS type, however, its number is smaller than MEDIUM BIOMASS type. 




Biomass amount	LARGE BIOMASS	MEDIUM BIOMASS	SMALL BIOMASS
Character shown in LANDSAT images	<p>Dark and light green color are mixing when color combination is set as R: G: B =Red: NIR: Green. Texture is rough.</p> 	<p>Green color expands uniformly when color combination is set as R: G: B =Red: NIR: Green. Texture is even.</p> 	<p>Light green color pixels are mixing with darker green color like patches when color combination is set as R: G: B =Red: NIR: Green.</p> 



Figure 102 Target area (Yellow flames)

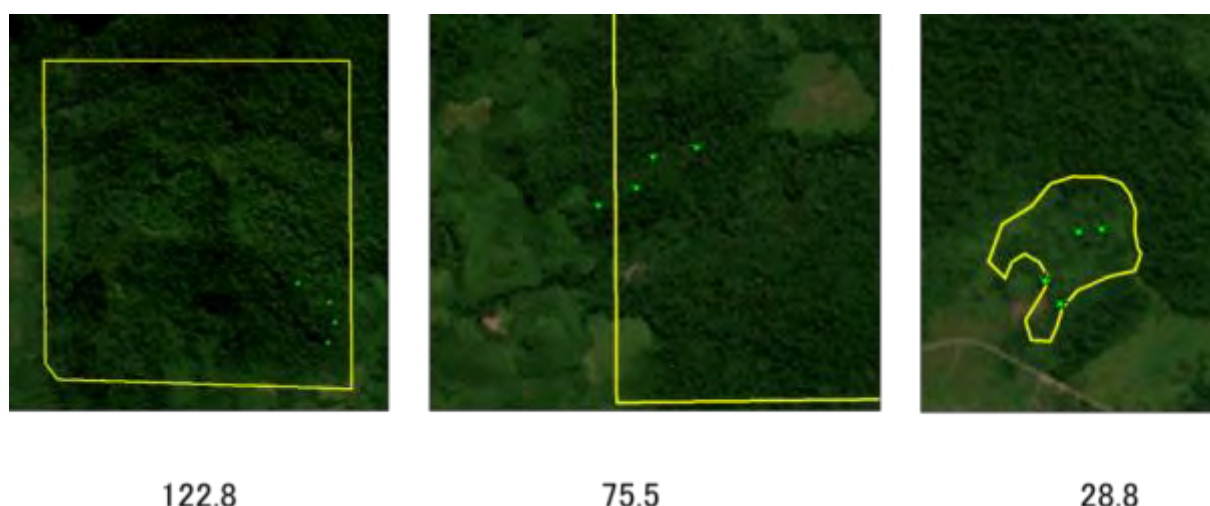


Figure 103 Median of biomass of each target area (Unit: tC/ha)
(Left: LARGE BIOMASS-,MEDIUM BIOMASS Center: MEDIUM BIOMASS, Right: MEDIUM BIOMASS-SMALL BIOMASS)

6. Draft an operational manual of REDD+

In this study, an REDD+ operational manual is to be drafted for GPNP and its Landscapes based on activities up to the development of a PDD relating to the REDD+ model of GPNP and its Landscape.

The Operation Manual for REDD+ has been drafted under the leadership of the IJ-REDD+ Ketapang Team based on surveys and activity processes in GPNP and its Landscape. The Consultant Team also worked on the manual. The contents of the manual are shown in the table below, of which the Consultant Team was responsible for Chapter 3 and Chapter 4.

Chapter 1	REDD+ Readiness
Chapter 2	Preparation for REDD+ Proponent
Chapter 3	Identification of REDD+ Target Site and Activity
Chapter 4	Set up REL & Monitoring Team

Chapter 3 described the series of processes of the socio-economic survey, target site selection, and target activity selection. Chapter 4 explained the construction of monitoring system such as GIS training based on the figure below, ascertaining forest coverage from satellite image analysis, REL calculation and peat land surveys, etc., and outlines the processes related to PDD development.

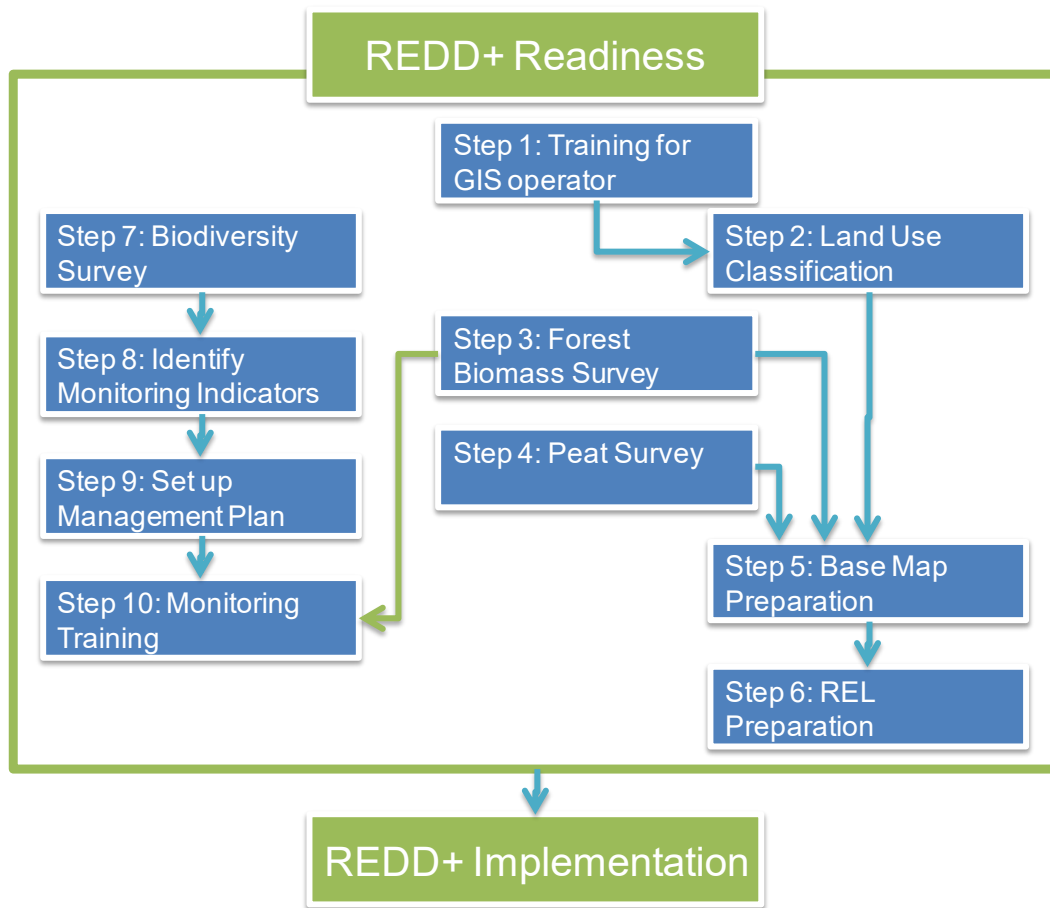


Figure 104 Contents arranged in REDD+ manual

Output 3 REDD+ model for HP/HL/APL is developed at pilot site(s) in West Kalimantan..

Activity 3 Components of the Output 3

Activity 3-1 Conduct studies on conventional management of HP/HL/APL (peatland)

(This activity will be conducted in line with activity 1-7)

Activity 3-2 Identify pilot site(s) for improved management of HP/HL/APL (peatland)

(This activity will be conducted in line with activity 1-7)

Activity 3-3 Calculate RL/REL for pilot site(s).

(Not addressed by REDD+ planning study team)

Activity 3-4 Identify policy and measures for improved management of HP/HL/APL (peatland) including the development of performance/safeguard indicators.

(Not addressed by REDD+ planning study team)

Activity 3-5 Estimate CO₂ emission for improved management.

(Not addressed by REDD+ planning study team)

Activity 3-6 Develop a carbon monitoring method.

(This activity will be conducted in line with activity 1-2 and 1-6)

Activity 3-7 Conduct baseline survey on biodiversity and community livelihood.

(Not addressed by REDD+ planning study team)

Activity 3-8 Conduct safeguard/co-benefit activities on the improvement of livelihood, biodiversity conservation and the provision of environmental services.

(Not addressed by REDD+ planning study team)

Activity 3-9 Collect and assess data on land use change and carbon stock, biodiversity conservation and community livelihood.

(Not addressed by REDD+ planning study team)

Activity 3-10 Draft an operational manual of REDD+ model by analyzing local conditions,

policy instruments, project activities and their impacts.

(Not addressed by REDD+ planning study team)

Output 4 Capacity of carbon monitoring is enhanced at the provincial level in Central Kalimantan.

Activity 4 Components of Output 4

Activity 4-1 Assist to organize MRV institution.

(Not addressed by REDD+ planning study team)

Activity 4-2 Provide training for MRV institution, local governments and communities to enhance knowledge and skills on carbon monitoring.

Basic remote sensing and GIS training was carried out to enhance the capacity of peat forest monitoring of local government of Central Kalimantan Province with 11 participants at Palangka Raya from 8th to 12th June 2015.

On the first day, basics of remote sensing and GIS, overview of the REDD+ activity and fundamental of peatland were explained by experts from IJ-REDD+ project team and University of Palangka Raya to understand the importance of REDD+ activity on peatland of Central Kalimantan.

From the second day, practice of basic manipulation of satellite image analysis and GIS integration was performed. Field survey technique which focus on the verification of satellite image analysis and positioning survey points by GPS were demonstrated to carry out practical and sustainable field survey by participants.

Table 65 List of participants

Organization	Name
Forestry Agency of Central Kalimantan	Mr.Hadriani
BLH kalteng	Mr.Juan Kristiawan
BPK Banjar Baru	Mr.Dian Lazuardi
BPK Banjar Baru	Mr.Dian Cahyo Buwono
BPKH Wilayanh XXI	Mr.Subiyanto
BPKH Wilayah XXI	Mr.Hafiq Prasetiadi
BKSDA Kalteng	Ms.Maulida Indira
Balai Taman Nasional Sebangau	Mr.Tatang Suwardi
BPAS Kahayan	Ms.Mira Lestari
University of Palangka Raya	Ms.Patricia Erosa Putir
University of Palangka Raya	Mr.Fernandes Orlando



Figure 105 Photos of participant

Table 66 Contents of the training program

Date	Training Contents
8 th June	<p>Morning session</p> <ol style="list-style-type: none"> 1. Basics of Remote sensing/GIS (Mr. Kazuyo Hirose, Japan Space Systems) <p>Afternoon session</p> <ol style="list-style-type: none"> 2. REDD+ and Forest Monitoring (Mr. Shigeru Takahara, IJ-REDD+ project) 3. Fundamental of peatland (Dr. Nina Yulianti, UNPAR) 4. REDD+ and peatland (Prof. Jagau Yusurum, UNPAR) 5. Question and answer, discussion
9 th June	<p>Practice of GIS basics by QGIS</p> <ol style="list-style-type: none"> 1. QGIS setup 2. Procedure to download LANDSAT image 3. Import satellite image to QGIS 4. Map preparation by QGIS for field survey on 10th June
10 th June	<p>Field survey (1), QGIS practice</p> <ol style="list-style-type: none"> 1. Positioning by GPS and site observation at kerangas for mining 2. Positioning by GPS and verification of Landsat images at Tangkiling 3. Import GPS data to QGIS 4. Digitizing and measuring areas of mining site, forest are and paddy field
11 th June	<p>Field survey (2), QGIS practice</p> <ol style="list-style-type: none"> 1. GPS positioning along the road from Karampangan to Tumbang Nusa

Date	Training Contents
	<ol style="list-style-type: none"> 2. Verification of Landsat image for canal development at peatland 3. Practice of Vertex for measuring distance and height of tree 4. Observation of peat material by drilling of peat-auger 5. Import position data by delimited text format (csv)
12 th June	<p>Practice of land classification, geo-reference and presentation of participants</p> <ol style="list-style-type: none"> 1. Practice of unsupervised classification by free software (Multispec) 2. Practice of geo-reference function by QGIS 3. Presentation from all participants about the achievement from the training



Positioning and recording survey point by GPS (Upper left)

Verification of satellite image at site (Upper right)

Estimation of the height of peat swamp forest by VERTEX (Lower left)

Peat core sample for the observation (Lower right)

Figure 106 Photos of field survey (June, 2015)

It was confirmed that participants achieved the goal of the training to understand basics of remote sensing and GIS through the presentation which was given by each participant on final day.

Participants gave some comments as follows;

- ✓ As positioning with GPS and importing GPS data by delimited text on QGIS are practical, I am going to introduce it to daily tasks.
- ✓ This is first time to observe the peat core sample. I am going to check the peat definition and how many peat areas are remained around Palangka Raya.
- ✓ As I have learned to utilize the satellite images and GIS data, I am going to share the knowledge with colleagues.

Activity 4-3 Assess carbon monitoring methods that are applied/being developed by REDD+ projects including JICA-JST in terms of accuracy, costs and accessibility.

(Not addressed by REDD+ planning study team)

Activity 4-4 Provide technical assistance for MRV institution according to its requirement.

(Not addressed by REDD+ planning study team)

Other Activities Conducted

1. Disseminate project findings and outcomes to relevant stakeholders in West Kalimantan.

When the REDD+ project is designated and implemented in developing countries, all of related activities mean improvement of land use in specific area. Then REDD+ project has much effects on livelihood of local people. Considering such situation and to implement REDD+, it is necessary to share the concept of REDD+ and to encourage local people to participate into the REDD+ related activities.

To share the concept of REDD+ and building awareness of activates, the consultants team have proposed to the project team t drafting flyer of REDD+ activities (flyer is A0 size, Figure 107) for disseminating project activities.. The Draft Flyer was prepared by using some illustrations for making stakeholders understand and was aimed to share the relationship between activities and forest conservation.



Figure 107 Proposed flyer



Monitoring



Meeting in target village



Deforestation in peatland



Livelihood activity (NTFP uses)

Figure 108 Illustrations of REDD+ activities

Chapter 3 Recommendations

Output 1

1. Supporting for establishment of provincial FREL in West Kalimantan Province

The Indonesian National FREL was submitted to UNFCCC in December 2015. This study also tried calculation of FREL covering the 4 districts targeted by IJ-REDD. Supporting for establishment of FREL covering the whole province in West Kalimantan is important by harmonizing the development of methodology of FREL in finalizing the National FREL with UNFCCC and also utilizing the other experiences as FORCLIME having the trial FREL covering Kapuas District in West Kalimantan Province.

2. Supporting for establishment of methodology of carbon monitoring in West Kalimantan Province

The study also facilitated planning carbon monitoring by West Kalimantan Province while the development of basic requirements of carbon monitoring were examined. As the result, the provincial level started to try to establish provincial level monitoring since the beginning of 2016. Supporting for establishment of methodology of carbon monitoring in provincial level is important by utilizing the sorted basic requirement trend and the development of planning of carbon monitoring by West Kalimantan Province. At starting carbon monitoring in provincial level, use of data of REDD+ Base Maps produced through the study is highly recommended, as some draft data has been used to update the land cover data by some ex trainees of IJ-REDD+ GIS Trainings from the Provincial Estate Office etc.

Output 2

1. Socio-economic Survey

The socio-economic survey was implemented in order to identify drivers and agents of deforestation and forest degradation. When the project launched, there were not any quantified data at the GPNP, aside from this purpose, the collecting information by this survey has been utilized for other practical scene. Collecting information related communities are highly recommended to carry on the natural resource management around the GPNP.

1.1. Collecting continuous data

Due to budgetary constraints and the survey period, the socio-economic survey that was carried out in the project collected sample data rather than collecting data from all households. Coming next phase, it will become possible to gain a more accurate understanding of information from the target site by periodically and continuously obtaining data and increasing the number of survey target households according to the purpose and its needs. Moreover all of the questionnaires and data entry forms used in this survey were delivered to the GPNP, therefore it is also possible to continue the survey by selecting

only the necessary items according to the purpose, and it is desirable to continuously collect socio-economic information in order to develop better management of natural resources and improve livelihood activities.

1.2. Strengthening skills of information collection and data management

Before socio-economic survey conducted, the information of villages around the GPNP had not been numerically controlled as statistical data, thus it is recommended to use opportunities such as the forum in order to improve the capability of data management in the future. Data process sharing was carried out in this survey, however in order for officers of GPNP to perform management and handle those data independently. It is suggested to strengthen monitoring capability together with data management capability.

1.3. Measuring of effectiveness of activities

It is recommended that the data obtained in this survey should be used as baseline data when measuring the effects of REDD+ activities or cooperative management activities that will be/ have been implemented in earnest going forwards (this is already being considered at the forum). Since there is a particular need to periodically assess avoiding deforestation/forest degradation effects of activities that have been implemented in this project, it is suggested that effectiveness should be ascertained at the same time as monitoring activities.

Others

2. Utilization of results of REDD+ potential site scoping for Output 3

Based on the results of explanation of the concept in January 2015, mainly IJ-REDD+ Long-term Expert (based in West Kalimantan) in cooperation with some personnel of Provincial Forestry Office and BKSDA has examined how to utilize the results of REDD+ potential site scoping as follows.

- i. To examine the candidates of pilot sites of Protection Forests (HL) in Kubu Raya District etc. where is easily accessed by provincial authorities concerned
- ii. To examine how to use the outputs for MoF-JICA Fire Control Cooperation “Japanese Technical Cooperation Project for Program of Community Development of Fires Control in Peat Land Area (FCP)” (e.g. implementation of demonstration emission reduction activities at the former trial villages of TPD approach)

However IJ-REDD+ Management level has never started any activities for Output 3 with using the results examined as above. It is suggested to re-examine to use the results of REDD+ potential site scoping by utilizing the final products of REDD+ Base Maps by the study.

3. Developing peat distribution map

Peat distribution maps of Wetlands International (2004), Ritung et al. (2011) were assessed by improved peat distribution map which was developed by IJ-REDD+ project based on the newly measured ground data with various geospatial data sets (satellite images, geology maps and others. As a result, large difference was recognized among the peat distribution maps of WI (2004), Ritung et al. (2011) and IJ-REDD+ project (2015). Further assessment is necessary to improve accuracy and to reduce uncertainty by following recommendations.

- i. Continuous field survey for improving accuracy
- ii. Periodical meeting with different organizations to exchange information of peat distribution

Indonesia-Japan Project for Development of REDD+ Implementation Mechanism (REDD+ Planning Study)

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Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting

Japan Forest Technology Association

Final Report
Appendix 1

**Indonesia-Japan Project for
Development of REDD+ Implementation
Mechanism (REDD+ Planning Study)**

Project Design Matrix

Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting

Japan Forest Technology Association

Project Design Matrix

Project title: Indonesia Japan Project for Development of REDD+ Implementation Mechanism (IJ-REDD+)

Project period: Three years (2013 – 2016)

Target areas: Ketapang, Kayong Utara, Kubu Raya and Pontianak Districts in West Kalimantan Province including Gunung Palung National Park (GPNP); and Central Kalimantan Province

Target group: MoFor; Provincial governments of West/Central Kalimantan; GPNP office; District governments of target areas; Private companies; Universities; and Communities

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Super Goal: Forest and biodiversity conservation are promoted and REDD+ benefits are generated.			
Overall Goal: REDD+ implementation mechanism developed by the project is integrated into national REDD+ mechanism.	1. REDD+ model developed by the project is utilized as one of REDD+ measures at the national level.	1. Interview to officials of MoFor and Task Force (REDD+ Agency)	The government maintains active policy on REDD+
Project Purpose: REDD+ implementation mechanism is developed in West and Central Kalimantan.	1. Policy document on forest carbon monitoring is developed by the provisional government in West Kalimantan. 2. Application of national park REDD+ model is stipulated in GPNP Management Plan as a conservation strategy of the national park. 3. Dissemination of REDD+ model for HP/HL/APL is planned by provincial/district government(s) in West Kalimantan. 4. Improvement of provincial RL/REL is proposed by MRV institution in Central Kalimantan.	1. Policy document in West Kalimantan 2. GPNP Management Plan 3. Interview to government officials 4. Proposal on RL/REL improvement	The international negotiation on climate change continues
Output 1: Sub-national framework on REDD+ is developed in West Kalimantan.	1-1. Provincial RL/REL is established. 1-2. Carbon monitoring method is developed. 1-3. Potential REDD+ sites for future investment are identified.	Project reports which include RL/REL and potential site map.	Provincial government secures counterpart budget.

Output 2: National park REDD+ model is developed at GPNP.	<p>2-1. Areas under different local conditions in national park are identified in terms of drivers of deforestation and forest degradation.</p> <p>2-2. Policy and measures to address the above causes are developed for respective areas.</p> <p>2-3. Amount of CO2 emissions is compared with RL/REL for respective areas.</p> <p>2-4. Effects of the project to biodiversity conservation and communities are assessed.</p> <p>2-5. An operational manual of national park REDD+ model is drafted.</p>	Project reports which include baseline survey report, RL/REL, biodiversity assessment and operational manual	National park office secures counterpart budget.
Output 3: REDD+ model for HP/HL/APL is developed at pilot site(s) in West Kalimantan.	<p>3-1. Policy and measures to reduce CO2 emission are developed for pilot site(s) of HP/HL/APL (mainly in peatland).</p> <p>3-2. Amount of CO2 emissions is compared with RL/REL for pilot site(s).</p> <p>3-3. Effects of the project to biodiversity conservation and communities are assessed for pilot site(s).</p> <p>3-4. An operational manual of REDD+ model for HP/HL/APL is drafted.</p>	Project reports which include RL/REL and operational manual for HP/HL/APL.	There are private companies/local organizations which are interested in REDD+.
Output 4: Capacity of carbon monitoring is enhanced at the provincial level in Central Kalimantan.	4-1. Carbon monitoring methods that are applied by REDD+ projects in Central Kalimantan are compiled by MRV institution.	Compiled report on carbon monitoring.	Provincial government sets up MRV institution.
Output 5: Project findings are referred to in the process of developing REDD+ implementation mechanisms at the national level.	5-1. Findings of the project are presented and recognized in Ministry of Forestry (MoFor) and other national agencies concerning REDD+.	Project reports Interview to officials of MoFor	
<u>Activity</u> 1-1) Organize a team that consists of provincial/district governments and university. 1-2) Provide training on remote sensing analysis and sample plot monitoring. 1-3) Overview drivers of deforestation and forest degradation in West Kalimantan.	<u>Input</u> Japanese side: * Long Term Experts (Chief advisor/Forest & REDD+ Policy, Forest Management/REDD+ Local Institutional Development, Participatory forest management/REDD+ Demonstration, Coordinator/Biodiversity Conservation		<u>Preconditions</u> Provincial and district governments are supportive to REDD+

<p>1-4) Collect data on historical/future land use and carbon stock at the district level.</p> <p>1-5) Calculate Provincial RL/REL.</p> <p>1-6) Develop a monitoring plan and implement it.</p> <p>1-7) Identify potential REDD+ sites and compile information for future REDD+ projects.</p> <p>1-8) Identify areas of strategic cooperation other than RL/REL and carbon monitoring.</p> <p>1-9) Provide policy and technical assistance for the execution of strategic cooperation.</p> <p>2-1) Conduct trainings on facilitation and other professional skills.</p> <p>2-2) Study drivers of deforestation/degradation and diversity of local conditions.</p> <p>2-3) Identify target villages and share information on IJ-REDD at the villages.</p> <p>2-4) Draft a REDD+ activity plan including the development of benefit sharing methods, performance indicators and safeguard indicators.</p> <p>2-5) Develop RL/REL and carbon monitoring method.</p> <p>2-6) Conduct baseline survey on biodiversity and community livelihood.</p> <p>2-7) Facilitate stakeholders to make agreement on resource management rules.</p> <p>2-8) Conduct safeguard/co-benefit activities on the improvement of livelihood, biodiversity conservation and the provision of environmental services.</p> <p>2-9) Collect and assess data on land use change and carbon stock, biodiversity conservation and community livelihood.</p> <p>2-10) Draft an operational manual of REDD+ model by analyzing local conditions, policy instruments, project activities and their impacts.</p> <p>3-1) Conduct studies on conventional management of HP/HL/APL (peatland).</p> <p>3-2) Identify pilot site(s) for improved management of HP/HL/APL (peatland).</p> <p>3-3) Calculate RL/REL for pilot site(s).</p>	<ul style="list-style-type: none"> * Short Term Experts (when needed, ex. Carbon assessment and monitoring, Satellite data analysis, Market/Funding mechanism) * Employment of National Coordinator, Field Coordinators and National Expert(s) * Training in Japan * Necessary machinery, equipment and materials delivered to project site * Running expenses for the implementation of the Project activities. <p>Indonesian side:</p> <ul style="list-style-type: none"> * Counterpart Personnel <ol style="list-style-type: none"> 1. Project Director 2. Project Manager 3. Officers in charge from PHKA * Travel expenses and allowances of counterpart personnel * Suitable office space * Available data and information related to the Project when considered appropriate and permitted by law * Running expenses for the implementation of the Project under MoFor 	
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<p>3-4) Identify policy and measures for improved management of HP/HL/APL (peatland) including the development of performance/safeguard indicators.</p> <p>3-5) Estimate CO2 emission for improved management.</p> <p>3-6) Develop a carbon monitoring method.</p> <p>3-7) Conduct baseline survey on biodiversity and community livelihood.</p> <p>3-8) Conduct safeguard/co-benefit activities on the improvement of livelihood, biodiversity conservation and the provision of environmental services.</p> <p>3-9) Collect and assess data on land use change and carbon stock, biodiversity conservation and community livelihood.</p> <p>3-10) Draft an operational manual of REDD+ model by analyzing local conditions, policy instruments, project activities and their impacts.</p> <p>4-1) Assist to organize MRV institution.</p> <p>4-2) Provide training for MRV institution, local governments and communities to enhance knowledge and skills on carbon monitoring.</p> <p>4-3) Assess carbon monitoring methods that are applied/being developed by REDD+ projects including JICA-JST in terms of accuracy, costs and accessibility.</p> <p>4-4) Provide technical assistance for MRV institution according to its requirement.</p> <p>5-1) Examine policies and strategies of MoFor and other agencies concerned with REDD+.</p> <p>5-2) Share project findings with MoFor and other agencies concerned with REDD+.</p> <p>5-3) Provide policy and technical assistance for MoFor and other agencies concerned with REDD+.</p> <p>5-4) Coordinate Japanese assistance in the REDD+/forest sector.</p> <p>5-5) Communicate with partners for effective implementation of IJ-REDD.</p>		
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Appendix 2

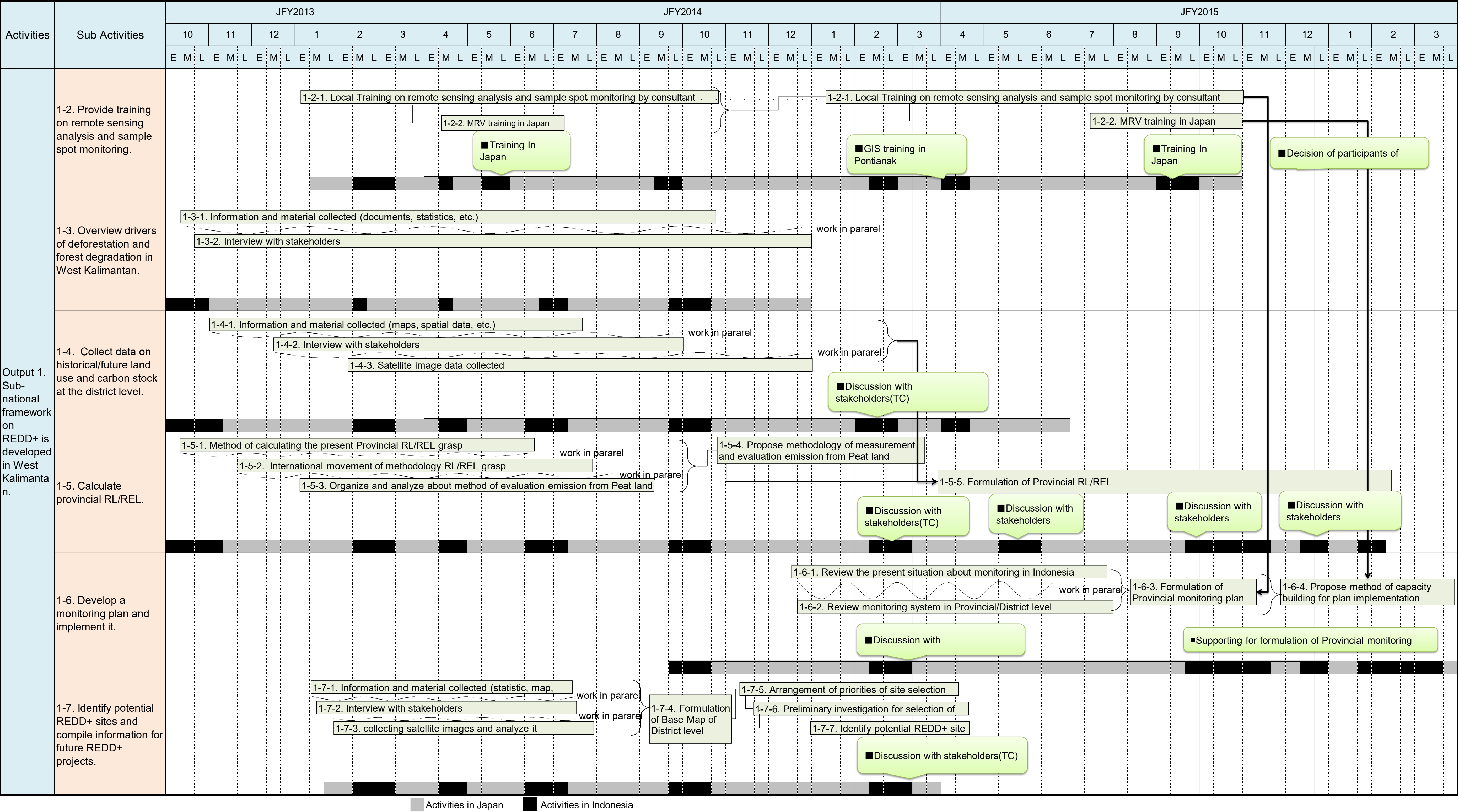
**Indonesia-Japan Project for
Development of REDD+ Implementation
Mechanism (REDD+ Planning Study)**

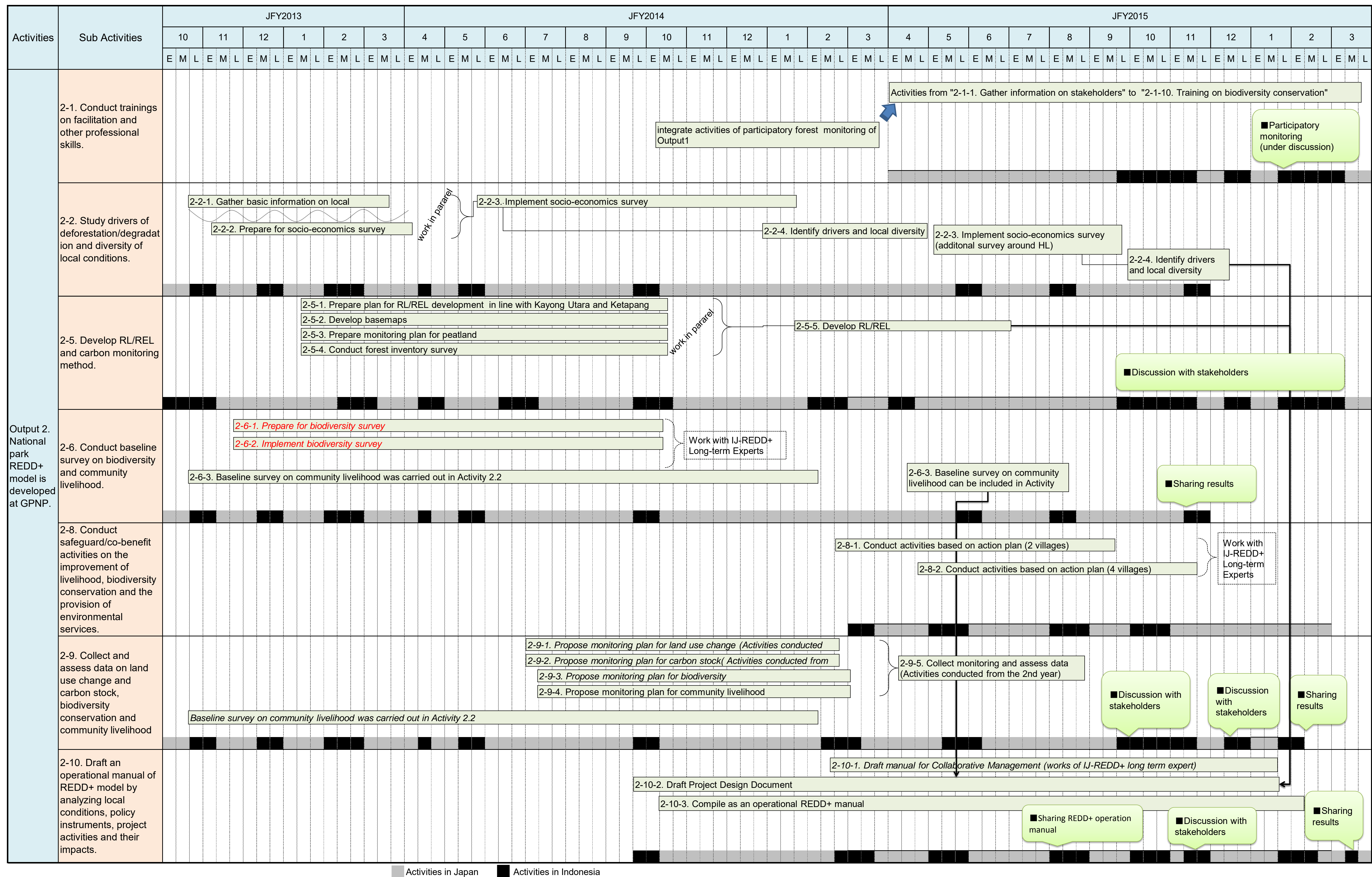
Working Flow Chart

Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting

Japan Forest Technology Association





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Appendix 3

**Indonesia-Japan Project for
Development of REDD+ Implementation
Mechanism (REDD+ Planning Study)**

Assignment of Consultants Team

Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting
Japan Forest Technology Association

Indonesia-Japan Project for Development of REDD+ Implementation Mechanism (REDD+ Planning Study)
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	Fields	Name	Organization	1st year																2nd year																3rd year																				Total	MM
				FY 2013																FY 2014																FY 2015																					
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5																
Works in Indonesia	(FY 2013, FY 2014) Satellite imagery analysis/ REL establishment 2	Yano Masato	Mitsubishi UFJ Research and Consulting																																						—	—															
	(FY 2015) Project management group_Chief/ REDD+ project development	Yano Masato	Mitsubishi UFJ Research and Consulting																																						7	0.23															
	(FY 2013, FY 2014) Carbon monitoring design/forest GIS/database 2	Suzuki Kei	Japan Forest Technology Association																																						10	0.33															
	(FY 2015) Project management group_Vice chief_Carbon monitoring	Suzuki Kei	Japan Forest Technology Association																																						17	0.57															
	(FY 2013, FY 2014) Project management group_Vice chief_Satellite imagery analysis/	Sasakawa Hiroshi	Japan Forest Technology Association																																							71	2.37														
	(FY 2015) Satellite imagery analysis/ REL establishment 1	Sasakawa Hiroshi	Japan Forest Technology Association																																							—	—														
	Satellite imagery analysis/ REL establishment 2	Furuta Tomoko	Japan Forest Technology Association																																							57	1.90														
	(FY 2013, FY 2014) Project management group_Chief/ REDD+ project development	Hiratsuka Motoshi	Mitsubishi UFJ Research and Consulting																																								64	2.13													
	(FY 2015) Satellite imagery analysis/ REL establishment 3	Hiratsuka Motoshi	Waseda University																																								13	0.43													
	Forest biomass survey/ Emission factor development 1	Amano Masahiro	Waseda University																																								32	1.07													
	Forest biomass survey/ Emission factor development 2	Nitsuma Kouhei	Japan Forest Technology Association																																									102	3.40												
	Socio-Economic survey	Chikaraishi Haruko	Mitsubishi UFJ Research and Consulting																																										145	4.83											
	(FY 2013, FY 2014) Carbon monitoring design/forest GIS/database 1	Oonishi Seido	Asia Air Survey																																										31	1.03											
	(FY 2015) Carbon monitoring design/forest GIS/database 1	Kuno Hiromitsu	Japan Forest Technology Association																																										110	3.67											
	Short term expert	Hirose Kazuyo	J-space systems																																										—	—											
																																								Total (Indonesia)					659	21.96											

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Appendix 4

**Indonesia-Japan Project for
Development of REDD+ Implementation
Mechanism (REDD+ Planning Study)**

Record of Training

Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting
Japan Forest Technology Association

Record of Training

Year	Date	Training/ OJT	Purpose	No. of participants (Approx.)	Venue
2014	February 19-20	On the Job Training of Ground truth	To collect information for training data for supervised labeling and verify results RS analysis	2	Kayong Utara, Ketapang
2014	February 24-28	Pre-training for basic skills of GIS	To obtain basic skills of GIS operation and field survey for forest and peatland monitoring	11	Pontianak
2014	February 24-27	On the Job Training of Ground truth	To collect information for training data for supervised labeling	2	Pontianak
2014	May 13-15	Training for national park staffs and surveyor of socio-economic survey for households	To share and understand objectives of socio-economic survey and keep consistency of the survey process	30	Sukadana
2014	May 20-22	Pre-training for basic skills of GIS	To obtain basic skills of GIS operation and field survey for forest monitoring	9	Pontianak
2014	June 11-20	Training course in Japan for development ability of satellite imagery analysis	To promote understanding of the relationship between REDD+ and related activities for monitoring, and practical techniques of satellite imagery analysis and forest monitoring	9	Japan
2014	April 12-16	On the Job Training of forest survey	To verify forest degradation and develop an emission factor	9	Kayong Utara
2014	September 16-19	Training for peatland mapping	To improve the skills of peatland mapping	4	Pontianak Mempawah
2014	October 8-17	On the Job Training of Ground truth	To add information for accuracy assessment and verifying	9	Pontianak, Mempawah
2014	September 11-17	On the Job Training of forest survey	To verify forest degradation and develop an emission factor	6	Kayong Utara

Indonesia-Japan Project for Development of REDD+ Implementation Mechanism (REDD+ Planning Study)
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Year	Date	Training/ OJT	Purpose	No. of participants (Approx.)	Venue
2014	September 9/25-27	On the Job Training of forest survey	To verify forest degradation and develop an emission factor	6	Kayong Utara
2015	January 1/20-21	Training of CO2 emission measurement	To measure CO2 emission from the peatland	5	Pontianak
2015	June 1-5	Pre-training for basic skills of GIS	To obtain basic skills of GIS operation and field survey for forest and peatland monitoring	15	Pontianak
2015	June 8-12	Pre-training for basic skills of GIS	To obtain basic skills of GIS operation and field survey for forest and peatland monitoring	11	Palangka Raya
2015	September 7-18	Training course in Japan for development ability of forest monitoring system	To promote understanding of the relationship between REDD+ and related activities for monitoring, and practical techniques of satellite imagery analysis and forest monitoring	8	Japan
2015	October 26-27	In-house Training on Improvement of Base Maps on Land cover	To try to do enhancement of base maps (current status: 2013) by confirming the existing ground reference data obtained	8	Pontianak
2015	October 28-29	Preparatory Workshop for Organizing Land and Forest Monitoring Team in West Kalimantan	To obtain basic knowledge and share the experience to utilize the skills of GIS and forest survey into monitoring GHG emission in land sector	30 (all ex GIS trainees)	Pontianak
2015	October 21-22	Meeting of Drafting Team from the Ex GIS Trainees	To try to do drafting road maps to build MRV/ monitoring mechanism	6	Pontianak
2016	March 7	Meeting for sharing data process methodologies of Socio-economic survey	To share the data process methodologies of Socio-economic survey with National Park officials.	5	Ketapang

- 1) All trainings and on the job trainings on GIS and forest surveys also mean as the training to enhance the basic capacity to be needed for MRV/ monitoring implementation.
- 2) The implementation of further trainings needed based on the results of meeting on 21-22 Dec, 2015. has been started by Provincial REDD+ Working Group through Provincial Local Environmental Agency since Feb. 2016 by provincial own budget.

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**Indonesia-Japan Project for
Development of REDD+ Implementation
Mechanism (REDD+ Planning Study)**

Procurement List

Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting
Japan Forest Technology Association

List of Procurements

No.	Date of Procured	Item	Detail Description	QTY
1	February 5 th , 2014	Original SPOT 6 Image	<ol style="list-style-type: none"> 1. Original raw data of SPOT satellite image 2. DVD 	1
2	February 13 th , 2014	GEOSPATIAL (ERDAS IMAGIN for Installation)	<ol style="list-style-type: none"> 1. ERDAS IMAGIN is software for processing satellite image 2. To copy the software by potential users 3. 1 box containing 2 CD <ul style="list-style-type: none"> ■ No.2(a): CD (for 32bit P/C) ■ No.2(b): CD (for 64 bit P/C) 	1 box (2CD)
		ERDAS IMAGINE Professional	<ol style="list-style-type: none"> 1. To operate software ERDAS IMAGIN by only one user 2. CD 	1
		ERDAS IMGINE Professional Dongle Key	<ol style="list-style-type: none"> 1. To operate software ERDAS IMAGIN by only one user 2. USB 	1

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Appendix 6

**Indonesia-Japan Project for
Development of REDD+ Implementation
Mechanism (REDD+ Planning Study)**

Meeting List

Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting
Japan Forest Technology Association

List of Meetings

Year	Date	Meeting	Venue
2013	October 29	First Coordination Meeting	Pontianak
2014	June 5	1 st Technical Committee	Pontianak
2014	July 22	1 st Joint Coordination Committee	Bogor
2015	January 29	2 nd Technical Committee	Pontianak
2016	March 11	Closing Meeting	Bogor

Notification: All meetings were organized by long term expert

Appendix 7-1 Final Report

Indonesia-Japan Project for Development of REDD+ Implementation Mechanism (REDD+ Planning Study)

Report of REDD+ planning and its Review

Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting

Japan Forest Technology Association

Planning Study of Landscape Forest Conservation in West Kalimantan Province, Indonesia

January 2016 (Version 2.0)

Responsible Organization XX

with supports from

**the Indonesia-Japan Project for Development of REDD+ Implementation
Mechanism (IJ-REDD+) funded by Japan International Cooperation Agency (JICA)**

Jurisdictional REDD+ Program Title	<i>Landscape Forest Conservation in West Kalimantan Province, Indonesia</i>
Version	<i>2.0 (January 22, 2016)</i>
Date of Issue	<i>31-6-2016 (scheduled under the IJ-REDD+)</i>
Prepared By	<i>Responsible Organization XX</i>
Contact	<i>Physical address,</i>

Notification

- This planning study use specific word of “**Project Description (PD)**” as the name of REDD+ Planning Document as the Case Study
- Edited sentences (red collar) in this document means revised points through review process.

1. Jurisdictional REDD+ Program details

1.1. Summary Description of the Jurisdictional REDD+ Program

In Indonesia, 94.4 million ha out of 190.5 million ha of total land (approximately 50.0%) is classified as forest, which is the third biggest tropical forest (approximately 10% of world tropical forest) behind Brazil and Democratic Republic of the Congo (DRC). Therefore, forest management in Indonesia is not a domestic agenda but the particularly important to mitigate global warming on global basis. However, as a result of exploitation of forest development and timber products since the early 1970s, over 20 million m³ of logs had been produced per year till 1990s and this significant deforestation became a concern world widely. In addition, illegal logging, forest fire, and conversion of lands to agriculture enhance forest degradation.



Typical land conversion from forest to other land categories in West Kalimantan Province

Forests in West Kalimantan Province where this REDD+ program locates, that covers a total area of 14,732 thousand ha, has a great potential to contribute reduction of greenhouse gas (GHG) emissions and enhance carbon stocks. In light of this, West Kalimantan Province is committed to contributing up to 7.8% of the national target in 2020. Then the Government of West Kalimantan Province has established a team to draft a provincial REDD+ strategy and action plan document for West Kalimantan Province based on the decision of the Governor of West Kalimantan No. 437/BLHD/2013. Also decision of the Governor of West Kalimantan No 115/BLHD/2012 was enforced to establish the REDD+ Working Group in the West Kalimantan Province.

Jurisdictional REDD+ program in this Project Description (PD) are based on such national and provincial forest conservation/REDD+ strategies and targeted adequate scale of jurisdictional level of sub-districts based REDD+ program, which are focusing Sukadana and Simpang Hilir Sub-Districts in Kayoung Utara District located in southern West Kalimantan Provinces (*see* location in following Figure 5). Also all of activities under the REDD+ program of “Landscape Forest Conservation in West Kalimantan Province, Indonesia” are focusing reducing deforestation and forest degradation through forest conservation concept of the Society of Friends of GPNP.

Forest area and its dynamics in Sukadana and Simpang Hilir Sub-districts are similar as overall West Kalimantan Province, which showed severe deforestation (land conversion from forest to other land categories) caused by human activities of expansion of plantation of oilpalm, rubber and other cash crops and mining (*see pictures below*). From results of fundamental survey for identifying land use change dynamics conducted by West Kalimantan Province, drivers of deforestation and forest degradation in target area are identified as mentioned below (Table 1).

Table 1 Identified drivers and categorized types of deforestation and forest degradation¹

GHG Emission Sources	Drivers	
Deforestation	Planned	<ol style="list-style-type: none"> 1. Expansion of local administrative/governance regions for infrastructure and other uses 2. Approved legal forest conversion (based on spatial plans/RTRW) 3. Forest conversion on lands reserved for other purposes (APL) 4. Forest conversion for mining concessions (e.g., coal, copper, gold, silver, nickel, tin) 5. Forest conversion for estate crop plantations (e.g., oil palm, rice, rubber, coffee, cocoa)
	Unplanned	<ol style="list-style-type: none"> 1. Unplanned forest conversion for estate crop plantations (e.g., oil palm, rice, rubber, coffee, cocoa) 2. Encroachment for timber, fuel wood, agriculture and small-scale mining 3. Uncontrolled forest fires 4. Land claims leading to conversion of forest areas
Forest Degradation	Planned	<ol style="list-style-type: none"> 1. Approval of timber utilization permits (concessions) in natural forests 2. Approval of industrial plantations in natural forests
	Unplanned	<ol style="list-style-type: none"> 1. Timber harvesting outside the annual allowable cut 2. Illegal logging 3. Forest fires due to natural factors 4. Small human-induced forest fires for land clearing

By considering such severe situation of deforestation and forest degradation, this program was started by the Responsible Organization XX, who was established to implement collaborative management in the area, to reduce pressures on forest resources in targets area by implementing counter measures/activities and aimed to reduce deforestation and forest degradation, and also to enhance carbon stock in the forests of

¹ Hardiansyah G. et al. 2014. REDD+ Strategy and action plan of West Kalimantan Province. REDD+ KALBAR.

target area.

To monitor results of implemented countermeasures by the Responsible Organization XX, which are GHG emission reductions and removals from the atmosphere after undertaking activities (Project Activities, *see* details in “3.3. REDD+ Activities and Drivers of Deforestation and/or Degradation”), the REDD+ program analyzed satellite images (LANDSAT TM and SPOT 5) from 2000 to 2013 to identify forest dynamics (changes in land and forest areas) in the target site. Additionally, the REDD+ program analyzed the dynamics of each forest type and revised them on the basis of a ground truth (field survey and application of high resolution satellite imagery of SPOT 5). The REDD+ program classified each forest type based on the Indonesian National Forest Inventory. The REDD+ program then quantified the amount of carbon stock per unit area of each forest type based on country-specific emission/removal factors provided in Indonesian national forest reference emission level (FREL) which was submitted into UNFCCC in 2015. Finally, since the change in the amount of carbon stock in project area and its surrounded area was closely related to human activity, the REDD+ program developed a new activities for the area under reference scenario and quantified its dynamics. From above monitoring and calculation process, as an ex-ante estimate, the REDD+ program is expected to reduce GHG by 7,823,620 tCO₂e within 10 years (i.e. 782,362 tCO₂e/year) of the REDD+ program start date.

1.2. Jurisdictional Proponent

The REDD+ program is conducted by the Responsible Organization XX and implementing structure is shown in Figure 1. This REDD+ program requires participation of various stakeholders to identify solutions to problems related to deforestation and forest degradation, a practice arising from unplanned land and forestry resource use and a major cause of deforestation and forest degradation in the area. The following structure for implementing the REDD+ program was developed as part of preliminary work (including discussions with stakeholders).

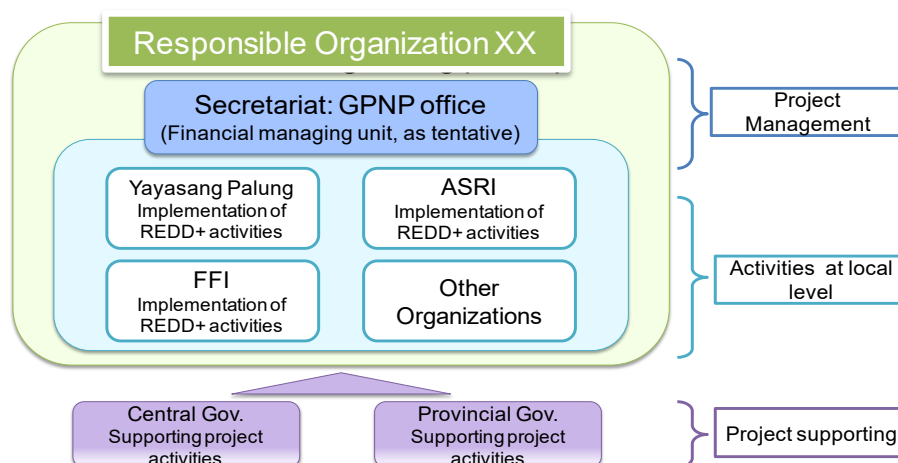


Figure 1 REDD+ program implementation structure

The forum is consist of 20 (Total number of organizations will be finalized before submitting PD) organizations from central and local Governments, NGOs and private sectors, and has been established as a

new organization those who have mission to 1) strengthen the communication of the parties in the landscape GPNP, 2) develop collaboration in the area of landscape management GPNP, 3) create synergy among the parties in the region and preserve the public welfare in the landscape of GPNP and 4) support and actively participate in the efforts of adaptation and mitigation of climate change in the landscape of GPNP to implement REDD+ program in the area, which is according to Ministerial Degree No.45 (Amendment 2002). Also some related organizations who have specific technical advantages, for example, habitat management of Orangutan, carbon monitoring, participatory approach, introduction of alternative livelihood and so on, are joined to the forum as follows;

Organization name	Responsible Organization XX
Contact person	<i>Responsible person: under discussion (should be added)</i>
Title	The forum has been established according to Ministerial Degree No. 45, and consists of 20 organizations from Governments, NGO and private sectors. Roles: <ol style="list-style-type: none"> 1. Strengthening the communication of the parties in the landscape GPNP 2. Develop collaboration in the area of landscape management GPNP 3. Creating synergy among the parties in the region and preserve the public welfare in the landscape GPNP 4. Support and actively participate in the efforts of adaptation and mitigation of climate change in the landscape GPNP
Address	Address: Jl. KH Wahid Hasyim 41-A, Ketapang, Kalimantan Barat, Indonesia
Telephone	Tel number: +62-(534) 33539
Email	E-mail (should be added)

Organization name	Gunung Palung National Park Office (GPNP)
Contact person	<i>Responsible person: under discussion (should be added)</i>
Title	Roles/ responsibilities: The GPNP office is responsible organization of the REDD+ program and secretariat of the Forum. The GPNP manages the task of forest conservation, forest monitoring. Also the GPNP has gathered opinions from all of stakeholders to help make profits as an incentive to sustain REDD+ over the mid- term and long-term.

1.3. Other Entities Involved in the Jurisdictional REDD+ Program

This REDD+ program has involved some organizations that have implemented REDD+ and their related activities. Each organization has many experiences to address to forest conservation activities in West Kalimantan Provinces and their knowledge is very specific to implement REDD+ activities in the area. Following organizations are core members and intensively implement REDD+ program.

Organization	Yayasang Palung
Activity Start Year	From 2009 they have conducted “Gunung Palung Orangutan Conservation Program
Target village/area	Padu Banjar, Pulau Kumbang, Pemangkat, Nopah Kuning and Rantu Panjang villages in total 6,000 ha in SH. VV has planned to have concession of Hutan Desa (2,000 ha)
Activity Type	Hutan Desa (Village forest) in Simpan Hilir sub-district Habitat conservation: They have conducted “Gunung Palung Orangutan Conservation Program” which including scientific research, conservation and education activities.
Concession type	Hutan Desa (2,000 ha, under preparing)

Organization	Alam Sehat Lestari (ASRI)
Activity Start Year	2007- Human health care services and forest care (against illegal logging) 2012- Environmental Education 2011- Forest Conservation (Forest guardians)
Target village/area	Total 24 villages, deeply 2 villages (Sudahan Jaya and) Reforestation 20 ha and restore 6 ha as key corridor for orangutan
Activity Type	Human healthcare service (against illegal logging): evaluating impact on illegal logging in village base in Sukadana sub-district Environmental Education: targeting children Forest Conservation: Forest Guardians monitor logging in their communities and conduct outreach for seeking alternative livelihood to loggers.
Concession type	-

Organization	Fauna & Flora International (FFI)
Activity Start Year	2007- Protecting carbon-rich peat forests in West Kalimantan (landscape-based HCVF assessment) 2011-2014 Asia-Pacific Community Carbon Pools and REDD+ Program
Target village/area	- Asia-Pacific Community Carbon Pools and REDD+ Program :Total 6 villages in Ketapang district (Including Laman Satong village) - Landscape-based HCVF assessment: Kapuas Hulu and Ketapang districts (working with oil palm plantation company, PT. PAS)
Activity Type	- Asia-Pacific Community Carbon Pools and REDD+ Program: conducting project pilot site included six villages, covering 14,325 ha of hutan desa (village

Organization	Fauna & Flora International (FFI)
	forest) in Ketapang district. - High Conservation Value Forest (HCVF): protecting key orangutan habitat from conversion to palm oil plantations. FFI has been conducted HCVF at landscape level in community swamp forest.
Concession type	HCVF

Organization	Cipta Usaha Sejati Ltd (PT. CUS)
Activity Start Year	In 2008, a license was issued with letter No.280 by the forestry service.
Target village/area	Simpang Hilir sub-district The area including two village; Perawas and Sungai Rembawan,
Activity Type	- Under preparation for registering VCS VM0004, it aims to 1) Prevent conversion of the site to oil palm plantation Restore the vegetation to its original condition, 2) Improve the well-being of the local communities surrounding the project area by empowering their capacity, 3) Quantify avoided emissions associated with the conservation of this peat swamp forest and 4) Sell Verified Emission Reductions (VERs) generated by the project. - PT. CUS is a member of Roundtable on Sustainable Palm Oil (RSPO) operating two oil palm estate in Kayong Utara under PT.CUS (26,206 ha) and PT. Jalin Vaneo (18,909ha).
Concession type	The area is categorized as Other Land Use Areas (APL= Area untuk Penggunaan Lain), through Surat Keputusan Menteri Kehutanan No. SK.265/Menhut-II/2008 on 1 August 2008, for an area of 18,042.49 ha. PT CUS/JV has a clearing license for the area within the project site, and an Exploitation Rights (HGU = Hak Guna Usaha).

Organization	Forestry department of Kayong Utara District
Activity Start Year	In 2007, district was formed under Law No.6 of 2007 from Ketapang district.
Target village/area	24 in total and one ranger
Activity Type	Kayong Utara District
Concession type	- The department has 3 section; Protection forest, Rehabilitation forest and Plantation - Managing forest area (HL,HP,(HTI)) - Conducting Hutan Desa activities in Karimata island

1.4. Program Start Date

The start date of the proposed REDD+ program activity crediting period is June 1, 2016. The real activities of the REDD+ program began on June 1, 2016, with the first orientation meeting in Sukadana

Sub-district, Kayong Utara District.

1.5. Program Crediting Period

The crediting period is 20 years: from June 1, 2016 to May 31, 2035 (program period is 40 years: from June 1, 2016 to May 31, 2055).

1.6. Estimated GHG Emission Reductions and/or Removals

Ex-ante estimates to determine program scale were provided only for the first 10-year baseline period through to May 31, 2025. As the anticipated emission reductions are less than 1,000,000 tCO₂e per year, the program falls short of the definition of mega project. Then, if program scale is according to Verified Carbon Standard (VCS) guidance on REDD projects (VCS AFOLU v3 3.1.9), this REDD+ program was not identified as large project as follows;

Project	Less than or equal to 1,000,000 tCO ₂ e per year
Large project	No

The estimated mean annual GHG emission reductions by the program (i.e. after accounting for leakage and prior to buffer withholding) are provided below (Table 2). Since the first baseline period is only 10 years, total GHG benefits are 7,823,620 tCO₂e.

Table 2 Estimated GHG emission reductions (tCO₂e) in the REDD+ program

Years	Estimated GHG emission reductions or removals (tCO ₂ e)
2016	782,362
2017	782,362
2018	782,362
2019	782,362
2020	782,362
2021	782,362
2022	782,362
2023	782,362
2024	782,362
2025	782,362
Total estimated ERs	7,823,620
Total number of crediting years	10
Average annual ERs	782,362

1.7. Jurisdiction Location and Geographic Boundaries

(1) Location and geographical boundaries

West Kalimantan Province is located in the western part of the island of Kalimantan (formerly known as Borneo) or between 2°08" North Latitude and 3°05' South Latitude and between 108°0' East Longitude and 114°10' East Longitude on the map of the earth. Based on that geographical location, West Kalimantan Province is traversed by the Equator (0° latitude) precisely on the city of Pontianak. West Kalimantan Province is also one of the tropical areas whose temperatures and humidity are quite high. Another characteristic of West Kalimantan Province is that it is one of the provinces in Indonesia that is directly adjacent to a foreign country, that is, the State of Sarawak, East Malaysia.

Most of West Kalimantan Province is low-lying land with an area of 146,807 km² or 7.53% of the total area of Indonesia or 1.13 times the island of Java. The region stretches straight more than 600 km from north to south and about 850 km from west to east. In terms of size, West Kalimantan Province is the fourth largest province in Indonesia (204,534 km²). West Kalimantan Province is a sub-national Government administration with 14 districts/cities, including REDD+ program site of Kayong Utara District (Figure 2).

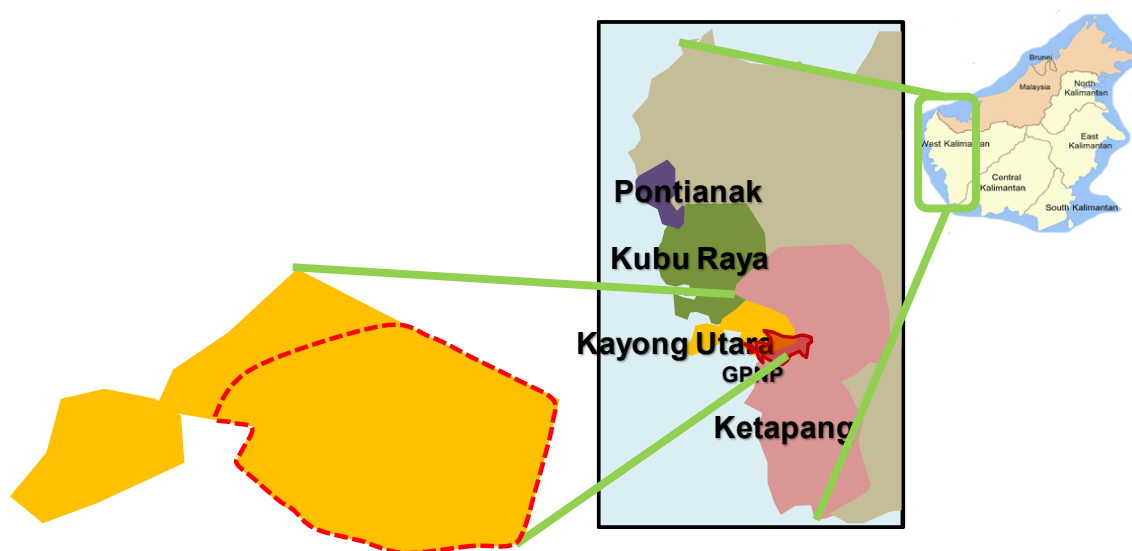


Figure 2 REDD+ program Location

The target site in this REDD+ program is Sukadana (1,027.1 km² in total) and Simpang Hilir Sub-districts (1,421.8km² in total) in Kayong Utara District (Figure 3). According to administrative boundary, there are 22 villages, which are 10 in Sukadana sub-district and 12 in Simpang Hilir sub-District. General information on each village is shown in Table 3

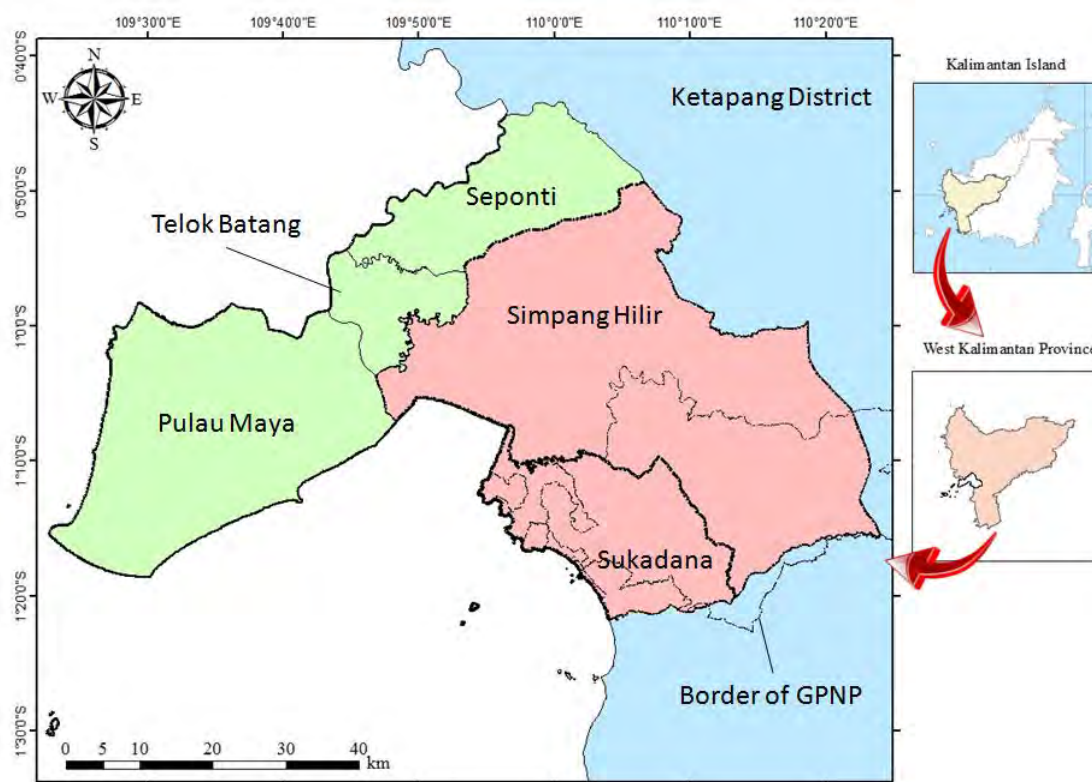


Figure 3 Location of both of Sukadana and Simbang Hilir sub-Districts

Table 3 General information on villages inside target area

Village name		Establishment of the Village	Registration of the Village	Number of sub-village in 2011	Number of households in 2011	Population	Major ethnic group	Land area (km ²)	Distance from District Center (km)
Sukadana	Simpang Tiga			3	466	1,730	Malay	75.0	21.0
	Sejahtera	N/A	1980	3	526	1,858	Malay, Bugis	126.7	5.0
	Pangkalan Buton	1978	1978	4	711	3,289	Malay	70.2	2.0
	Sutera			5	1074	4,733	Malay, Madura	63.3	0.0
	Benawai Agung	N/A	1985	3	588	2,084	Malay, Madura	144.4	6.0
	Harapan Mulia			3	702	2,492	Malay	192.0	12.0
	Sedahan Jaya	2005	2006	4	508	2,053	Malay, Jawa, Bali	41.3	7.5
	Gunung Sembilan	2005	2006	3	296	967	Malay	27.0	1.5
	Pampang Harapan	N/A	2007	3	269	1,136	Malay	64.3	21.5
	Riam Berasap Jaya			3	423	1,699	Malay	75.0	20.5
Simpang Hilir	Padu Banjar	1913	N/A	6	1028	3268	Malay	105.8	23.2
	Pulau Kumbang			4	572	2284	Malay	5.3	17.1
	Pemangkat			3	459	1597	Malay, Jawa	27.0	9.2
	Nipah Kuning			5	712	2536	Malay	27.0	4.8
	Rantau Panjang	1942	N/A	8	1012	3935	Malay, Jawa, China	49.3	5.0
	Penjalaan	1987	1992	3	647	2509	Malay	96.3	4.0
	Telok Melano			3	748	2822	Malay, China	7.4	0.6
	Sungai Mata Mata	1931	1958	4	887	3109	Malay	323.2	3.8
	Batu Barat	1942	1981	4	483	1903	Malay	183.2	16.0
	Matan Jaya			4	564	2475	Malay	312.1	87.0
	Lubuk Batu			2	234	890	Malay	276.5	60.0
	Medan Jaya	2005	2005	3	503	2010	Malay, Bugis	8.7	0.3

(2) Climatic conditions

The climate in West Kalimantan Province, including the project area of Sukadana and Simpang Hilir Sub-districts, is classified as “Tropical Rainforest Climate” under the Köppen climate classification. In Ketapang District facing on Kayong Utara District, the mean monthly high temperature ranges from 30.66°C in January to 32.36°C in May. The mean monthly low ranges from 23.34°C in July to 24.64°C in January (Figure 3). Annual rainfall is 3,134 mm (with monthly low of 125.1 mm in September and monthly high of 455.2 mm in November) (Figure 4).

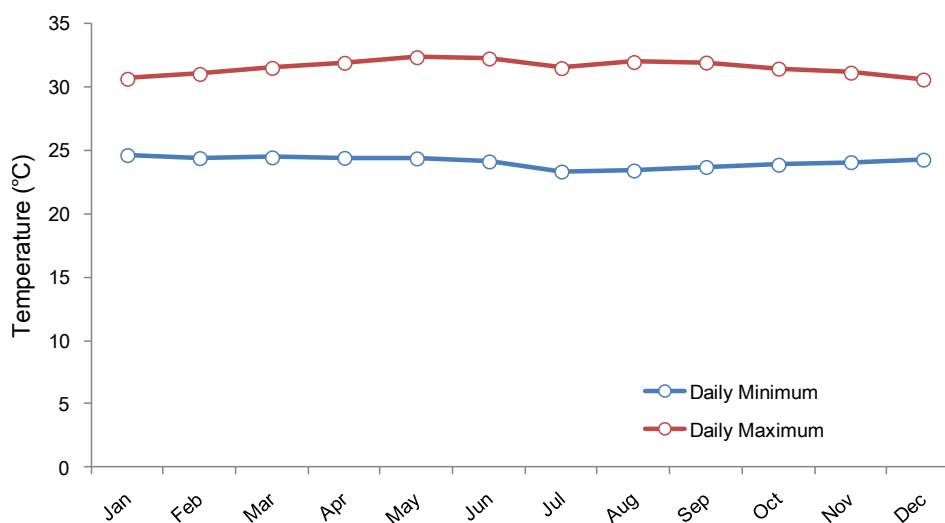


Figure 3 Temperature at the target site in West Kalimantan Province (Based on monthly averages for the 50-year period 1951-2000)

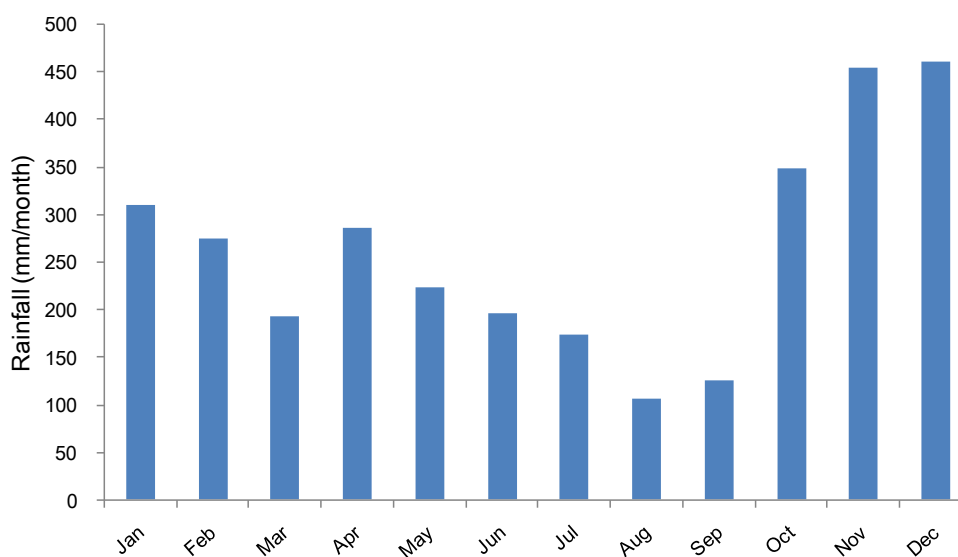


Figure 4 Rainfall at the target site in West Kalimantan Province (monthly averages for the 5-year period 2008-2012)

(3) Ecosystem conditions

The reference region of Kayong Utara District is located in southern West Kalimantan Province. The altitude of the main settlement in the REDD+ program site is under 100 m. The native vegetation is the typical forest.

(4) Land use condition

Current land use is significantly affected by human activities. Rich forests have been converted to degraded forests. The results of land use analysis based on satellite imagery in Kayong Utara District or reference region show “Secondary Swamp Forest” was decreased 71,235 ha (approximately 61% compared with 2000). Land use in the project area is very similar to the typical pattern in Kayong Utara District in West Kalimantan Province.

(5) Endangered species

The reference region is including the habitat area of Orangutan. The some organizations have had activities/works to protect endangered wild Orangutans especially around the GPNP. This REDD+ program also makes consideration for endangered species.

All target area (i.e. project area) is under control by the REDD+ program. Spatial boundaries consist of reference region, project area, leakage belt and forest (Figure 5). In this REDD+ program, the program set spatial boundaries based on following concepts.

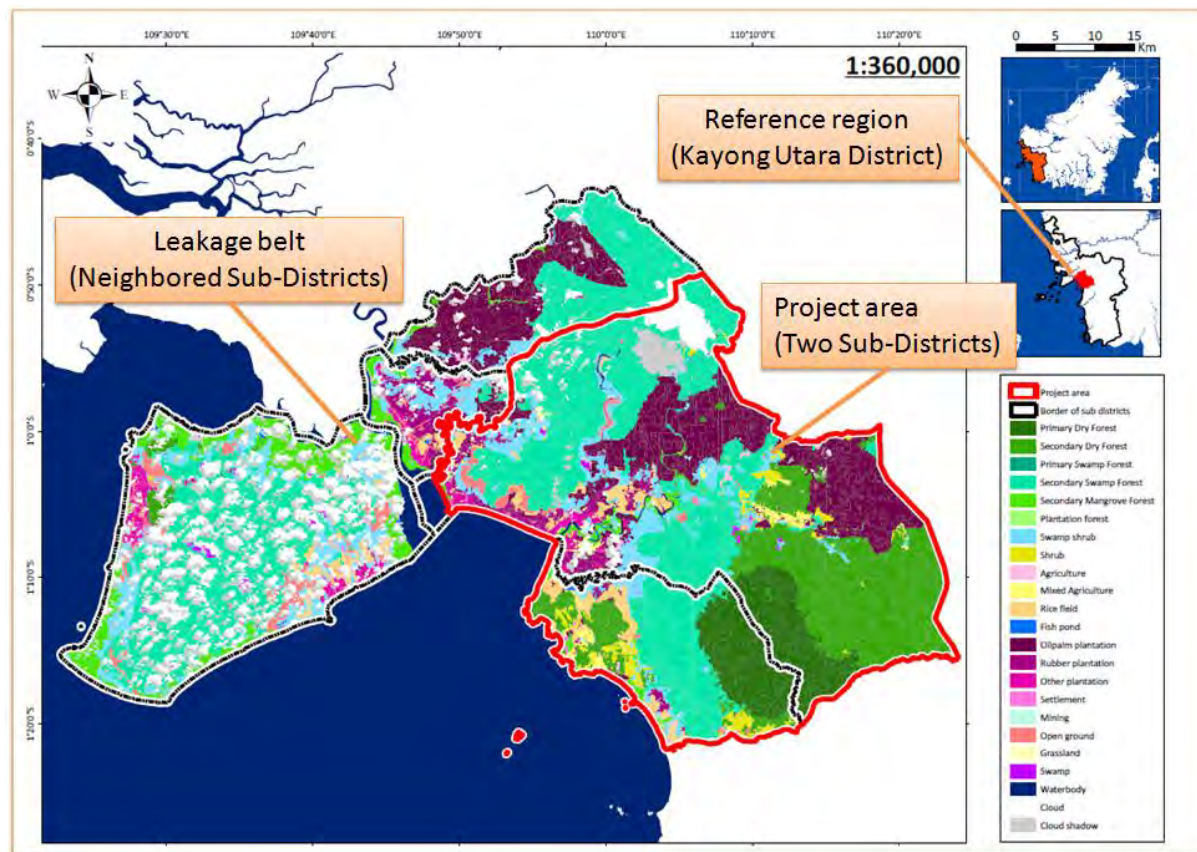


Figure 5 Spatial boundaries of reference region, project area and leakage belt

(6) Reference region

As shown in Figure 5, reference region in this PD are overall area in Kayong Utara District, West Kalimantan Province and it was because West Kalimantan Province and/or Kayong Utara District had not been developed sub-national baselines. Therefore, reference region was identified as overall Kayong Utara District including the project area of Sukadana and Simpang Hilir Sub-districts. It was because there is a typical forest ecosystem which is similar to the project area. Therefore, it is appropriate to set overall Kayong Utara District as the reference region for the project area. In the overall Kayong Utara District, the area under severe deforestation and forest degradation is expanding due to some drivers, which makes it even more appropriate to identify the overall district as the reference region for the project area.

The reference region has an area of 413,208 ha (consist of 220,793 ha of forest area and 192,415 ha of non-forest area) – approximately 2 times bigger than the project area. The criteria used to define the reference region were based on drivers (agent, agent group and related drivers), forest/vegetation classes and socio-economic conditions. The reference region meets the following conditions;

a. Drivers

i) Agents and drivers of deforestation

To analyze the agents and drivers of deforestation in the project area of Sukadana and Simpang Hilir Sub-districts, the REDD+ program proponents used participatory methods. A detailed description of the agents and drivers of deforestation in the project area are explained in “3.3. REDD+ Activities and Drivers of Deforestation and/or Degradation”. Interviews to Officials of Kayong Utara District Government, proponents were conducted to identify that there are similar condition of agents and drivers of deforestation between Kayong Utara District (reference region) and the Sukadana and Simpang Hilir Sub-districts (project area). The first main deforestation drivers in both areas are exploitation of the forest area for oil palm plantation and second one is the land conversion from forest area to substantial small scale crops land.

ii) Agents groups

The agents of deforestation both within Kayong Utara District (reference region) and the project area of Sukadana and Simpang Hilir Sub-districts are almost all of small farm holders using conventional techniques to convert natural forests and secondary forests into croplands.

iii) Infrastructure drivers

In both reference region and project area, there is no new improved infrastructures related

deforestation and forest degradation.

iv) Other spatial drivers expected to influence the project area

From interviews to Officials of Kayong Utara District Government, no other major drivers were identified in both reference region and the project area, therefore, no additional drivers are expected to emerge near or inside the project area.

b. Landscape configuration and ecological conditions

Ecological condition in reference region is as follows; regarding forest/vegetation classes, in both reference region and project area, forest classifications are certainly same. Over 60% of project area has forest classes that exist in at least 53% of the rest of reference region.

c. Socio-economic conditions

According to the information from the officials in Kayong Utara Government, legal status of the land, land tenure, enforced policies/regulations and socio-economic conditions in both reference region and the project area are similar, therefore, it is appropriate to set overall Kayong Utara District as the reference region for the project area.

(7) Project area

As shown in Figure 6, project area, which is project area in this PD are Sukadana and Simpang Hilir Sub-districts in Kayon Utara District, West Kalimantan Province. The location of the project area, including each village, main road and other related information are shown in Figure 6.

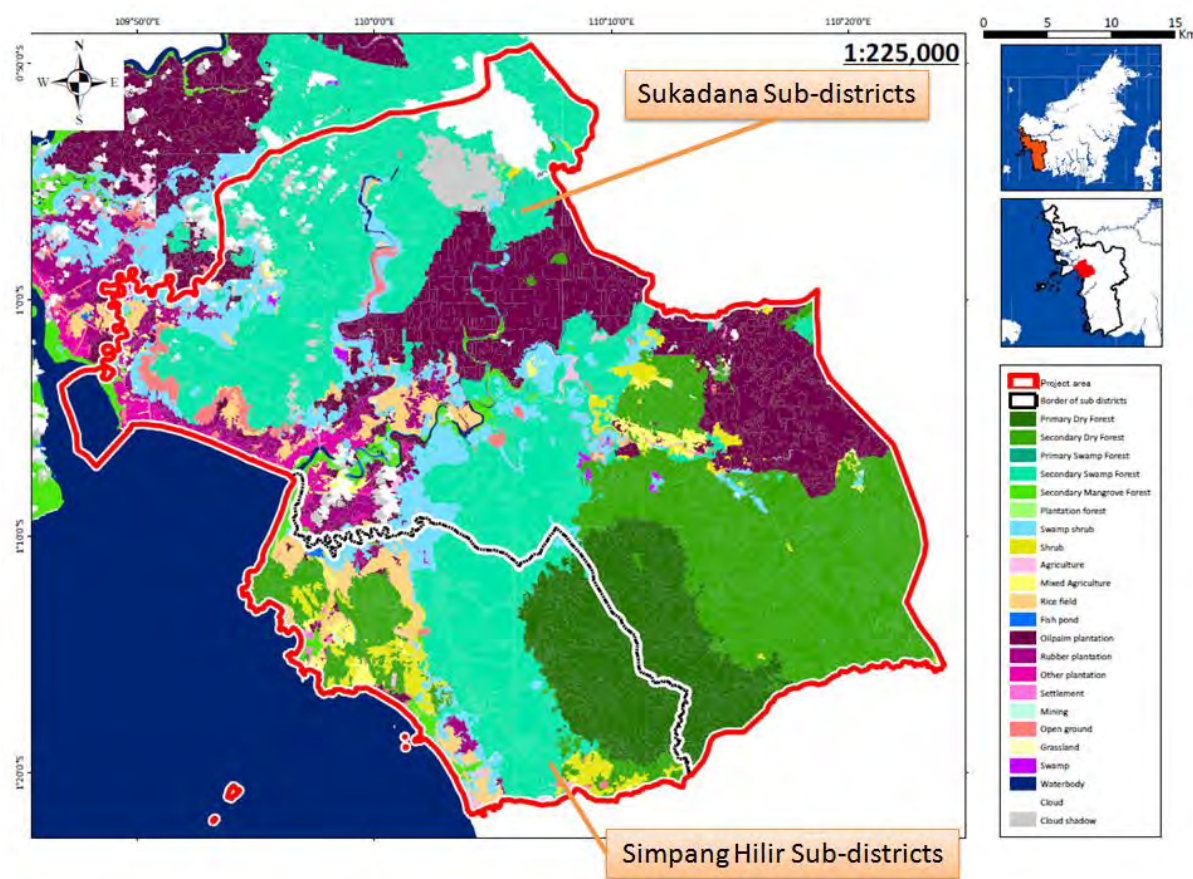


Figure 6 Project area of Sukadana and Simpang Hilir Sub-districts

The project area includes all forests area observed according to Indonesian National Forest Inventory within the boundaries of the project area and reference region, as illustrated in Figure 6.

The total project area is 222,324 ha (project area is 133,615 ha including 88,709 ha of non-forest area) and location in each village is mentioned in Figure 6.

(8) Leakage belt

As shown in Figure 6, leakage belt in this project are same as reference region (overall area in Kayong Utara District, West Kalimantan Province). From results of preliminary survey before the commencement of the REDD+ program and mobility analysis by expert opinion and participant rural appraisal (PRA) of the REDD+ program, leakage belt was identified as neighbor regions in Kayong Utara District where is same as reference levels. Opinions from Officials of Kayong Utara District Government had been supported such concept of leakage belt.

(9) Forest

According to the definition of Indonesian National Forest Inventory, the specific definition of forests in this REDD+ program is identified and applied to the REDD+ program as follows;

Minimum area of land	0.25 ha
Average tree height	5 m
Minimum tree crown cover	30% and above



Primary Dry Forest around GPNP



Oil palm (categorized as cropland) around GPNP

Also, forest classification such as primary dryland forest, Secondary dryland forest, Primary swamp forest and so on are adopted by Indonesian National Forest Inventory according to Minister Degree of SNI 8033, 2014. The baseline scenario is based on a multi-temporal historical analysis of deforestation. The analysis yielded a digital map of forest cover, deforestation that was filtered to a minimum-mapping unit (MMU) of 1.0 ha; the forest class has an overall accuracy of 80%. The forest benchmark was generated from the multi-temporal historical analysis. Also some area covered by clouds and shadows were analyzed according specific methodology.

This forest class is according to Indonesian National Forest Inventory (Table 4).

Table 4 Applied forest class in this REDD+ program²

Forest class	Definition	Land clarification according to IPCC
Primary dryland forest	Natural tropical forests grow on non-wet habitat including lowland, upland, and montane forests with no signs of logging activities. The forest includes pygmies and heath forest and forest on ultramafic and lime-stone, as well as coniferous, deciduous and mist or cloud forest.	Forest
Secondary dryland forest	Natural tropical forest grows on non-wet habitat including lowland, upland, and montane forests that exhibit signs of logging activities indicated by patterns and	Forest

² Directorate General of Climate Change 2015. National Forest Reference Emission Level for Deforestation and Forest Degradation in the Context of the Activities Referred to in Decision 1/CP.16, Paragraph 70 UNFCCC

	spotting of logging. The forest is including pygmies and heath forest and forest on ultramafic and lime-stone, as well as coniferous, deciduous and mist or cloud forest.	
Primary swamp forest	Natural tropical forest grows on wet habitat including brackish swamp, sago and peat swamp, with no signs of logging activities	Forest
Secondary swamp forest	Natural tropical forest grows on wet habitat including brackish swamp, sago and peat swamp that exhibit signs of logging activities indicated by patterns and spotting of logging	Forest
Primary mangrove forest	Inundated forest with access to sea/brackish water and dominated by species of mangrove and Nipa (Nipa frutescens) that has no signs of logging activities	Forest
Secondary mangrove forest	Inundated forest with access to sea/brackish water and dominated by species of mangrove and Nipa (Nipa frutescens) that exhibit signs of logging activities indicated by patterns and spotting of logging	Forest
Plantation forest	Planted forest including areas of reforestation, industrial plantation forest and community plantation forest	Forest
Dry shrub	Highly degraded log over areas on non-wet habitat that are ongoing process of succession but not yet reach stable forest ecosystem, having natural scattered trees or shrubs	Grassland
Wet shrub	Highly degraded log over areas on wet habitat that are ongoing process of succession but not yet reach stable forest ecosystem, having natural scattered trees or shrubs	Grassland
Savanna and Grasses	Areas with grasses and scattered natural trees and shrubs. This is typical of natural ecosystem and appearance on Sulawesi Tenggara, Nusa Tenggara Timur, and south part of Papua island. This type of cover could be on wet or non-wet habitat	Grassland
Pure dry agriculture	All land covers associated to agriculture activities on dry/non-wet land, such as tegalan (moor), mixed garden and ladang (agriculture fields)	Cropland

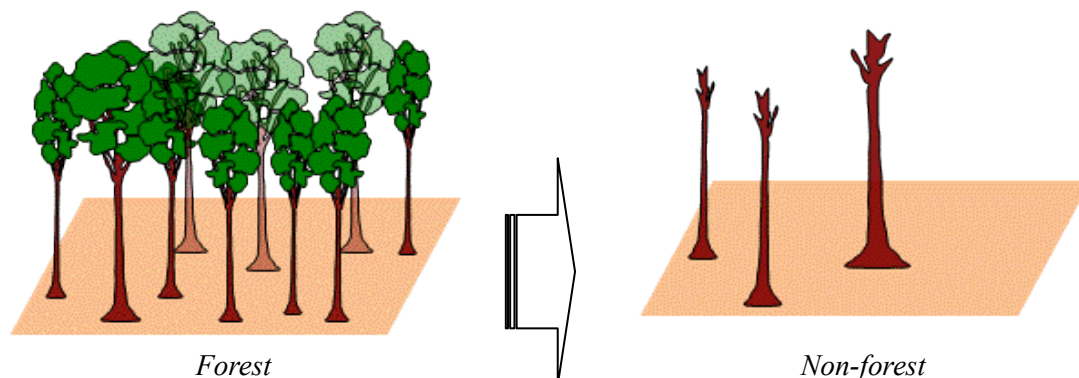
Table 4 *continued*

Forest class	Definition	Land clarification according to IPCC
Mixed dry agriculture	All land covers associated to agriculture activities on dry/non-wet land that mixed with shrubs, thickets, and log over forest. This cover type often results of shifting cultivation and its rotation, including on karts	Cropland
Estate crop	Estate areas that has been planted, mostly with perennials crops or other agriculture trees commodities	Cropland
Paddy field	Agriculture areas on wet habitat, especially for paddy, that typically exhibit dyke patterns (pola pematang). This cover type includes rain-fed, seasonal paddy field, and irrigated paddy fields	Cropland

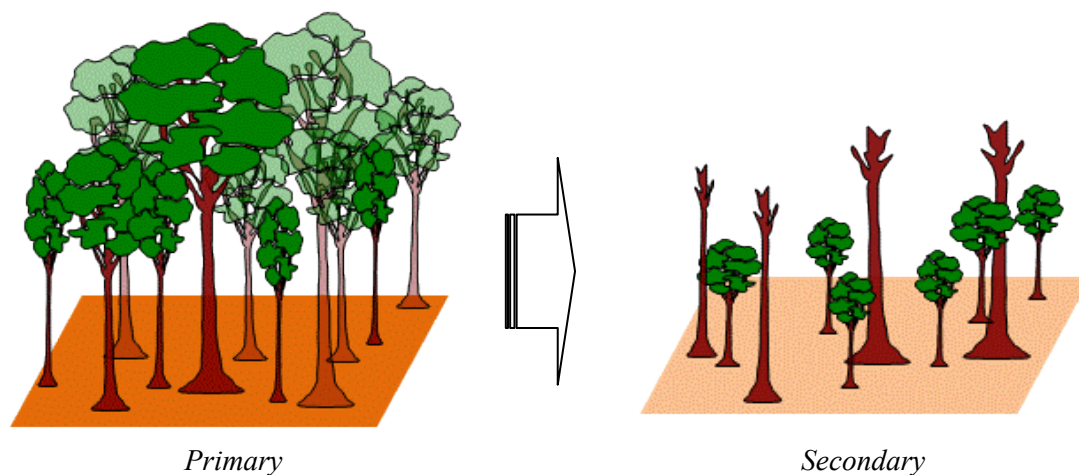
Transmigration areas	Kind of unique settlement areas that exhibit association of houses and agroforestry and/or garden at surrounding	Settlement
Fish pond/aquaculture	Areas exhibit aquaculture activities including fish ponds, shrimp ponds or salt Ponds	Wetland
Bare ground	Bare grounds and areas with no vegetation cover yet, including open exposure areas, craters, sandbanks, sediments, and areas post fire that has not yet exhibit regrowth	Other land
Mining areas	Mining areas exhibit open mining activities such as open-pit mining including tailing ground	Other land
Settlement areas	Settlement areas including rural, urban, industrial and other settlements with typical appearance	Settlement
Port and harbor	Sighting of port and harbor that big enough to independently delineated as independent object	Other land
Open water	Sighting of open water including ocean, rivers, lakes, and ponds	Wetland
Open swamps	Sighting of open swamp with few vegetation	Wetland
Clouds and no-data	Sighting of clouds and clouds shadow with size more than 4 cm ² at 100.000 scales display	No data

In this PD, REDD+ activities consist of; 1) reducing deforestation; 2) reducing forest degradation; and 3) enhancing forest carbon stocks (not include afforestation and reforestation). Definition of each carbon stock changes is illustrated in Figure 7.

Deforestation: land conversion from forest land to other land (e.g., cropland, grazing land and settlements)



Forest Degradation: change of forest types (e.g., primary forest to secondary forest)



Carbon Enhancement: change of forest types (e.g., plantation forest to primary forest)

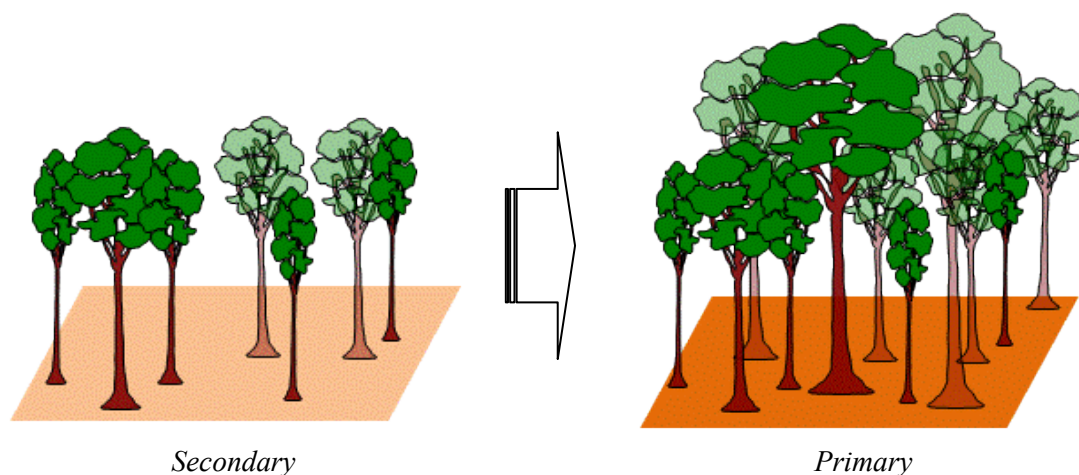


Figure 7 Concept of deforestation, forest degradation and carbon enhancement in the forest in this PD

1.8. Conditions Prior to Program Initiation

Since the UNFCCC COP 13 meeting in Bali in 2007, Indonesia has prioritized climate change planning and action. In 2009, the President announced a commitment to reduce GHG emissions nationwide by at least 26% below business as usual levels by 2020. National strategies and action plans recognize that

land-use change and forestry activities are the main sources of Indonesia's emissions, accounting for 84% of Indonesia's total emissions.



(Left: Well managed forest in GPNP Right: Regenerated vegetation after fires)
Landscape in Kayong Utara District facing on GPNP

The largest forest fires that took place in 1997/1998 during dry seasons were associated with the El Nino phenomenon. After the El Nino-induced forest fires of 1997, forest and peat fires always occur every year and significantly affected GHG emissions. Fires directly change carbon stocks into GHG. During dry seasons, the burning of land could go uncontrolled and threaten oilpalm plantation estates and industrial plantation forests because this may lead to wild fires that would burn plantation areas and production forest also. Land cover change from 2000 to 2013 which shows land conversion from forest to cropland (i.e. oil palm plantation) are visually quantified by satellite imagery analysis by JICA IJ-REDD+ (please see details in below).

In certain cases, fire is used as a weapon to resolve conflicts over land ownership. It should be noted that peat and forest fires also occurred in areas for other uses, and in both production and conservation forest areas³. The extent of such forest and peat fires are presented in the following Table 5 and land-cover change between 2000 and 2015 are shown in Figure 8.

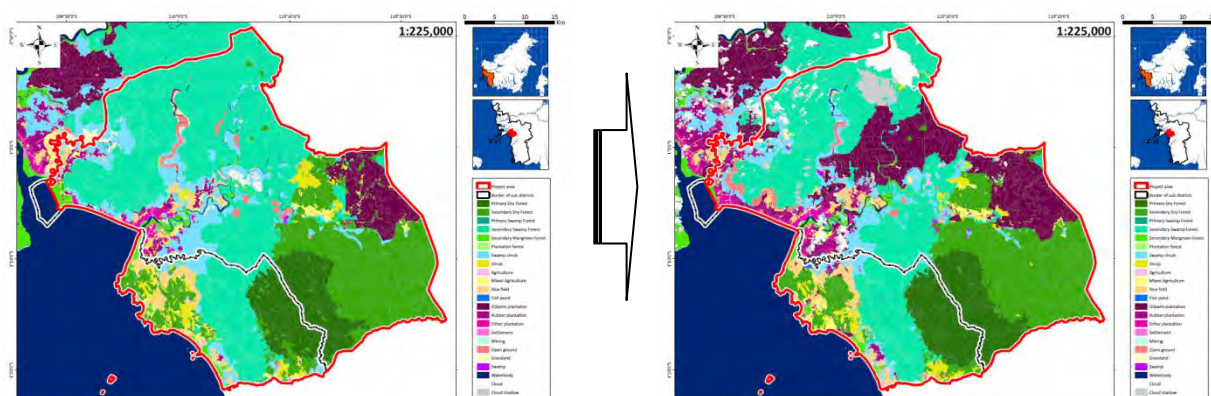
Table 5 Past burned area caused by forest and peat fires around target area in West Kalimantan Province⁴

³ Dinas Kehutanan Provinsi Kalimantan Barat 2012. Provincial Statistics.

⁴ Dinas Kehutanan Provinsi Kalimantan Barat 2012. Provincial Statistics.

District	Burned Area (ha)				
	2007	2008	2009	2010	Average
Kubu Raya	69	447	428	105	262
Ketapang	5	10	642	0	164

Before this REDD+ program, forest area of Sukadana and Simpang Hilir Sub-districts are categorized in both of Hutan Lindung (protected forest), Hutan Produksi (Production Forest) and Areal Penggunaan Lain (APL) (Non-forest Zone). Also forest distribution area had been changed since 2000 (Figure 2008).



Left: land cover in 2000 Right: land cover in 2013
Figure 8 Land use change before REDD+ program start

1.9. Approvals

All of responsibility for implementing REDD+ program, which include leakage management and issues to be solved are held by the Responsible Organization XX (Total number of participated organizations will be finalized before submitting PD). Also some tasks of institutional arrangement regarding jurisdictional approach are owned by the Responsible Organization XX.

(1) Nested Subnational Jurisdictions

This REDD+ program does not allow additional or new lower-level activities.

(2) Nested Projects

This REDD+ program does not allow additional or new lower-level activities.

1.10. Compliance with Laws, Statutes and Other Regulatory Frameworks

The REDD+ program aims to be in compliance with Indonesia's laws and regulations, as well as those governing international trade. Specifically, the most relevant local laws and regulations related to the REDD+ program activities include:

- Law No. 5 of 1990 on Natural Resources Conservation and Biological Ecosystem
- Law No. 41 of 1999 on Forestry
- Law No. 32 of 2004 on Regional Government

- Law No. 26 of 2007 on regarding Spatial Planning
- Law No. 32 of 2009 on Environmental Protection and Management
- Presidential Regulation No. 61/2011 regarding National Action Plan on GHG Emission Reduction
- Presidential Decree No. 62/2013 regarding managing agency for the reduction of emission from deforestation and degradation of forest and peatlands
- Government Regulation No. 44 of 2004 on Forestry Planning
- Government Regulation No. 45 of 2004 on Forest Protection
- Government Regulation No. 6 of 2007 on Forest Management and Formulation of Forest Management and Forest Utilization Plan
- Government Regulation No. 38 of 2007 on the Division of Governmental Affairs Between the Government, Provincial Government and Regency/Municipal Government
- Government Regulation No. 10 of 2010 on the procedure of altering the appropriation and function of forest areas
- Government Regulation No. 24 of 2010 on the Use of Forest Areas
- Government Regulation No. 60 of 2012 on the amendment of No. 10/2010 on Procedures for altering the appropriation and function of forest areas
- Minister of Forestry Regulation No P.68/Menhut-II/2008 on the Implementation of Demonstration Activities on Reduction of Emission from Deforestation and Degradation
- Minister of Forestry Regulation No. P.61/Menhut-II/2008 regarding Provisions and Procedures for the Granting of Business Permits for the Utilization of Products of Wood Forest Ecosystem Restoration in Natural Production Forests thru Application.
- Minister of Forestry Regulation No.P.30/Menhut-II/2009 Reduction of Emissions from Deforestation and Forest Degradation Procedure
- Minister of Forestry Regulation No. P.4/Menhut-II/2011 - Forest Reclamation Guidelines
- Minister of Forestry Regulation P. 20/Menhut-II/2012 on Implementation of Forest Carbon
- Minister of Forestry Decree No. 259/Kpts-II/2000 regarding harmonization of Central and Provincial Spatial Plans
- Minister of Forestry Decree No. SK.455/Menhut-ii/2008 on Working Group on Climate Change in the Department of Forestry
- Ministry of Forestry Decree No.P.36/Menhut-II/2009 regarding Procedures for Licensing of Commercial Utilization of Carbon Sequestration and/or Storage in Production and Protected Forests.
- Minister of Forestry Decree No. SK 13/Menhut-II/2009 on Climate Change Working Group in the Ministry of Forestry
- Minister of Forestry Decree No SK.199/Menhut-II/2012 on Creation of The Preparatory Unit for The Macro Plan for Forestry Tenure

1.11. Ownership and Other GHG Programs

(1) Right of Use

Legally the reference and the project areas are classified as National Park, Forest area (HP, HL, HTI) and other land use (APL) based on SK.733/ Menhut-II/2014. In accordance with those classifications, the proponents have secured provisional right of use. The carbon right is secured in accordance with Regulation No. P. 20/Menhut-II/2012. Therefore the REDD+ program proponents have control of the project area by virtue of above rights of use. The authorization process will be taken as the activities in Forum (i.e. forum activities mentioned in “3.3. REDD+ Activities and Drivers of Deforestation and/or Degradation”)

(2) Participation under Other GHG Programs

This REDD+ program has not and will not seek to generate credits in any other form. Any reductions in GHG emissions achieved through this REDD+ program will not be used to meet compliance requirements, whether regional or national. Neither Indonesia nor the regional or local governments have established a national target, a compliance program, or a cap-and-trade system.

1.12. Benefit Sharing Mechanism

Benefit sharing mechanism and/or benefit distribution system among all stakeholders are essential to keep motivation to participate into the REDD+ program. In Indonesia, regulation for REDD+ mechanism is still under development, then discussions on benefit sharing mechanism in this REDD+ program have not reach to the agreement points. The mechanism should be in line with the Decree 36/2009⁵ and also distribution rate and other regulation should be finalized after some times of stakeholder’s meeting.

1.13. Program Sensitive Information

No sensitive information.

2. Safeguards

2.1. Stakeholders Consultation

The jurisdictional REDD+ program has been developed and this document has been documented with a multi-stakeholders process in a transparent manner. The process included some internal meetings and workshops. Relevant stakeholders (described section of “Chapter 1 Output 1 Activity 1-1 1.2. Consulted and its process and outcomes are summarized below;

Stakeholders	Ministry of Environment and Forestry in Indonesia
Manner of consulting	<ul style="list-style-type: none">- Sharing the draft PD and gathering the comments- Carrying out 3 times of meeting and discussion to develop final draft- Having the workshop as a co-chair in order to consult with relevant stakeholders

⁵ Ministry of Forestry 2009. Ministry of Forestry Decree No. P.36/Menhut-II/2009 regarding Procedures for Licensing Of Commercial Utilisation Of Carbon Sequestration and/or Storage In Production and Protected Forests

Stakeholders	Forum Members
Manner of consulting	<ul style="list-style-type: none"> - [Need to be shared with forum] - Carrying out X time of meeting and discussion to develop final draft - Having the workshop as a co-cheer in order to consult with relevant stakeholders

Stakeholders	The villages in Sukadana Sub-district
Manner of consulting	<ul style="list-style-type: none"> - Having the consultation workshop to share the result of socio-economic survey and exchanged opinions Sedahan Jaya Village: on 14-15th October, 2014 with 29 participants - Riam Berasap Village: on 19th May, 2015 with 16 participants - -Sejahtera Village: on 9th August, 2015 with 41 participants - Taking collaborative management process in 4 villages - Conducting FPIC process

Stakeholders	The villages in Simpang Hilir Sub-district
Manner of consulting	<ul style="list-style-type: none"> - Having the consultation workshop to share the result of socio-economic survey and exchanged opinions - Batu Barat Village: on 10th February, 2015 with 18 participants - Matan Jaya Village: on 27th March, 2015 with 21 participants

Stakeholders	FPIC Training Work shop
Manner of consulting	<ul style="list-style-type: none"> - Having the workshop for FPIC training - Held on 11th-13th January, 2016

2.2. Relevant institutions and/or standards

Relevant rules, standards, procedural descriptions, guidelines that are used as guidance to meet sub-national social and environmental safeguard requirements which have also addressed and respected safeguards requirements and all of the safeguards contained Decision 1/CP.16 of the UNFCCC Cancun Agreements, are listed in Table 6.

Table 6 Relevant institutions and/or standards in Indonesia

Institutions and standards in Indonesia	Description
Pengelolaan Hutan Produksi Lestari (PHPL) as policies and regulations	Pengelolaan Hutan Produksi Lestari, a sustainability management system for all production forest concessions in Indonesia.
Sistem Verifikasi Legalitas	Sistem Verifikasi Legalitas Kayu, timber legality verification system

Kayu (SVLK)	which is part of PHPL.
SFM Certification	Sustainable Forest Management, refers to voluntary certification standards for SFM used in the context of timber production. The Forest Stewardship Council (FSC) and Lembaga Ekolabel Indonesia (LEI) are the two most well known systems used in Indonesia.
Kajian Lingkungan Hidup Strategis (KLHS)	Kajian Lingkungan Hidup Strategis, strategic environmental assessment (SEA) is a mandatory control mechanism for development policies, plans and programs at the National, Provincial and Kabupaten level (UU 32/2009)
Analisis Mengenai Dampak Lingkungan (AMDAL)	Analisis Mengenai Dampak Lingkungan, environmental impact assessment.
Free, Prior, and Informed Consent (FPIC)	Free, Prior, and Informed Consent (or Consultation, per Government of USA and WB), a process that provides opportunity for indigenous and/or local communities to reject or approve activities in forests to which they have rights.

2.3. Handling and resolving grievances and disputes

Mechanisms for handling and resolving grievances and dispute have not been developed. The REDD+ program will consider who and how should identify and resolve grievances and disputes relating to the design, implementation and evaluation of the REDD+ program. The Responsible Organization XX has continuously held workshops and meetings in order to review the process on security framework for REDD+ in and around GPNP.

3. Jurisdictional Baseline Details

3.1. Jurisdictional Baseline Start Date and Frequency of Update

The historical reference period is from 2000 to 2013, totaling 14 years. The start and end date of the REDD+ program crediting period, 20 years in total, are June 1, 2015 and May 31, 2034, respectively. The REDD+ program crediting period is subject to renewals. The fixed baseline period covers a 10 years period from 2016 to 2025. The minimum duration of a monitoring period will be one year and will not exceed the fixed reference period. It is expected that monitoring reports will be issued every 3-5 years, depending on REDD+ program circumstances. This REDD+ program will seek registration only under the VCS. The REDD+ program will not seek to register credits with any other program.

3.2. Previously Established Jurisdictional Baseline and/or Reduction Commitments

In West Kalimantan Province, and each District in the Province have not established baseline (i.e. forest reference level according to UNFCCC decision) even in January 2016. Therefore, the PD dose not considered relationship between previously established jurisdictional baseline and/or reduction commitments.

3.3. REDD+ Activities and Drivers of Deforestation and/or Degradation

The agents, drivers, and underlying causes of deforestation and forest degradation in the project area were identified through the socio-economic survey, such as interviews with local stakeholders (officials from the GPNP, NGOs and community leaders) a review of socio-economic study conducted by the IJ-REDD+, participatory workshops in community, and experts opinions.

The process of identifying drivers and agents and selecting REDD+ activities for reducing GHG emissions are shown in Figure 9.

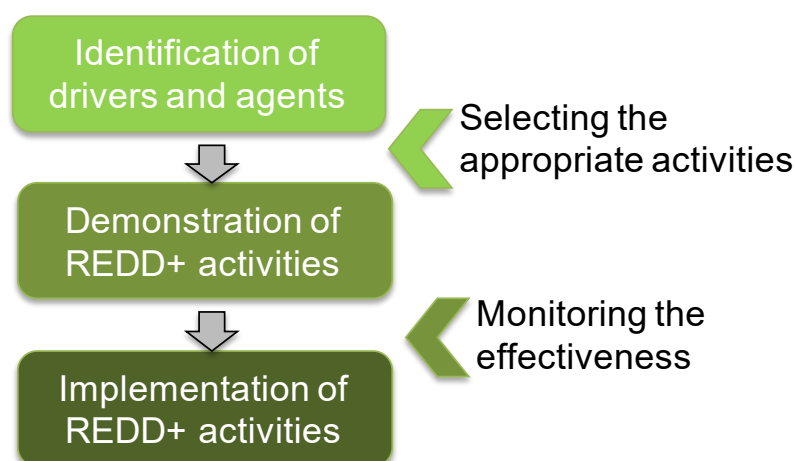


Figure 9 Process of identifying drivers and agents and selecting REDD+ activities

(1) Identification of agents and drivers of deforestation and forest degradation

Based on the sources described above, 1 agent group was identified in planned deforestation and 3 agents group were identified in unplanned deforestation and forest degradation. Oil palm plantation settler is the main agents responsible for deforestation since around the year of 2007. Other agents, small scale subsistence farmers who converted forest area to crops land and forest resource user, also present in the project area.

a. Planned deforestation

This REDD+ program defines one main agent and drivers of deforestation and forest degradation- converting the forest area to oil palm plantation. These are the dominant agents of deforestation and forest degradation in the region and are expected to be in the coming decades.

Agent 1	Oil palm plantation settler
Driver	In accordance with the satellite imagery analysis, XX area of plantations has been increasing since 2006.

b. Unplanned deforestation and forest degradation

There are other potential agents of deforestation and degradation in the project area however

according to expert opinion these do not cause significant deforestation in comparison to agent 1. In order to secure the safeguard aspects the REDD+ program also need to consider following agent;

Agent 2	Subsistence small scale farmer without irrigation system (rice production in dry paddy)
Driver	<p>- Land use conversion for crops land</p> <p>The community who are engaging in upland rice and/or shifting cultivation. Their main income generation is labor salary in oil palm plantation. Instable employment condition has community returned to substantial foaming like shifting cultivation and there is a possibility that the number of land conversion to crops land will be increasing by population growth of the target area.</p>

Agent 3	Forest resource user in particular non timber forest products (NTFPs)
Driver	<p>- Growing forest resource utilization pressure</p> <p>The fuel wood is the main source of cooking while propane gas is widely introduced in project area. Approximately 76% (minimum30%- maximum97%) of target households collecting fuel woods in forest area and 19% (minimum3.3%- maximum71.5%) of target households are deriving their income from NTFPs selling. The customary way of natural resource use is sustainable. However there is the possibility that the forest utilization pressure will be increasing by population growth of the target area.</p>

Agent 4	Small scale loggers
Driver	<p>- Logging</p> <p>In mainly 1990's, the impact on deforestation caused by illegal logging had been decreasing since the main income source around project area has been shifted to employment of oil palm plantation and logging for self consumption as building materials are continuing on a small scale. However there is the possibility that the timber utilization will be increasing by population growth of the target area.</p>

These agents do not present independently, one agent activities shall be plurality of drives shown in Table 7.

Table 7 Community group and their characteristics

Community group	Main income generation	Dependence of substantial farming	NTFP usage	Underlying problem	General problem
Group A	Harvesting Dry land paddy / NTFP selling/ small scale logger	High	Yes	<ul style="list-style-type: none"> ● Insufficient yield amount ● Lack of agricultural techniques ● Insufficient income 	Population growth (immigration). Unrecognized boundary between community area and conservation forest area (NP, HL). Lack of land use and natural resource management policies/ rules and their enforcements Low coordination for forest management among local stakeholders (community, government and NGOs)
Group B	Harvesting rubber plantation	High-Middle	Yes	<ul style="list-style-type: none"> ● Influenced by market price of rubber ● New migrants cannot gain enough land 	
Group C	Labor salary in oil palm plantation	Middle	Yes	<ul style="list-style-type: none"> ● Lost own farming area ● Income disparities 	
Group D	Harvesting Wetland paddy	Low	Yes	<ul style="list-style-type: none"> ● Conflict over the resource allocation 	
Group A	Harvesting Dry land paddy / NTFP selling / small scale logger	High	Yes	<ul style="list-style-type: none"> ● Insufficient yield amount ● Lack of agricultural technique ● Insufficient income 	
Group B	Harvesting rubber plantation	High-Middle	Yes	<ul style="list-style-type: none"> ● Influenced by market price of rubber ● New migrants cannot gain enough land 	

(2) Identification of underlying causes of deforestation

The underlying causes make the unsustainable exploitation of forest in the project area are summarized below;

- Market price of palm oil
- Market price of rubber
- Lack of land use and natural resource management policies/ rules and their enforcements in community level
- Lack of coordination for forest governance among local government
- Lack of coordination for forest management among local stakeholders (community, government and NGOs)
- Lack of agricultural techniques
- Lack of economic opportunities other than working in oil palm plantation
- Population Growth

(3) REDD+ Activities

As mentioned above, the landscape level has multi agents and drivers, and multi underlying causes for deforestation and forest degradation. Thus the REDD+ activities are implemented through the two scales to avoid the baseline deforestation and forest degradation. One is small scale activity which carried out by the NGOs in order to approach multi agents and drivers in each village level. The other is wide scale to handle with the underlying causes. This approach ensures that the communities are undertaking activities or benefiting from the inputs that are well suited to their circumstances and needs, and are more likely to succeed since the forest governance condition will be put into place (Figure 10).

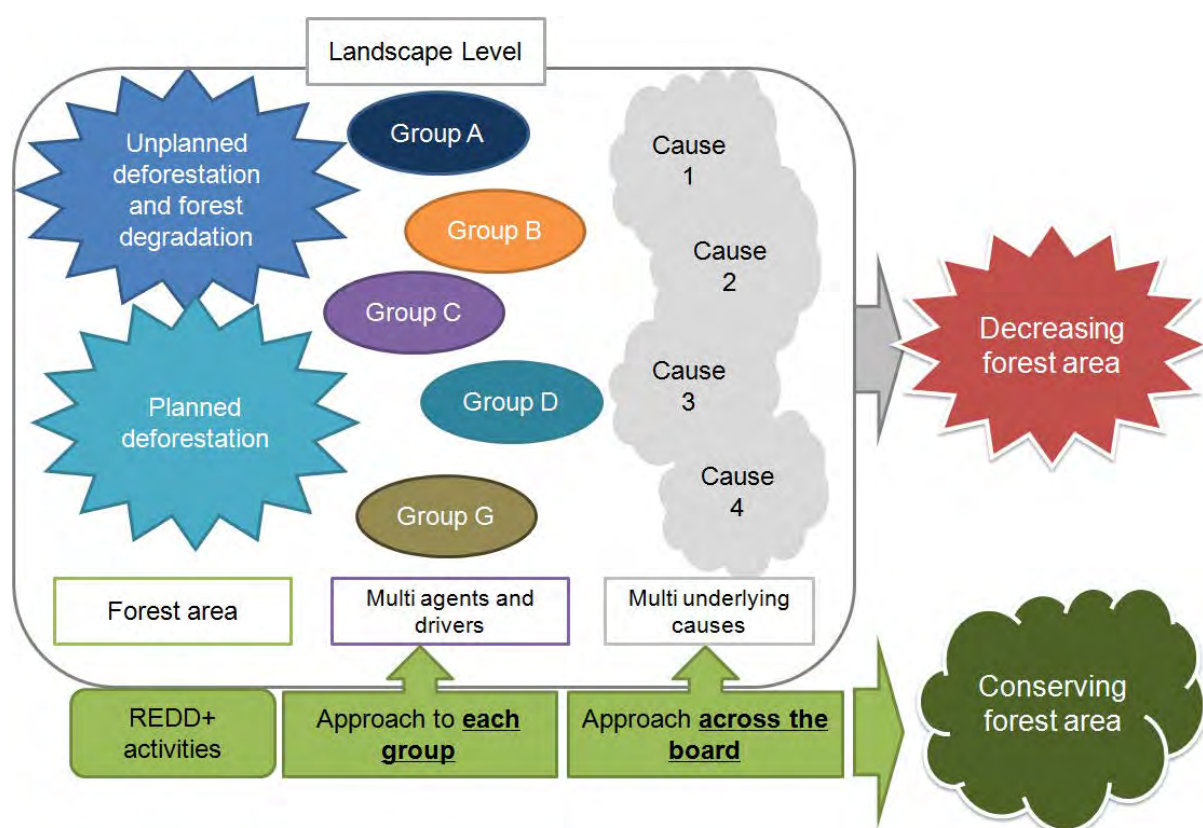


Figure 10 REDD+ approach to landscape level

a. REDD+ activities: Approach to each group

REDD+ activities	Improving agriculture techniques
How it will achieve net GHG emission reductions	Land conversion to crops area is negatively related to rice yields especially in dry land paddy (rain-fed paddy/ without irrigation system). Training communities in conservation farming techniques that allow them to improve the productivities on small areas of land then reducing their needs to clear new areas of forest to expand fields. Installing organic farming also introduce the system with low cost input that is enable them to secure sustainable manner.
REDD+ activities	Introducing alternative livelihood – eco tourism-
How it will achieve net GHG emission reductions	The local economy will not be diversified away from agriculture and forest exploitation on a broad enough scale to decrease the loss of forest by providing alternative livelihood. Introducing oil palm plantation gave labor opportunities to community. However, this provided a direct opportunity for a part of community. The involvement of community in eco tourism activities is designed aim to provide local communities as alternative income, to help them to perceive and receive benefits from their forest environment and organizing community group.

REDD+ activities	Introducing community forest monitoring system for illegal logging
How it will achieve net GHG emission reductions	Forest monitoring system for illegal logging by involving the community is introduced. To emphasize the forest area protection with a variety of incentives; such as providing health care services are introduced.

REDD+ activities	Awareness rising for natural resource management
How it will achieve net GHG emission reductions	The REDD+ program has carried out an environmental education for community. It has enhanced the effectiveness of above mentioned activities since the community understanding for biodiversity and natural resource conservation has been improving.

b. REDD+ activities: Approach to across the board of project area

REDD+ activities	Building forest management structure in communities through collaborative management
How it will achieve net GHG emission reductions	The REDD+ program is focusing on enforcing community abilities for management of forests and natural resources management by their own through the activities of collaborative management and/or community forestry (Hutan Desa). The land zoning and making rules for natural resource utilization lead the better management of forest area. To take this process also secures the community rights to access to these natural resources.

REDD+ activities	Enforcing forest governance through forum activities and facilitation process
How it will achieve net GHG emission reductions	The relationship had not been well developed between communities and local government. Also, the community might not be recognized the boundary between community area and conservation forest area. Thus forest encroachment and land conversion has gradually occurred in and around the project area. To strengthen the forest management governance at the landscape level, the collaborative management system has been constructed among relevant stakeholders through the activity by the forum

3.4. Program Boundary

In line with 2006 IPCC Guidelines for National Greenhouse Gas Inventories “Volume 4 Agriculture, Forestry and Other Land Use”, carbon pools, which are target of GHG emissions and removals, are defined as following Table 8.

Table 8 Selected Carbon Pools

Carbon pools	Included/excluded	Justification/Explanation of choice
Aboveground	Included	The baseline land use in the project area is conversion of forests to other land use, and degradation of natural and secondary forests by pioneer shifting cultivation. Therefore the carbon stock in this pool is likely to be relatively large compared to the REDD+ program scenario.
Belowground	Included	Recommended by the methodology as it usually represents between 15% and 30% of the above-ground biomass.
Dead wood	Excluded	Conservatively excluded (the carbon stock in this pool is not expected to be higher than the baseline compared to the REDD+ program scenario).
Harvest wood products	Excluded	Under the baseline scenario, illegal or selective logging occurs at very small scale. Such results were supported by results of preliminary survey. Therefore, harvested wood products have been considered insignificant.
Litter	Excluded	Not to be measured
Soil organic carbon	Included	To be measured

Also GHG types which are target of GHG emissions and removals are defined as following Table 9.

Table 9 Identified source of GHG types

	Gas	Included?	Justification/Explanation
Biomass burning	CO ₂	Excluded	Counted as carbon stock change
	CH ₄	Excluded	Considered insignificant
	N ₂ O	Excluded	Considered insignificant
Livestock emissions	CO ₂	Excluded	Not counted as carbon stock change
	CH ₄	Excluded	Not a significant source.
	N ₂ O	Excluded	Not a significant source.
Paddy field	CO ₂	Excluded	Not counted as carbon stock change
	CH ₄	Excluded	Not a significant source.
	N ₂ O	Excluded	Not to be measured

3.5. Description of Jurisdictional Baseline Method

(1) Accounting Method

Accounting of GHG emission reductions are according to land-based system. In this REDD+ program, land clarification based on Indonesian National Forest Inventory was applied and estimation of GHG emission reductions are based on land-based analysis (satellite imagery analysis). Land-based system are consistent with national forest management system in Indonesia, therefore there are no information gap and some kind gaps of over or under estimation and accounting in this REDD+ program.

(2) Most Plausible Jurisdictional Baseline Scenario

The baseline scenario (i.e. reference scenario according to the JCM word) is continuous deforestation and forest degradation in the target site, such area into some types of secondary forest and non-forest area (e.g., plantations). The scenario has been identified through preliminary survey (see section of “(3) Baseline Scenario Selection Method” below).

(3) Baseline Scenario Selection Method

The identification and selection of alternative land use scenarios for baseline determination and additionality assessment were carried out in accordance with the VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, Version 3.

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

Sub-step 1a. Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity: The following alternative land use scenarios were identified for the REDD+ program (Table 10):

Table 10 Alternative land use scenarios in REDD+ target site

Alternative directions	Details
Alternative 1	Continuation of deforestation activities taking place prior to the activities in the target site
Alternative 2	Creation of large industrial/agricultural projects as alternative livelihood to shifting cultivation
Alternative 3	Management and protection of the area as Protection Forest by the Central Government or Provincial Government
Alternative 4	Project activities taking place without registration of this project

As discussed above, Government of the West Kalimantan Province lacks the funds to manage and protect the target site and has no corresponding plans. Therefore, Alternative 3 is considered implausible. The remaining three alternatives are considered below.

Sub-step 1b. Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations: Alternative 1 entails deforestation due to land conversion. Either activity is considered legal or acceptable by the Government. Presumably, the activities would have been allowed to continue in the region. This alternative remains plausible. Alternative 4 includes all REDD+ program activities not currently registered as VCS projects. As outlined in “1.10 Compliance with Laws, Statutes and

Other Regulatory Frameworks”, all activities comply with all applicable laws and regulations. Alternative 2 includes the granting of agricultural concessions or the development of large-scale agricultural initiatives in the area. Since the REDD+ program site is recognized as land managed by the Forum, it would be illegal to grant concessions in most parts of the REDD+ program site. For this reason, Alternative 2 is eliminated from further consideration. Then Alternatives 1 and 4 remain as plausible alternatives.

Sub-step 1c. Selection of the baseline scenario: The investment analysis in following additionality demonstrates that Alternative 4 is significantly less financially attractive than Alternative 1, prompting the conclusion that Alternative 1 is the most likely baseline scenario.

Sub-step 2a. Determine appropriate analysis method: In Option 1, a simple cost analysis, is the appropriate analysis method. This analysis focuses solely on revenues generated by the REDD+ program that can be used for REDD+ program activities.

Sub-step 2b. – Option I. Apply simple cost analysis: The annual management costs associated with the REDD+ program are roughly 1 million USD. Based on 2011 data, an estimated 30% of these costs are for introduction of alternative livelihood. Approximately 50% of the costs are for information gathering and data analysis (including GIS), program development, coordination, and monitoring. The remaining 20% is used for financial and office administration. With successful REDD+ program validation and verification, annual costs are expected to increase 10% to an estimated average of 1.1 million USD annually. The additional costs are necessary to expand land use and extension activities to a larger number of communities; to undertake carbon monitoring and verification of carbon credits; to expand REDD+ program communication with stakeholders; to undertake outreach and capacity building among other REDD+ proponents; and to account for inflation for costs such as salaries, transportation, and equipment. A financial statement highlighting projected expenses and revenues for the period 2016–2035 will be provided to the validator. Moving forward, revenues from the sale of carbon credits will be used directly to cover the costs of introduction of alternative livelihood, additional activities related to the REDD+ program, and the establishment of an endowment to ensure long-term financing for REDD+ program activities. This will allow all proponents to continue REDD+ program activities that ensure reduced emissions from deforestation. Any remaining revenues will be shared with the Government. The Government has reviewed and agreed to a specific revenue-sharing agreement. The REDD+ program has no other revenue sources. There is no established government funding for the management of the REDD+ or the protection of the intact forest. The REDD+ program site will not be used for any revenue-generating purpose. The organizations that have financed the REDD+ program to date will not provide additional funds once verified carbon credits have been generated. Since the proposed REDD+ program activity generates no financial benefits other than VCS-related income, the REDD+ program proceed to the common practice assessment below.

Step 4: Common Practice (Common Practice Assessment)

The REDD+ program has management contracts with the Government to oversee REDD+ program activities. REDD+ program activities are managed by the REDD+ program. However, the management

contracts differ markedly. The REDD+ program has a 20-year, full-management contract for all activities. In REDD+ program activities, the REDD+ program budget indicates 1 million USD was spent on the site. The financial plan includes mention of partnerships with the REDD+ program and other organizations to assist in financing the protection services. The REDD+ program, whose purpose is land and forest management and engagement of neighboring communities to ensure the long-term success of the conservation efforts, spends roughly 1 million USD annually. In sites managed by national and regional governments, extensive activities beyond land use planning or environmental education tend to be limited. The overall funding available for protected areas is clearly limited. Due to the proponent's unique management plan and significantly more extensive activities, this REDD+ program does not reflect common practice, a key distinction between it and other sites and conservation REDD+ programs. Thus, Alternative 1 is the most likely baseline scenario.

(4) Land Cover Maps

An analysis of land-use and land-cover change in the reference region was conducted in around 3 to 6 years intervals for the reference period (2000-2013) using medium resolution satellite imagery, and then it was validated using a combination of high-resolution satellite imageries. All data sources used in these analyses are listed in Table 11.

Table 11 Data sources of satellite imagery analysis

2000		2006		2009		2011		2013	
File name	Source	File name	Source	File name	Source	File name	Source	File name	Source
LE71200602001 134SGS00	USGS	LT51200602006 268BKT00	USGS	MOSAİK_2009_ NUTM49_N01	INCAS	MOSAİK_2011_ NUTM49_N01	INCAS	LC81200602013 175LGN00	USGS
LE71200612001 134SGS00	USGS	LT51200612006 268BKT00	USGS	MOSAİK_2009_ NUTM49_S01	INCAS	MOSAİK_2011_ NUTM49_S01	INCAS	LC81200612013 175LGN00	USGS
LE71200622001 134SGS00	USGS	LT51200622006 268BKT00	USGS	MOSAİK_2009_ NUTM49_S02	INCAS	MOSAİK_2011_ NUTM49_S02	INCAS	LC81200622013 175LGN00	USGS
LE71210602001 173SGS00	USGS	LT51210602005 224BKT00	USGS	MOSAİK_2009_ NUTM49_S05	INCAS	MOSAİK_2011_ NUTM49_S05	INCAS	LC81210602013 166LGN00	USGS
LE71210612001 173SGS00	USGS	LT51210612005 224BKT00	USGS					LC81210612013 166LGN00	USGS
LE71210622001 173SGS00	USGS	LT51210622005 224BKT00	USGS					LC81210622013 150LGN00	USGS

Following definition of classes of land-use was applied in this REDD+ program (Table 12).

Table 12 List of all land use and land cover classes existing at the REDD+ program start date within the reference region

Class identifier		Trend in carbon stock	Presence in ¹	Baseline activity ²			Description (including criteria for unambiguous boundary definition) according to Indonesian National Forest Inventory
ID	Name			LG	FW	CP	
1	Primary dryland forest	Constant	PA, RA, LK	N	N	N	Please see Table 4
2	Secondary dryland forest	Decreasing	PA, RA, LK	N	Y	N	Same as above
3	Primary swamp forest	Constant	PA, RA, LK	N	Y	N	Same as above
4	Secondary swamp forest	Decreasing	PA, RA, LK	N	Y	N	Same as above
5	Primary mangrove forest	Constant	PA, RA, LK	N	Y	N	Same as above
6	Secondary mangrove forest	Decreasing	PA, RA, LK	N	Y	N	Same as above
7	Plantation forest	Increasing	PA, RA, LK	Y	Y	N	Same as above

1: PA = Project area, RR = Reference region, LK = Leakage belt

2: LG = Logging, FW = Fuel-wood collection; CP = Charcoal Production (Y/N)

The REDD+ program defined 23 land-cover classes, and many possible combinations of land-cover change categories.

The best practice in the remote sensing field emphasizes the use of medium resolution imagery as a very cost-effective method for classifying and monitoring forest cover and loss, and the type of spectral analysis using such imagery is sufficient to accurately distinguish closed-canopy forest from many vegetation formations. LANDSAT imagery, one such type of medium resolution imagery, was used in this REDD+ program to map the forest cover and loss. Following pictures shows areas of typical fallow in the REDD+ program site.



Landscape in Kayong Utara District facing GPNP

Land-cover change data for the reference region were mapped by JICA IJ-REDD+, via time-series analysis using satellite imagery of optical sensor data: LANDSAT-Thematic Mapper (TM) LANDSAT-Enhanced Thematic Mapper Plus (ETM+), for the reference period of 2000 to 2013. As a result, 23 classes were mapped, including forest cover and loss, non-forest, cloud, and water. In order to assure a high quality analysis, IJ-REDD+ special pre-processing, IJ-REDD+ interpretation and classification, and IJ-REDD+ post-processing steps was applied, and land-cover maps were developed (Figure 11 to Figure 15).

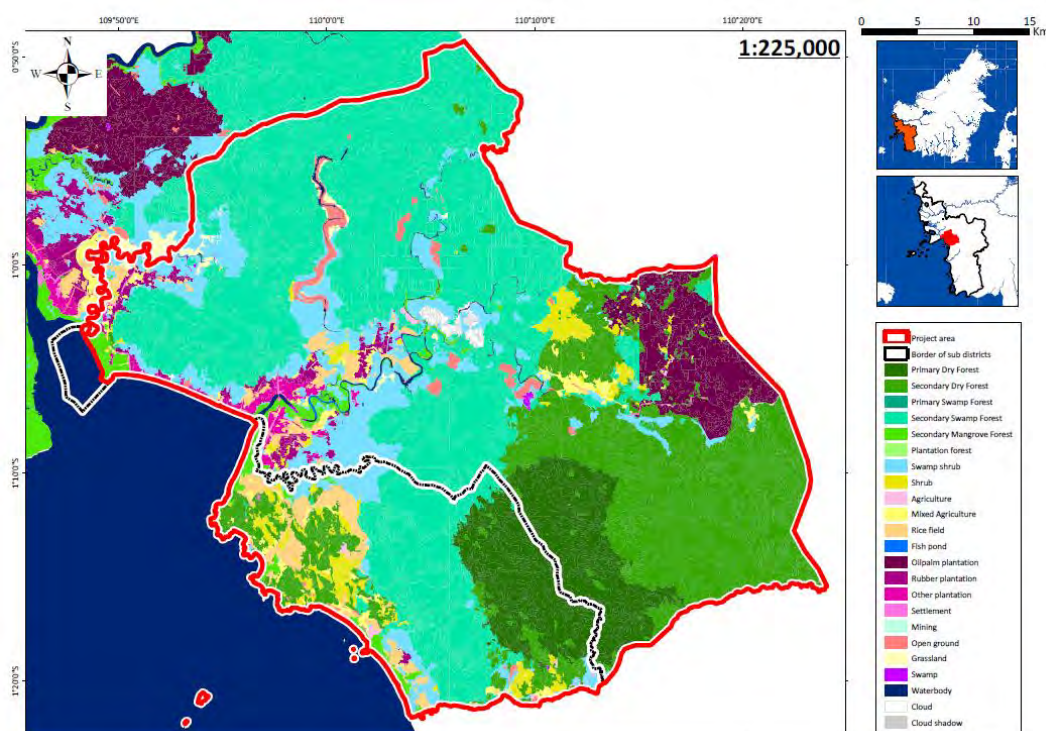


Figure 11 Land cover in reference period from 2000

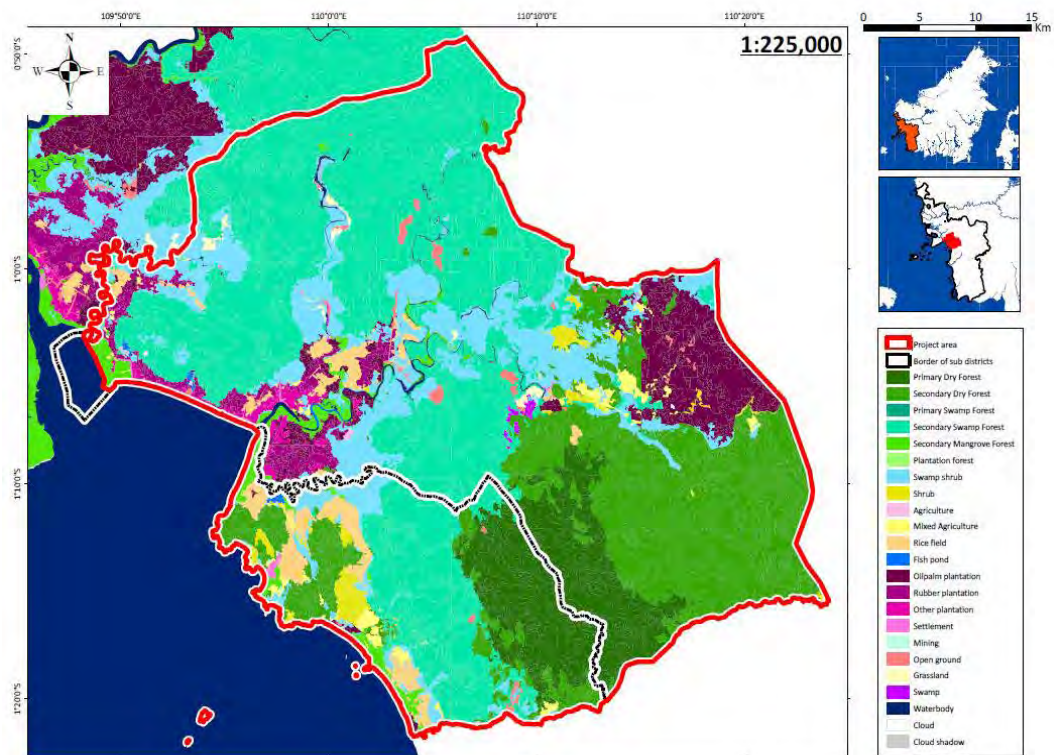


Figure 12 Land cover in reference period from 2006

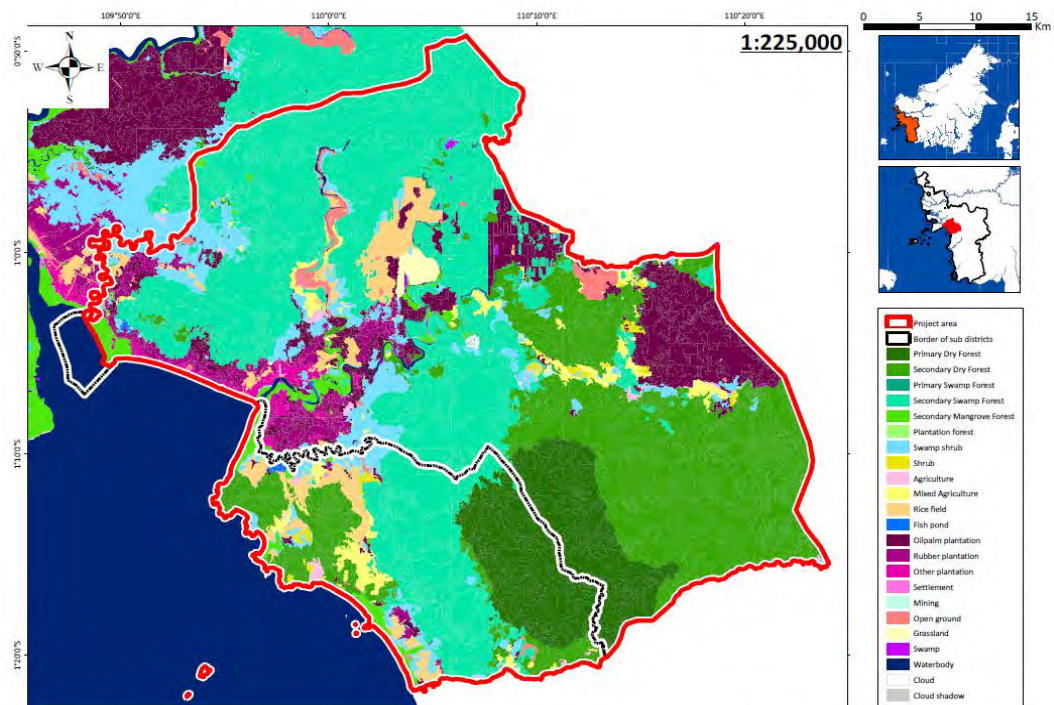


Figure 13 Land cover in reference period from 2009

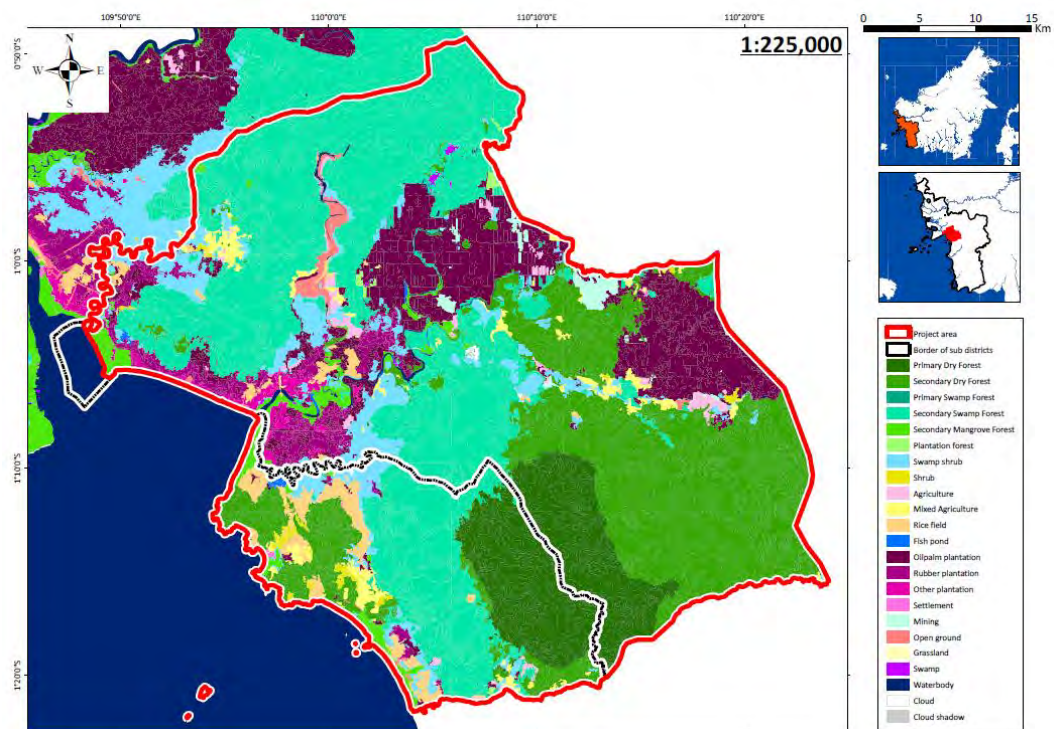


Figure 14 Land cover in reference period from 2011

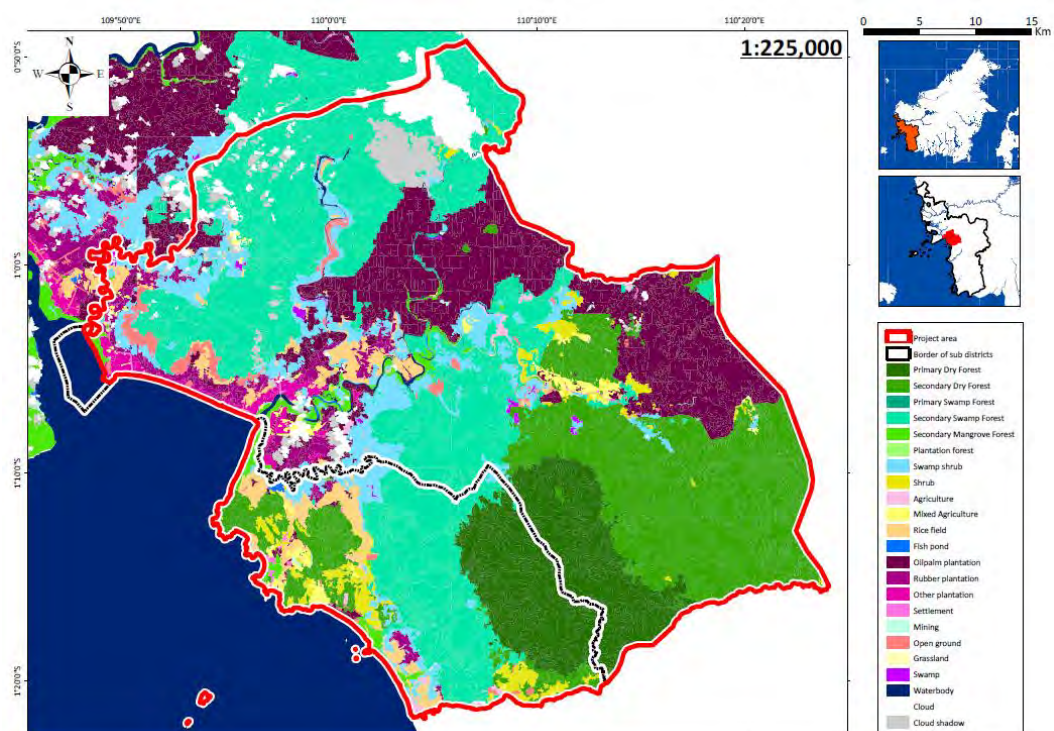


Figure 15 Land cover in reference period from 2013

From analysis by using land cover map in Figure 11 to Figure 15, land dynamics in each category of reference region, project area and leakage belt are shown in Figure 16 to Figure 18 .

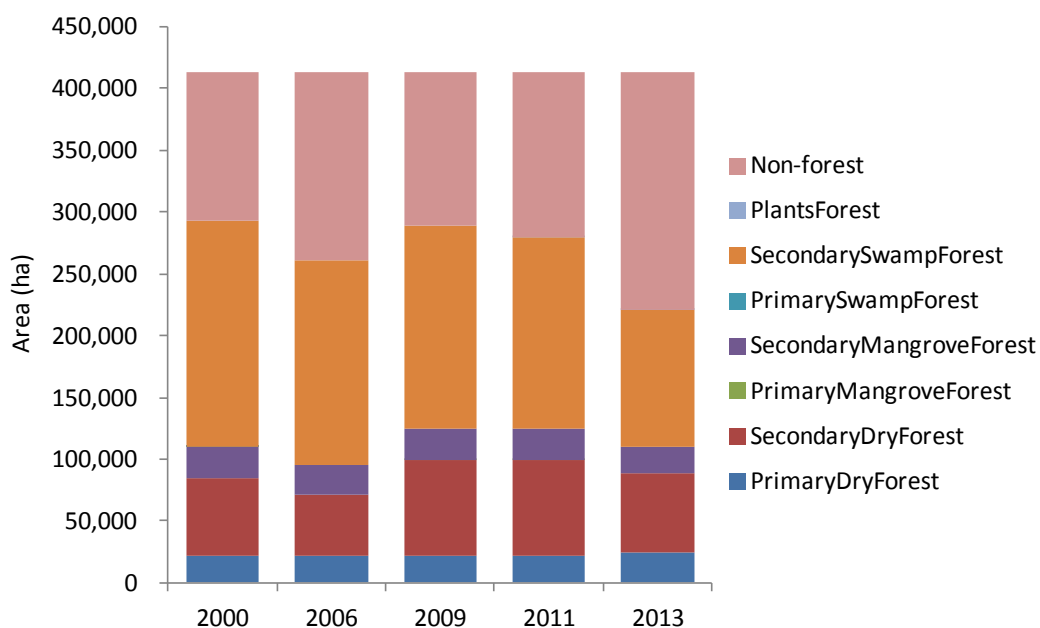


Figure 16 Dynamics of each type of forest area in reference region

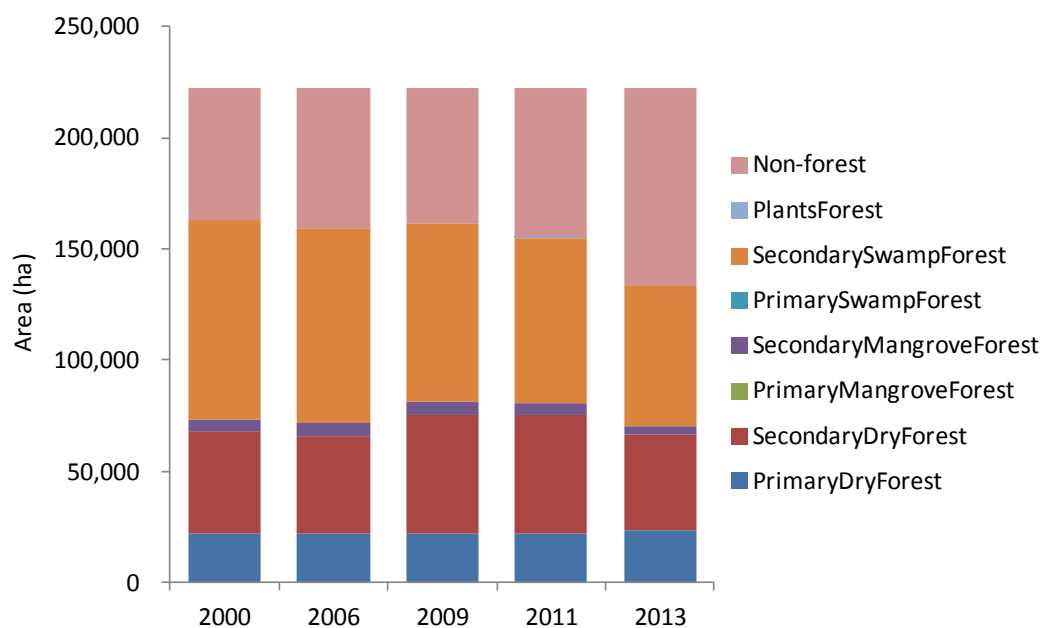


Figure 17 Dynamics of each type of forest area in project area

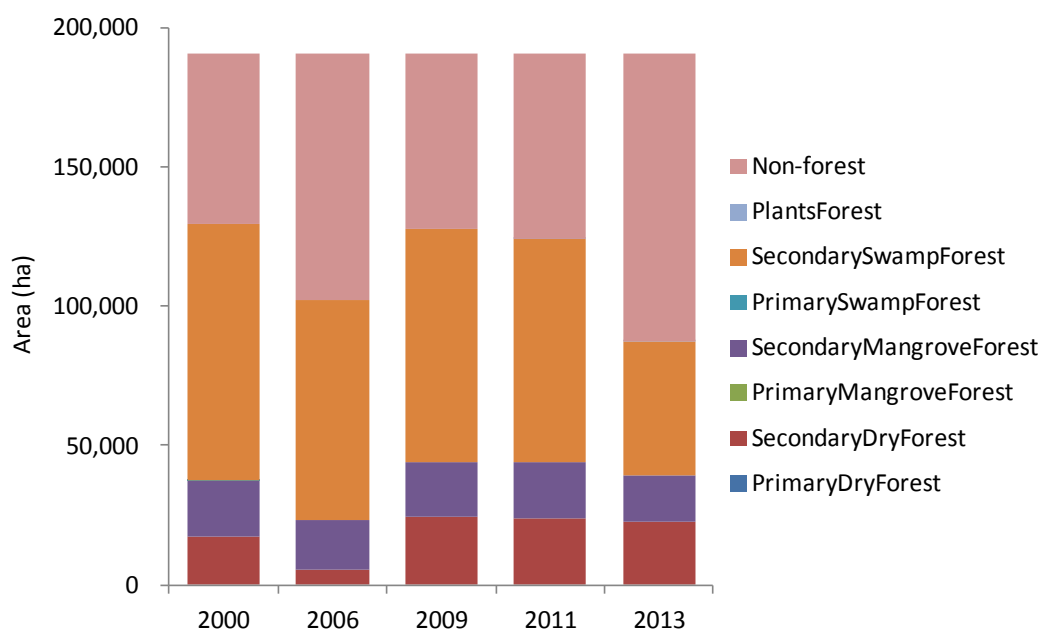


Figure 18 Dynamics of each type of forest area in leakage belt

The 2013 land cover classification developed by the methodology of this REDD+ program was validated by ground truth data of 1,143 points within West Kalimantan Province, which was acquired by IJ-REDD+. All plots were located within forested areas in project area, reference region and some plots are located in outside of reference region (but from same forest type and vegetation) (Figure 19).

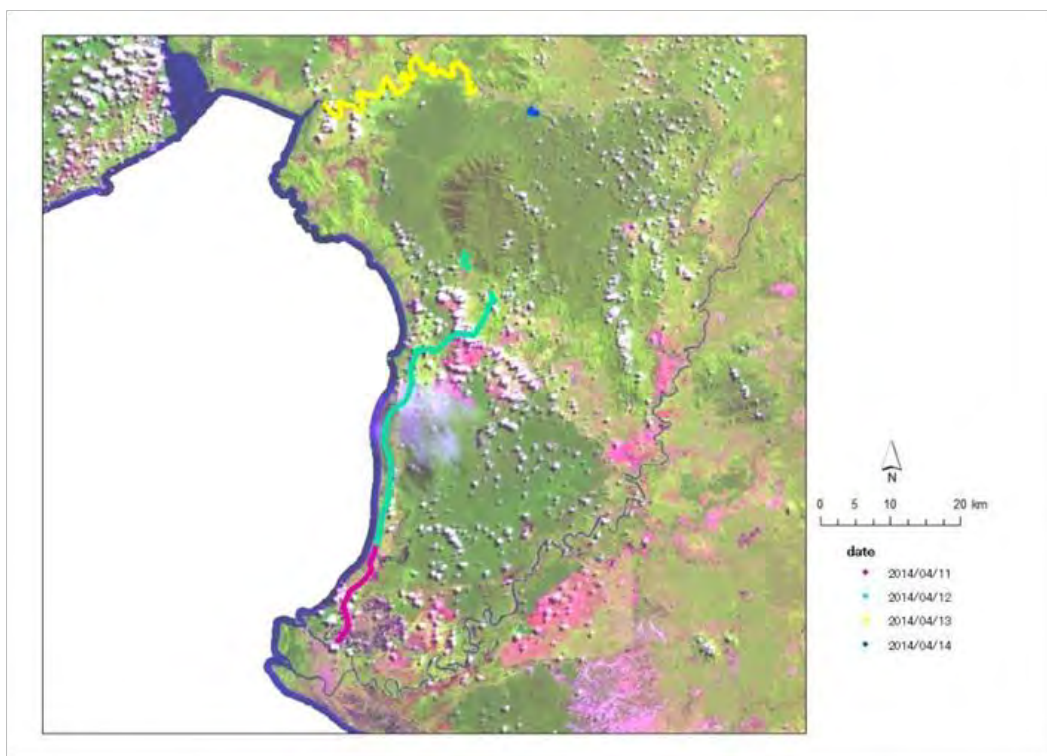


Figure 19 Location of ground truth survey in Kayong Utara District

The resulting confusion matrix for forest and non-forest is presented in Table 13 and Table 14. The overall accuracy was 82.1%.

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Table 13 Result of accuracy assessment for forest and non-forest (2010 land cover classification by this REDD+ program's methodology)

V4_13		Verf																							Matched data	Class accuracy	
		2001_PrimaryDryForest	2002_SecondaryDryForest	2004_PrimaryMangroveForest	20041_SecondaryMangroveForest	2005_PrimarySwampForest	20051_SecondarySwampForest	2006_PlantsForest	2007_Shrub	20071_SwampShrub	20091_Agriculture	20092_MixedAgriculture	20093_RiceField	20094_FishPond	2010_Plantation_oilpalm	2010_Plantation_others	2010_Plantation_rubber	2012_Settlement	2014_OpenGround	20141_Mining	3000_GrassLand	5001_WaterBody	50011_Swamp	SubTotal			
Classification	2001_PrimaryDryForest	40																						40	40	100.0	
	2002_SecondaryDryForest		86						2			4												92	86	93.5	
	2004_PrimaryMangroveForest																										
	20041_SecondaryMangroveForest				73		2			3												3		81	73	90.1	
	2005_PrimarySwampForest					29	1																	30	29	96.7	
	20051_SecondarySwampForest		1		2	1	84			8						1			1					98	84	85.7	
	2006_PlantsForest						1	36											2					39	36	92.3	
	2007_Shrub		4						48	13	1	6				1			2						75	48	64.0
	20071_SwampShrub			1	1		3		6	81	1	2	1		1	3	1		1						102	81	79.4
	20091_Agriculture									1	6	38				3	1	1							50	38	76.0
	20092_MixedAgriculture			5					10	2		45	2				3	1	3		1				72	45	62.5
	20093_RiceField								1	8	4		63			5			5						86	63	73.3
	20094_FishPond									1			2	36								2	1	42	36	85.7	
	2010_Plantation_oilpalm						2		1	4	2				71	1		1	5						87	71	81.6
	2010_Plantation_others								1	2	2	1	3			66	2	1							78	66	84.6
	2010_Plantation_rubber										6	2		3			66						1	78	66	84.6	
	2012_Settlement										2	2						53	12					2	71	53	74.6
	2014_OpenGround								1	5		1	2		3	1			75						88	75	85.2
	20141_Mining										1		2				1		9	31			2		47	31	66.0
	3000_GrassLand																					9			9	9	100.0
5001_WaterBody							1															78	1	80	78	97.5	
50011_Swamp							4			5								4						35	48	35	72.9
SubTotal	40	96	1	76	30	98	36	71	147	52	60	78	36	76	81	73	57	119	31	10	85	40	1393	1143	82.1		

Table 14 Result of accuracy assessment for forest types (2010 land cover classification by this REDD+ program's methodology)

EF Group	Class	Accuracy (%)
A		86.3
EF 30	2007_Shrub	64.0
	20071_SwampShrub	79.4
	20092_MixedAgriculture	62.5
B		86.4
EF 2-10		
B1		77.2
	20091_Agriculture	76.0
	20093_RiceField	73.3
B2		88.1
	2012_Settlement	74.6
	2014_OpenGround	85.2
C		85.7
EF 0	20094_FishPond	85.7
	20141_Mining	66.0
	5001_WaterBody	97.5
	50011_Swamp	72.9

To estimate carbon stock change in above-ground and below-ground biomass, we used analyzed land cover maps and emission factors. On the other hand, as specific situation in West Kalimantan Province, GHG emissions from peat soil were also important when we estimate landscape level's GHG emission with high accuracy. Then, in this PD, peat soil distribution was improved by field survey (see pictures below), which was based on internationally used peat soil distribution map prepared by the Wetland International⁶.



Survey of peat soil distribution

⁶ Wetlands International 2004. Maps of peatland distribution and carbon content in Kalimantan, 2000-2002. 51.

For improving peat soil distribution in 4 districts facing on ocean in West Kalimantan Province, 324 points are surveyed and soil type and peat depth are monitored and recorded (Figure 20). From such survey, peat soil distribution applied in this PD was improved (Figure 21).

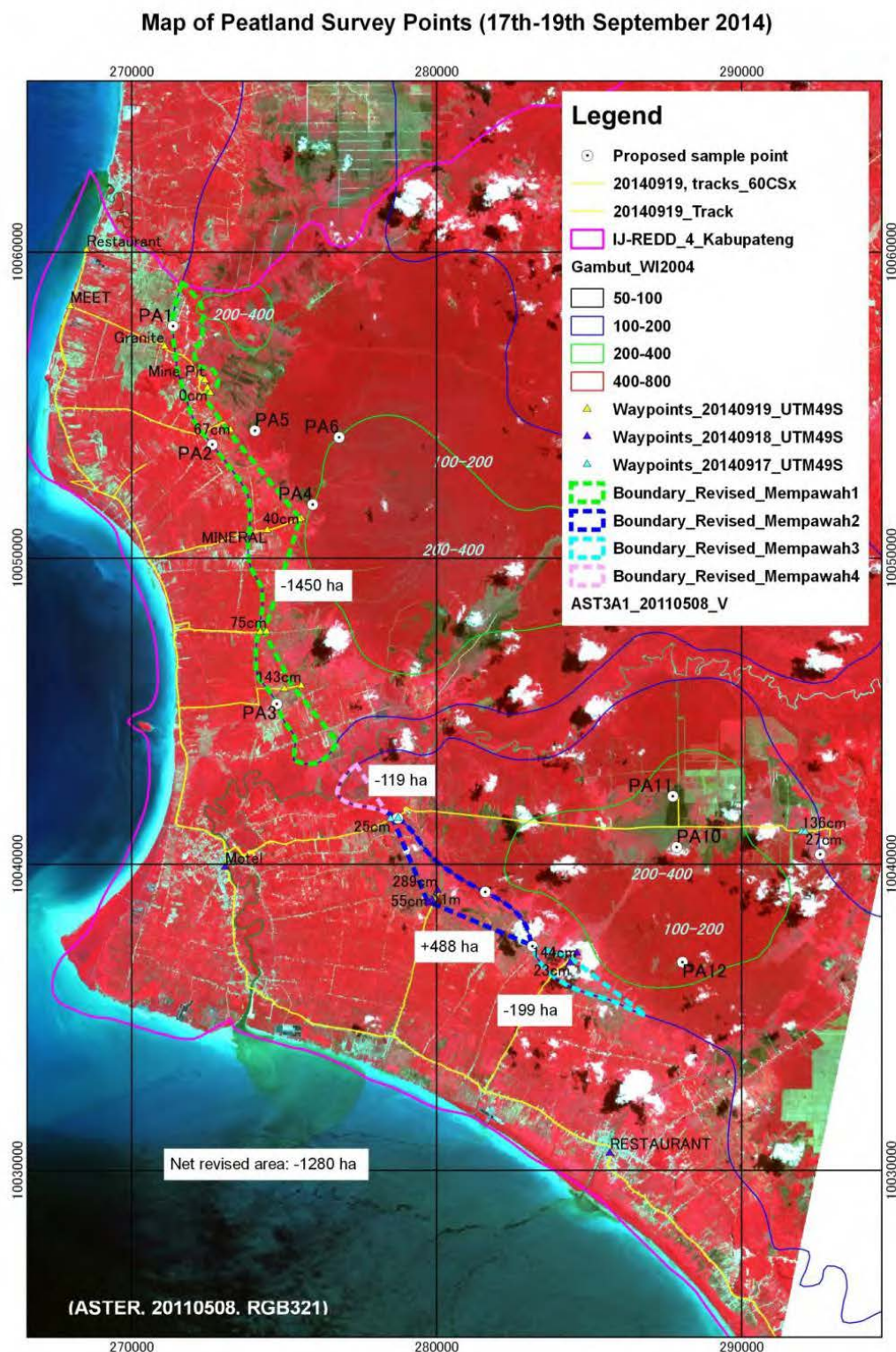
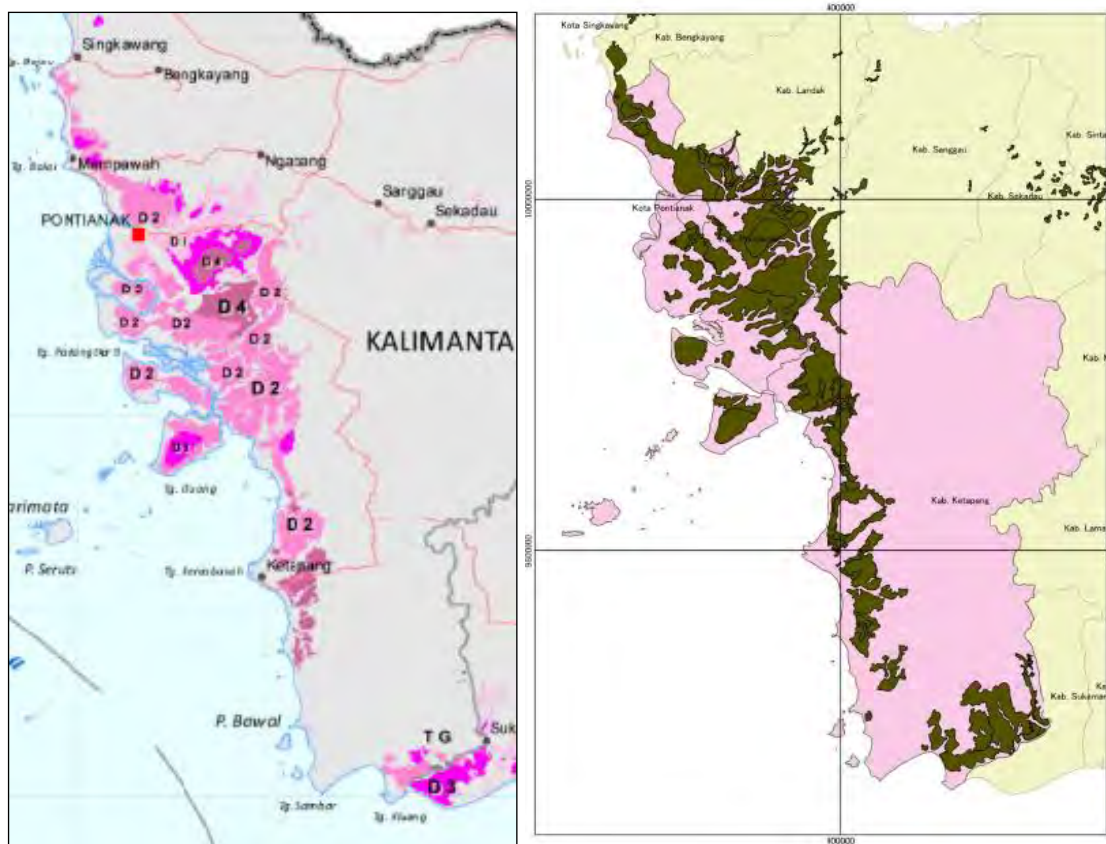


Figure 20 Survey points of peat soil distribution



Left: map prepared by Ritung et al (2011) Right: map prepared by Wetlands International (2004)
Figure 21 Image of peat soil distribution compared with the map prepared by the Wetland International

As results of improvement of peat soil distribution, total area of peat soil are estimated as mentioned in Table 15.

Table 15 Improved peat soil area in 4 districts

	Wetland International 2004	Ritung 2011	IJ-REDD+
Kayong Utara	163,303	214,054	193,930
Ketapang	337,552	255,873	259,283
Kubu Raya	410,241	519,885	503,990
Pontianak	70,889	74,755	74,441
Kab Pontianak	398	2,280	2,801
Total	982,383	1,066,847	1,034,445

(5) Excluded Forest Loss in Historical Reference Period

Identify any instances of forest loss (e.g., large infrastructure projects, geological or weather-related impacts) in the historical reference period that are excluded from the calculation and projection of the

rate of deforestation and associated GHG emissions in the baseline, including clearly identifying the associated geographic area and month and year of occurrence. Demonstrate and justify that forest loss exceeds 1,000 hectares and is not likely to reoccur during the baseline period.

(6) Large Unavoidable Infrastructure Projects

Considering current situation to manage forest resources by landscape approach in project area, there is no plan to allow large-scale infrastructure projects and/or unplanned such disturbances in Kayong Utara District as reference region of this REDD+ program.

(7) Large-Scale Commercial Deforestation

There had been conducted some types of land conversion (e.g. converted from rich forest to oilpalm plantation) in Kayong Utara District where is reference region in this REDD+ program. But all of such land conversions have not exceeded 10% of historical deforestation in each. Considering current situation to manage forest resources by landscape approach in project area, there is no plan to allow new commercial logging and or land conversion in project area and its surrounding area in the future.

(8) Carbon Loss

Indicate the method(s) used to reliably establish the pattern of carbon loss over time. The method(s) should be scientifically sound, based on empirical evidence and not likely to overestimate early carbon losses.

4. Quantification of GHG Emission Reductions and/or Removals

4.1. Baseline Emissions

To estimate carbon stock in each forest type, i.e. GHG emissions, it is required to apply stratification methods according to forest and land types in target site. Therefore this REDD+ program applied following stratifying the reference region according to the results from the analysis of agents and drivers of deforestation (Table 16).

Table 16 Stratification of the reference region

Stratum ID		Description	Area at year (ha)			
ID	Name		2000	2006	2009	2011
1	Primary dryland forest	See Table 4	21,6 16	21,6 12	22,2 43	22,2 43
2	Secondary dryland forest		63,0 51	49,8 76	77,2 34	76,8 22
3	Primary swamp forest		0	0	239	224
4	Secondary swamp forest		25,6 08	23,2 44	25,4 31	25,2 06
5	Primary mangrove forest		101	0	0	0
6	Secondary mangrove forest		182, 610	166, 454	163, 762	154, 783
7	Plantation forest		0	0	0	528
8	Non-forest	Land use except for forests (See Table 4)	120, 222	152, 022	124, 298	133, 402

(1) Quantitative projection of future deforestation

To project the annual areas of baseline deforestation in the reference region, the target area of REDD+ is continuously being impacted by land conversion within and around its boundaries that rely heavily on forest conversion to cropland to sustain their income generation activities. Such activities are identified by following methods a to d;

a. Image selection

LANDSAT Thematic Mapper (TM) images of different dates were compiled from the United States Geographical Survey (USGS). The dates of historic imagery were then plotted over a timeline to demonstrate that on average they were distributed over the entire historical reference period, thus avoiding any bias in the image weights used to estimate the observation weights.

b. Observation points

The total number of observation points in the reference region was estimated based on the variance of small sample data. Initially 1,143 points were distributed over the reference region and classified according to the land cover observed in the satellite imagery above listed (Figure 19).

c. Land-cover classification

The estimation of baseline activity data was analyzed using method in above – where historical land cover changes are assumed to be representative of future trends in all-over reference region. Therefore reference region is based on only one zone.

The land-cover map for the historical period was generated by interpreting LANDSAT imageries. These imageries have a spatial resolution of approximately 30 m, thus each type of forest and non-forest areas can be identified accurately.

The state of forest of each point was then visually classified based on each LANDSAT covering the historical period. One of the following classes was assigned to each point; Forest, Non-Forest, Cloud/Shadow, Build-up, or no images. Consistency of the accuracy must be taking into account when carrying out forest classification using several points in time of satellite imagery. If the error of the classification at each point in time exceeds the amount of the change, the trend of the change would not be able to be delivered. Therefore, classification methodology, such as updating only changed land, is desirable while respecting the result of one time before the target time. So as to detect the monitoring target, new slash-and-burn area is required to be extracted primarily as the amount of the change between two points in time. From this aspect, the REDD+ program decided to extract only changed land from forest to non-forest through comparing two points in time while using the classification result of one time before at the land of not changed. Different method is used for the land changed from non-forest to forest, such as plantation, since remote sensing is difficult to extract them. From the above points of view, flow of the classification methodology is shown as below Figure 22.

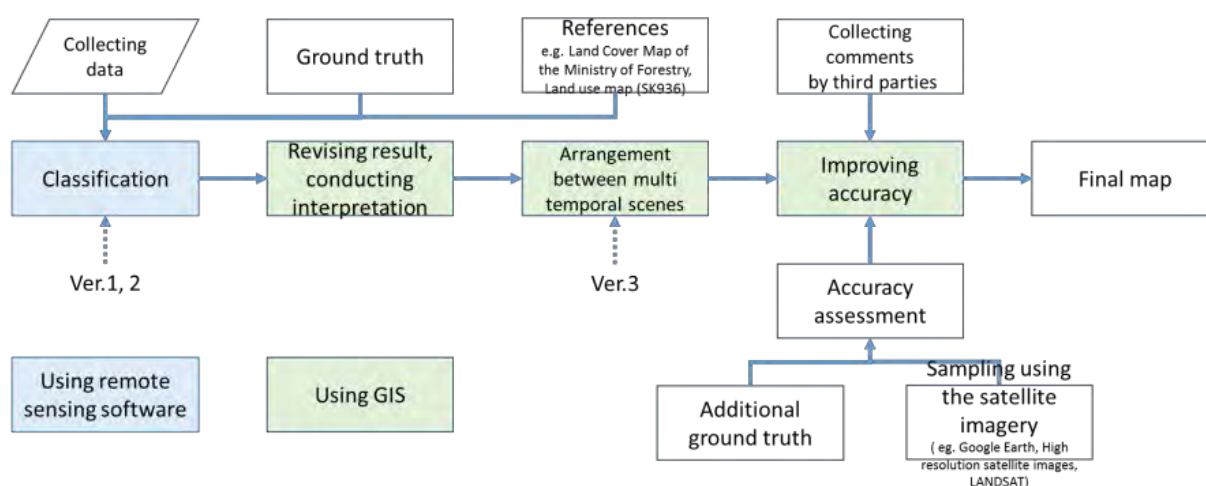


Figure 22 Classification Methodologies

d. Considering national/regional circumstances

As explained in above “3.5. Description of Jurisdictional Baseline Method”, it is appropriate to use a time function approach to estimate the rate of baseline deforestation and forest degradation in the area. However, to keep consistency with Indonesian national forest reference emission level (FREL) development methodology, we have not considered national and/or regional circumstances on process of establishing reference levels. In this PD, projected yearly deforestation are based on mean deforestation area during 2000 to 2013.

(2) Quantitative projection of future deforestation

The portion of the annual areas of baseline deforestation and forest degradation for each forest class within the reference region was determined using satellite imagery analysis. The map of forest classes was overlaid with the projected yearly deforestation maps applied mean deforestation area during 2000 to 2013. The results of preparing annual areas of baseline deforestation and forest degradation in reference region are presented in Table 17 and its land cover change matrix are in Table 18 to Table 21.

Table 17 Annual areas of baseline deforestation in reference region

Project year t	Stratum in the reference region (ha)							Total	
	PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Annual	Cumulativ
	$ABLRR_{i,t}$	$ABSLRR_{i,t}$	$ABSLRR_{i,t}$	$ABSLRR_{i,t}$	$ABSLRR_{i,t}$	$ABSLRR_{i,t}$	$ABSLRR_{i,t}$	$ABSLRR_{i,t}$	e
	ha	ha	ha	ha	ha	ha	ha	ha	$ABSLRR_{i,t}$ ha
2015	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	5,553.3
2016	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	11,106.6
2017	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	16,659.9
2018	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	22,213.2
2019	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	27,766.5
2020	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	33,319.8
2021	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	38,873.1
2022	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	44,426.4
2023	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	49,979.6
2024	-162.3	-162.7	0.0	391.2	7.8	5,479.6	-0.3	5,553.3	55,532.9

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 18 Area changes from 2000 to 2006 in reference region from IPCC Approach 2

		Area of each Stratum in 2006 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2000 (ha)	PDF ¹	18,917	2,455	0	0	0	226	0	18
	SDF ²	2,449	43,549	0	13	0	607	0	16,433
	PMF ³	0	0	0	0	0	0	0	0
	SMF ⁴	0	81	0	21,114	0	266	0	4,147
	PSF ⁵	0	0	0	0	0	21	0	80
	SSF ⁶	32	1,416	0	443	0	160,873	0	19,846
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	214	2,375	0	1,674	0	4,461	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 19 Area changes from 2006 to 2009 in reference region from IPCC Approach 2

		Area of each Stratum in 2009 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2006 (ha)	PDF ¹	20,123	1,489	0	0	0	0	0	0
	SDF ²	1,919	44,283	6	94	0	1,085	0	2,488
	PMF ³	0	0	0	0	0	0	0	0
	SMF ⁴	0	128	48	20,658	0	247	0	2,163
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	180	1,267	82	302	-	147,695	0	16,928
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	21	30,066	103	4,378	0	14,735	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 20 Area changes from 2009 to 2011 in reference region from IPCC Approach 2

		Area of each Stratum in 2011 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2009 (ha)	PDF ¹	22,243	0	0	0	0	0	0	0
	SDF ²	0	76,686	0	26	0	47	0	475
	PMF ³	0	0	224	0	0	0	0	15
	SMF ⁴	0	0	0	24,819	0	2	0	611
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	0	88	0	7	0	154,084	468	9,115
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	0	48	0	354	0	650	60	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest. 4: SecondaryMangroveForest, 5: PrimarySwampForest. 6: SecondarySwampForest and 7: PlantsForest

Table 21 Area changes from 2011 to 2013 in reference region from IPCC Approach 2

		Area of each Stratum in 2013 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2011 (ha)	PDF ¹	22,035	162	0	0	0	11	0	35
	SDF ²	1,691	64,646	0	207	0	2,597	0	7,681
	PMF ³	0	0	0	9	0	89	0	126
	SMF ⁴	0	0	0	17,904	0	179	0	7,123
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	0	40	0	803	0	108,152	0	45,788
	PF ⁷	0	0	0	0	0	12	4	512
	Non-forest	0	318	0	1,599	0	335	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest. 4: SecondaryMangroveForest, 5: PrimarySwampForest. 6: SecondarySwampForest and 7: PlantsForest

4.2. Projection of the annual areas of baseline deforestation in the project area and leakage belt

The portion of the annual areas of baseline deforestation and forest degradation for each forest class within the project area and leakage belt was also determined using satellite imagery analysis. The results of preparing annual areas of baseline deforestation and forest degradation are presented in Table 22 and Table 23. Also land cover change matrixes in project area were in Table 24 to Table 27 and leakage belt were in Table 28 to Table 31. Noted that methodology for developing baseline or forest reference emission level (FREL in UNFCCC) is

consist of Indonesian national FREL which was submitted to UNFCCC⁷.

Table 22 Annual areas of baseline deforestation in the project area

Project year <i>t</i>	Stratum in the reference region (ha)							Total	
	PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Annual	Cumulative
	<i>ABLP_{A,t}</i>	<i>ABSLP_{A,t}</i>	<i>ABSLP_{A,t}</i>	<i>ABSLP_{A,t}</i>	<i>ABSLP_{A,t}</i>	<i>ABSLP_{A,t}</i>	<i>ABSLP_{A,t}</i>	<i>ABSLP_{A,t}</i>	<i>ABSLP_{A,t}</i>
	ha	ha	ha	ha	ha	ha	ha	ha	ha
2015	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	2,275.2
2016	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	4,550.4
2017	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	6,825.7
2018	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	9,100.9
2019	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	11,376.1
2020	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	13,651.3
2021	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	15,926.5
2022	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	18,201.8
2023	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	20,477.0
2024	-162.3	264.9	0.0	90.9	0.0	2,081.7	0.0	2,275.2	22,752.2

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest.
6: SecondarySwampForest and 7: PlantsForest

⁷ BP-REDD+ 2015. National Forest Reference Emission Level for Deforestation and Forest Degradation in the Context of the Activities Referred to in Decision 1/CP.16, Paragraph 70 (REDD+) Under the UNFCCC: A Reference for Decision Makers, Published by BP-REDD+ Indonesia

Table 23 Annual areas of baseline deforestation in the leakage belt

Project year <i>t</i>	Stratum in the reference region (ha)							Total	
	PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Annual	Cumulative
	<i>ABLLB_{i,t}</i> ha	<i>ABSLB_{i,t}</i> ha	<i>ABSLB_{i,t}</i> ha	<i>ABSLB_{i,t}</i> ha	<i>ABSLB_{i,t}</i> ha	<i>ABSLB_{i,t}</i> ha	<i>ABSLB_{i,t}</i> ha	<i>ABSLB_{i,t}</i> ha	<i>ABSLB_{i,t}</i> ha
2015	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	3,278.1
2016	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	6,556.1
2017	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	9,834.2
2018	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	13,112.3
2019	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	16,390.4
2020	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	19,668.4
2021	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	22,946.5
2022	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	26,224.6
2023	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	29,502.7
2024	0.0	-427.6	0.0	300.3	7.8	3,397.9	-0.3	3,278.1	32,780.7

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 24 Area changes from 2000 to 2006 in project area from IPCC Approach 2

		Area of each Stratum in 2006 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2000 (ha)	PDF ¹	18,917	2,455	0	0	0	226	0	18
	SDF ²	1,787	31,775	0	10	0	443	0	11,990
	PMF ³	0	0	0	0	0	0	0	0
	SMF ⁴	0	16	0	4,266	0	54	0	838
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	16	701	0	219	0	79,638	0	9,825
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	1,450	16,098	0	11,345	0	30,238	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 25 Area changes from 2006 to 2009 in project area from IPCC Approach 2

		Area of each Stratum in 2009 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2006 (ha)	PDF ¹	20,123	1,489	0	0	0	0	0	0
	SDF ²	1,708	39,423	6	84	0	966	0	2,215
	PMF ³	0	0	0	0	0	0	0	0
	SMF ⁴	0	31	12	4,959	0	59	0	519
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	95	667	43	159	0	77,696	0	8,905
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	27	38,520	131	5,610	0	18,879	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest.
6: SecondarySwampForest and 7: PlantsForest

Table 26 Area changes from 2009 to 2011 in project area from IPCC Approach 2

		Area of each Stratum in 2011 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2009 (ha)	PDF ¹	22,243	0	0	0	0	0	0	0
	SDF ²	0	52,745	0	18	0	32	0	327
	PMF ³	0	0	224	0	0	0	0	15
	SMF ⁴	0	0	0	5,378	0	0	0	132
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	0	43	0	4	0	75,414	229	4,461
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	0	2,654	0	19,428	0	35,697	3,279	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest.
6: SecondarySwampForest and 7: PlantsForest

Table 27 Area changes from 2011 to 2013 in project area from IPCC Approach 2

		Area of each Stratum in 2013 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2011 (ha)	PDF ¹	22,035	162	0	0	0	11	0	35
	SDF ²	1,162	44,430	0	142	0	1,785	0	5,279
	PMF ³	0	0	0	9	0	89	0	126
	SMF ⁴	0	0	0	3,893	0	39	0	1,549
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	0	19	0	385	0	51,867	0	21,959
	PF ⁷	0	0	0	0	0	9	3	390
	Non-forest	0	9,441	0	47,545	0	9,959	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest.
6: SecondarySwampForest and 7: PlantsForest

Table 28 Area changes from 2000 to 2006 in reference region from IPCC Approach 2

		Area of each Stratum in 2006 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2000 (ha)	PDF ¹	0	0	0	0	0	0	0	0
	SDF ²	662	11,774	0	4	0	164	0	4,443
	PMF ³	0	0	0	0	0	0	0	0
	SMF ⁴	0	64	0	16,848	0	212	0	3,309
	PSF ⁵	0	0	0	0	0	21	0	80
	SSF ⁶	16	715	0	223	0	81,235	0	10,022
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	1,498	16,632	0	11,721	0	31,240	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest.
6: SecondarySwampForest and 7: PlantsForest

Table 29 Area changes from 2006 to 2009 in reference region from IPCC Approach 2

		Area of each Stratum in 2009 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2006 (ha)	PDF ¹	0	0	0	0	0	0	0	0
	SDF ²	211	4,860	1	10	0	119	0	273
	PMF ³	0	0	0	0	0	0	0	0
	SMF ⁴	0	97	37	15,698	0	188	0	1,644
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	85	601	39	143	0	69,999	0	8,023
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	38	54,186	185	7,891	0	26,556	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest.
6: SecondarySwampForest and 7: PlantsForest

Table 30 Area changes from 2009 to 2011 in reference region from IPCC Approach 2

		Area of each Stratum in 2011 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2009 (ha)	PDF ¹	0	0	0	0	0	0	0	0
	SDF ²	0	23,941	0	8	0	15	0	148
	PMF ³	0	0	0	0	0	0	0	0
	SMF ⁴	0	0	0	19,441	0	2	0	478
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	0	45	0	4	0	78,669	239	4,654
	PF ⁷	0	0	0	0	0	0	0	0
	Non-forest	0	2,749	0	20,122	0	36,972	3,397	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest.
6: SecondarySwampForest and 7: PlantsForest

Table 31 Area changes from 2011 to 2013 in reference region from IPCC Approach 2

		Area of each Stratum in 2013 (ha)							
		PDF ¹	SDF ²	PMF ³	SMF ⁴	PSF ⁵	SSF ⁶	PF ⁷	Non-forest
Area of each Stratum in 2011 (ha)	PDF ¹	0	0	0	0	0	0	0	0
	SDF ²	529	20,216	0	65	0	812	0	2,402
	PMF ³	0	0	0	0	0	0	0	0
	SMF ⁴	0	0	0	14,011	0	140	0	5,574
	PSF ⁵	0	0	0	0	0	0	0	0
	SSF ⁶	0	21	0	418	0	56,284	0	23,829
	PF ⁷	0	0	0	0	0	3	1	122
	Non-forest	0	9,372	0	47,198	0	9,886	0	0

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest.

6: SecondarySwampForest and 7: PlantsForest

4.3. Program Emissions

The actual GHG emissions reductions generated by the REDD+ program will be determined through ex-post measurements of REDD+ program results based on its monitoring plan. Here, under the assumption of REDD+ program effectiveness and following the methodology requirements, the ex-ante carbon stock changes within the project area are estimated by multiplying the annual total baseline carbon stock change by the factor (1-EI), where (EI) is an Effectiveness Index ranging from 0 (no effectiveness) to 1 (maximum effectiveness).

The EI was estimated based on the demonstration of REDD+ program activities. We also assumed that higher effectiveness rate will be achieved. We assumed that in the effectiveness rate will be 20%.

(1) Calculation of baseline activity data per forest class

In order to estimate the area in hectares of each forest class within the project area deforested and degraded under the baseline scenario, annual deforestation rate was applied for 2015-2024. The results are shown in above Table 17, Table 22 and Table 23.

(2) Calculation of baseline activity data per post-deforestation forest class

a. Estimation of the average carbon stocks of each LU/LC class

Average carbon stocks was estimated based on IPCC emission factor database (EFDB) and Indonesian National Forest Inventory, as well as non-forest classes projected to exist in the project area under the baseline scenario. The factors used are illustrated in Table 32 and Table 33.

Table 32 Factors identified for use in the area for estimating above-ground biomass and living biomass

(above-ground and below-ground biomass)

Forest type/ species group	Value in each Portion		Source
	Above-ground (AB)	Below-ground (BG)	
Primary dryland forest	269.4	13.6% of AG	Indonesian Government (2015) ⁸ for AB and IPCC EFDB (2015) for BG
Secondary dryland forest	203.3	13.6% of AG	Same as above
Primary swamp forest	208.5	13.6% of AG	Same as above
Secondary swamp forest	124.7	13.6% of AG	Same as above
Primary mangrove forest	274.8	13.6% of AG	Same as above
Secondary mangrove forest	170.5	13.6% of AG	Same as above
Plantation forest	120.0	13.6% of AG	Same as above
Non-forest	28.1	13.6% of AG	Same as above

Table 33 Factors identified for use in the area for estimating GHG from peat soil

Forest type/ species group	GHG emission from peat soil	Source
Primary dryland forest	0.0	Indonesian Government (2015) ⁹
Secondary dryland forest	19.0	Same as above
Primary swamp forest	0.0	Same as above
Secondary swamp forest	19.0	Same as above
Primary mangrove forest	0.0	Same as above
Secondary mangrove forest	19.0	Same as above
Plantation forest	73.0	Same as above
Non-forest	26.3	Same as above

In the baseline scenario, the carbon stocks and boundaries of the forest classes within the project area is assumed to remain constant. It is not expected that areas will lose carbon due to degradation, logging for timber, charcoal production or fuel wood collection.

A complete description of the sampling design and field measurements are provided to the validator, if necessary. The average carbon content in all LU/LC classes as well as the 90% confidence intervals are reported in Table 34 and applied factors was in Table 35.

Table 34 Carbon stocks per hectare of initial forest classes (including specific groups) existing in the

⁸ BP-REDD+ 2015. National Forest Reference Emission Level for Deforestation and Forest Degradation in the Context of the Activities Referred to in Decision 1/CP.16, Paragraph 70 (REDD+) Under the UNFCCC: A Reference for Decision Makers, Published by BP-REDD+ Indonesia

⁹ BP-REDD+ 2015. National Forest Reference Emission Level for Deforestation and Forest Degradation in the Context of the Activities Referred to in Decision 1/CP.16, Paragraph 70 (REDD+) Under the UNFCCC: A Reference for Decision Makers, Published by BP-REDD+ Indonesia

project area and leakage belt

LU/LC class		Average carbon stock per hectare + 90% CI					
		Cab_{cl}		Cbb_{cl}		$Ctot_{cl}$	
ID_{cl}	Name	average stock t CO ₂ e ha ⁻¹	+ 90% CI t CO ₂ e ha ⁻¹	average stock t CO ₂ e ha ⁻¹	+ 90% CI t CO ₂ e ha ⁻¹	average stock t CO ₂ e ha ⁻¹	+ 90% CI t CO ₂ e ha ⁻¹
1	Primary dryland forest	269.4	80.8	36.6	11.0	306.0	91.8
2	Secondary dryland forest	203.3	61.0	27.6	8.3	230.9	69.3
3	Primary swamp forest	208.5	62.6	28.4	8.5	236.9	71.1
4	Secondary swamp forest	124.7	37.4	17.0	5.1	141.7	42.5
5	Primary mangrove forest	274.8	82.4	37.4	11.2	312.2	93.7
6	Secondary mangrove forest	170.5	51.2	23.2	7.0	193.7	58.1
7	Plantation forest	120	36.0	16.3	4.9	136.3	40.9
8	Non-forest	28.1	8.4	3.8	1.1	31.9	9.6

Cab_{cl} : Average carbon stock per hectare in the above-ground biomass carbon pool of class cl; tCO₂-e ha⁻¹

Cbb_{cl} : Average carbon stock per hectare in the below-ground biomass carbon pool of class cl; tCO₂-e ha⁻¹

$Ctot_{cl}$: Average carbon stock per hectare in all accounted carbon pools cl; tCO₂-e ha⁻¹

Table 35 Values to be used after discounts for uncertainties

LU/LC class		Average carbon stock per hectare + 90% CI					
		<i>Cab_{cl}</i>		<i>Cbb_{cl}</i>		<i>Ctot_{cl}</i>	
<i>ID_{cl}</i>	Name	C stock t CO ₂ e ha ⁻¹	C stock change t CO ₂ e ha ⁻¹	C stock t CO ₂ e ha ⁻¹	C stock change t CO ₂ e ha ⁻¹	C stock t CO ₂ e ha ⁻¹	C stock change t CO ₂ e ha ⁻¹
1	Primary dryland forest	188.6	-	25.6	-	214.2	-
2	Secondary dryland forest	142.3	-	19.4	-	161.7	-
3	Primary swamp forest	146.0	-	19.8	-	165.8	-
4	Secondary swamp forest	87.3	-	11.9	-	99.2	-
5	Primary mangrove forest	192.4	-	26.2	-	218.5	-
6	Secondary mangrove forest	119.4	-	16.2	-	135.6	-
7	Plantation forest	84.0	-	11.4	-	95.4	-
8	Non-forest	19.7	-	2.7	-	22.3	-

Cab_{cl}: Average carbon stock per hectare in the above-ground biomass carbon pool of class *cl*; tCO₂-e ha⁻¹

Cbb_{cl}: Average carbon stock per hectare in the below-ground biomass carbon pool of class *cl*; tCO₂-e ha⁻¹

Ctot_{cl}: Average carbon stock per hectare in all accounted carbon pools *cl*; tCO₂-e ha⁻¹

Note: Average carbon stock per hectare is as same in each *ID_{cl}* for in all years.

Carbon stock in post-deforestation class was assumed as cropland, grazing land and settlement, which carbon stock are estimated by applying weight average value in case of current year of 2013 and was estimated as 22.3 t CO₂e ha⁻¹ from conservative manner (Table 36).

Table 36 Long-term (20-years) average carbon stocks per hectare of post-deforestation LU/LC classes present in the reference region

Project year <i>t</i>	Average carbon stock per hectare + 90% CI					
	<i>Cab</i>		<i>Cbb</i>		<i>Ctot</i>	
	<i>C stock</i> t CO ₂ e ha ⁻¹	±90% CI t CO ₂ e ha ⁻¹	<i>C stock</i> t CO ₂ e ha ⁻¹	±90% CI t CO ₂ e ha ⁻¹	<i>C stock</i> t CO ₂ e ha ⁻¹	±90% CI t CO ₂ e ha ⁻¹
Value from conservative manner	-	-	-	-	22.3	-

Carbon stock in post-deforestation class was assumed as land conversion from forest to other lands and applied as 22.3 t CO₂e ha⁻¹ from conservative manner (Table 36). As a result, as example, the net emissions per ha from LULC-change in case of from Primary Dryland Forest in Project Area is 191.9 tCO₂e/ha (i.e. 214.2 tCO₂e/ha – 22.3 tCO₂e/ha).

By applying such values, estimated baseline carbon stock change in reference region are in Table 37

to Table 39. Estimated baseline carbon stock change in project area are in Table 40 to Table 42. Estimated baseline carbon stock change in leakage belt are in Table 43 to Table 45.

Table 37 Baseline carbon stock change in the above-ground biomass in reference region

Project year <i>t</i>	Carbon stock changes in the above-ground biomass per initial forest classes														Total carbon stock change in the above-ground biomass of the initial forest classes in the reference region	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		annual	cumulative
	<i>ABRR</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>ABRR</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>ABRR</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>ABRR</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>ABRR</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>ABRR</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>ABRR</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>ABRR</i> _{i,t} tCO ₂ -e	<i>ABRR</i> _{i,t} tCO ₂ -e
2015	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	2,331,453
2016	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	4,662,905
2017	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	6,994,358
2018	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	9,325,811
2019	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	11,657,263
2020	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	13,988,716
2021	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	16,320,168
2022	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	18,651,621
2023	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	20,983,074
2024	-162	691	-163	522	0	535	391	320	8	705	5,480	438	-0	308	2,331,453	23,314,526

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 38 Baseline carbon stock change in the below-ground biomass in reference region

Project year <i>t</i>	Carbon stock changes in the below-ground biomass per initial forest classes														Total carbon stock change in the below-ground biomass of the initial forest classes in the reference region	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		annual	cumulative
	<i>BBRR_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBRR_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBRR_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBRR_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBRR_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBRR_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBRR_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBRR_{i,t}</i> tCO ₂ -e	<i>BBRR_{i,t}</i> tCO ₂ -e
2015	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	317,078
2016	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	634,155
2017	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	951,233
2018	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	1,268,310
2019	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	1,585,388
2020	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	1,902,465
2021	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	2,219,543
2022	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	2,536,620
2023	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	2,853,698
2024	-162	94	-163	71	0	73	391	44	8	96	5,480	60	-0	42	317,078	3,170,776

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 39 Baseline CO₂ emissions from peat soil in reference region

Project year <i>t</i>	CO ₂ emissions from peat soil per initial forest classes																Total carbon stock change in the below-ground biomass of the initial forest classes in the reference region	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		Deforested area (Non-forest)		annual <i>SCRR_{i,t}</i>	cumulative <i>SCRR_{i,t}</i>
	<i>SCRR_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCRR_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCRR_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCRR_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCRR_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCRR_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCRR_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCRR_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	tCO ₂ -e	tCO ₂ -e
2015	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	254,484
2016	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	508,967
2017	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	763,451
2018	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	1,017,935
2019	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	1,272,419
2020	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	1,526,902
2021	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	1,781,386
2022	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	2,035,870
2023	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	2,290,354
2024	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	5,553	26	254,484	2,544,837

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 40 Baseline carbon stock change in the above-ground biomass in project area

Project year <i>t</i>	Carbon stock changes in the above-ground biomass per initial forest classes														Total carbon stock change in the above-ground biomass of the initial forest classes in the project area	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		annual	cumulative
	<i>ABPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABPA_{i,t}</i> tCO ₂ -e	<i>ABPA_{i,t}</i> tCO ₂ -e
2015	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	966,095
2016	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	1,932,189
2017	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	2,898,284
2018	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	3,864,379
2019	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	4,830,474
2020	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	5,796,568
2021	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	6,762,663
2022	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	7,728,758
2023	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	8,694,853
2024	-162	691	265	522	0	535	91	320	0	705	2,082	438	0	308	966,095	9,660,947

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 41 Baseline carbon stock change in the below-ground biomass in project area

Project year <i>t</i>	Carbon stock changes in the below-ground biomass per initial forest classes														Total carbon stock change in the below-ground biomass of the initial forest classes in the project area	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		annual	cumulative
	<i>BBPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBPA_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>BBPA_{i,t}</i> tCO ₂ -e	<i>BBPA_{i,t}</i> tCO ₂ -e
2015	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	131,389
2016	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	262,778
2017	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	394,167
2018	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	525,556
2019	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	656,944
2020	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	788,333
2021	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	919,722
2022	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	1,051,111
2023	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	1,182,500
2024	-162	94	265	71	0	73	91	44	0	96	2,082	60	0	42	131,389	1,313,889

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 42 Baseline CO₂ emissions from peat soil in project area

Project year <i>t</i>	CO ₂ emissions from peat soil per initial forest classes																Total carbon stock change in the below-ground biomass of the initial forest classes in the reference region	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		Deforested area (Non-forest)		annual <i>SCPA_{i,t}</i>	cumulative <i>SCPA_{i,t}</i>
	<i>SCPA_{cd,t}</i> ha	<i>Ctot_{cd,t}</i> tCO ₂ -e ha ⁻¹	<i>SCPA_{cd,t}</i> ha	<i>Ctot_{cd,t}</i> tCO ₂ -e ha ⁻¹	<i>SCPA_{cd,t}</i> ha	<i>Ctot_{cd,t}</i> tCO ₂ -e ha ⁻¹	<i>SCPA_{cd,t}</i> ha	<i>Ctot_{cd,t}</i> tCO ₂ -e ha ⁻¹	<i>SCPA_{cd,t}</i> ha	<i>Ctot_{cd,t}</i> tCO ₂ -e ha ⁻¹	<i>SCPA_{cd,t}</i> ha	<i>Ctot_{cd,t}</i> tCO ₂ -e ha ⁻¹	<i>SCPA_{cd,t}</i> ha	<i>Ctot_{cd,t}</i> tCO ₂ -e ha ⁻¹	<i>SCPA_{cd,t}</i> ha	<i>Ctot_{cd,t}</i> tCO ₂ -e ha ⁻¹	tCO ₂ -e	tCO ₂ -e
2015	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	106,151
2016	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	212,302
2017	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	318,453
2018	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	424,604
2019	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	530,755
2020	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	636,906
2021	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	743,057
2022	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	849,208
2023	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	955,359
2024	-162	0	-163	19	0	0	391	19	8	0	5,480	19	-0	73	2,275	26	106,151	1,061,510

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 43 Baseline carbon stock change in the above-ground biomass in leakage belt

Project year <i>t</i>	Carbon stock changes in the above-ground biomass per initial forest classes														Total carbon stock change in the above-ground biomass of the initial forest classes in the leakage belt	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		annual	cumulative
	<i>ABLB_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABLB_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABLB_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABLB_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABLB_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABLB_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABLB_{icl,t}</i> ha	<i>Ctot_{icl,t}</i> tCO ₂ -e ha ⁻¹	<i>ABLB_{i,t}</i> tCO ₂ -e	<i>ABLB_{i,t}</i> tCO ₂ -e
2015	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	1,365,358
2016	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	2,730,716
2017	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	4,096,074
2018	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	5,461,432
2019	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	6,826,789
2020	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	8,192,147
2021	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	9,557,505
2022	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	10,922,863
2023	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	12,288,221
2024	0	691	-428	522	0	535	300	320	8	705	3,398	438	0	308	1,365,358	13,653,579

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 44 Baseline carbon stock change in the below-ground biomass in leakage belt

Project year <i>t</i>	Carbon stock changes in the below-ground biomass per initial forest classes														Total carbon stock change in the below-ground biomass of the initial forest classes in the leakage belt	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		annual	cumulative
	<i>BBLB</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>BBLB</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>BBLB</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>BBLB</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>BBLB</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>BBLB</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>BBLB</i> _{icl,t} ha	<i>Ctot</i> _{icl,t} tCO ₂ -e ha ⁻¹	<i>BBLB</i> _{i,t} tCO ₂ -e	<i>BBLB</i> _{i,t} tCO ₂ -e
2015	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	185,689
2016	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	371,377
2017	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	557,066
2018	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	742,755
2019	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	928,443
2020	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	1,114,132
2021	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	1,299,821
2022	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	1,485,509
2023	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	1,671,198
2024	0	94	-428	71	0	73	300	44	8	96	3,398	60	0	42	185,689	1,856,887

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

Table 45 Baseline CO₂ emissions from peat soil in leakage belt

Project year <i>t</i>	CO ₂ emissions from peat soil per initial forest classes																Total carbon stock change in the below-ground biomass of the initial forest classes in the reference region	
	PDF ¹		SDF ²		PMF ³		SMF ⁴		PSF ⁵		SSF ⁶		PF ⁷		Deforested area (Non-forest)		annual <i>SCLB_{i,t}</i>	cumulative <i>SCLB_{i,t}</i>
	<i>SCLB_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCLB_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCLB_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCLB_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCLB_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCLB_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCLB_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	<i>SCLB_{id,t}</i> ha	<i>Ctot_{id,t}</i> tCO ₂ -e ha ⁻¹	tCO ₂ -e	tCO ₂ -e
2015	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	148,333
2016	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	296,666
2017	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	444,998
2018	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	593,331
2019	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	741,664
2020	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	889,997
2021	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	1,038,329
2022	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	1,186,662
2023	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	1,334,995
2024	-162	0	-163	19	0	0	391	19	8	0	5,480	19	0	73	3,278	26	148,333	1,483,328

1: PrimaryDryForest, 2: SecondaryDryForest, 3: PrimaryMangroveForest, 4: SecondaryMangroveForest, 5: PrimarySwampForest, 6: SecondarySwampForest and 7: PlantsForest

(3) Ex-ante estimation of carbon stock changes due to unavoidable unplanned deforestation within

In this REDD+ program, according to baseline scenario of the PD, GHG emission in the future (up to 2034) is estimated by applying simple method which is same as Indonesian national level's FREL. Also, for estimation of GHG emission in REDD+ program scenario, some parameters which are assumed by implementing effects of REDD+ program activities are applied EI of 20%.

a. Ex-ante estimated net actual carbon stock changes in the project area

The results of the previous step are summarized in Table 46.

Table 46 Ex-ante estimated net carbon stock change in the project area under the REDD+ program scenario

Project year <i>t</i>	Total carbon stock decrease in above-ground biomass		Total carbon stock decrease in below-ground biomass		Total carbon stock decrease in soil carbon		Total carbon stock change in the project case	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
	<i>CSDabPA_t</i>	<i>CSDabPA</i>	<i>CSDbbPA_t</i>	<i>CSDbbPA</i>	<i>CSDscPA_t</i>	<i>CSDscPA</i>	<i>CSCPA_t</i>	<i>CSCPA</i>
	t-CO ₂ e	t-CO ₂ e	t-CO ₂ e	t-CO ₂ e	t-CO ₂ e	t-CO ₂ e	t-CO ₂ e	t-CO ₂ e
2015	966,095	966,095	131,389	131,389	106,151	106,151	1,203,635	1,203,635
2016	966,095	1,932,189	131,389	262,778	106,151	212,302	1,203,635	2,407,269
2017	966,095	2,898,284	131,389	394,167	106,151	318,453	1,203,635	3,610,904
2018	966,095	3,864,379	131,389	525,556	106,151	424,604	1,203,635	4,814,538
2019	966,095	4,830,474	131,389	656,944	106,151	530,755	1,203,635	6,018,173
2020	966,095	5,796,568	131,389	788,333	106,151	636,906	1,203,635	7,221,808
2021	966,095	6,762,663	131,389	919,722	106,151	743,057	1,203,635	8,425,442
2022	966,095	7,728,758	131,389	1,051,111	106,151	849,208	1,203,635	9,629,077
2023	966,095	8,694,853	131,389	1,182,500	106,151	955,359	1,203,635	10,832,711
2024	966,095	9,660,947	131,389	1,313,889	106,151	1,061,510	1,203,635	12,036,346

(4) Ex-ante estimation of actual non-CO₂ emission from forest fires

GHG emissions from some activities are evaluated. However significant emissions are not identified in this project (Table 47).

Table 47 Total ex-ante estimated actual emissions of non-CO₂ gasses due to forest fires (biomass

burning) in the project area

Project year <i>t</i>	Total ex-ante estimated actual non-CO ₂ emissions from forest fires in the project area	
	<i>NCO2PA_t</i> , t-CO ₂ e	<i>NCO2PA</i> , t-CO ₂ e
2015	<i>Not estimated</i>	<i>Not estimated</i>
2016	<i>Not estimated</i>	<i>Not estimated</i>
2017	<i>Not estimated</i>	<i>Not estimated</i>
2018	<i>Not estimated</i>	<i>Not estimated</i>
2019	<i>Not estimated</i>	<i>Not estimated</i>
2020	<i>Not estimated</i>	<i>Not estimated</i>
2021	<i>Not estimated</i>	<i>Not estimated</i>
2022	<i>Not estimated</i>	<i>Not estimated</i>
2023	<i>Not estimated</i>	<i>Not estimated</i>
2024	<i>Not estimated</i>	<i>Not estimated</i>

(5) Total ex-ante estimations for the project area

The total ex-ante estimation of GHG emissions for the project area is reported in Table 48.

Table 48 Total ex-ante estimated actual net carbon stock changes and emissions of non-CO₂ gasses in the project area

Project year <i>t</i>	Total <i>ex-ante</i> carbon stock decrease in above-ground biomass		Total <i>ex-ante</i> carbon stock decrease in below-ground biomass		Total <i>ex-ante</i> carbon stock decrease in soil carbon		Total <i>ex-ante</i> estimated actual non-CO ₂ emissions		Total <i>ex-ante</i> estimated GHG emissions	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
	<i>CSDabPA_t</i> t-CO ₂ e	<i>CSDabPA</i> t-CO ₂ e	<i>CSDbbPA_t</i> t-CO ₂ e	<i>CSDbbPA</i> t-CO ₂ e	<i>CSDscPA_t</i> t-CO ₂ e	<i>CSDscPA</i> t-CO ₂ e	<i>CSCnon-co2PA_t</i> t-CO ₂ e	<i>CSCnon-co2PA</i> t-CO ₂ e	<i>totalPA_t</i> t-CO ₂ e	<i>totalPA</i> t-CO ₂ e
2015	966,095	966,095	131,389	131,389	106,151	106,151	<i>Not estimated</i>	<i>Not estimated</i>	106,151	106,151
2016	966,095	1,932,189	131,389	262,778	106,151	212,302	<i>Not estimated</i>	<i>Not estimated</i>	106,151	212,302
2017	966,095	2,898,284	131,389	394,167	106,151	318,453	<i>Not estimated</i>	<i>Not estimated</i>	106,151	318,453
2018	966,095	3,864,379	131,389	525,556	106,151	424,604	<i>Not estimated</i>	<i>Not estimated</i>	106,151	424,604
2019	966,095	4,830,474	131,389	656,944	106,151	530,755	<i>Not estimated</i>	<i>Not estimated</i>	106,151	530,755
2020	966,095	5,796,568	131,389	788,333	106,151	636,906	<i>Not estimated</i>	<i>Not estimated</i>	106,151	636,906
2021	966,095	6,762,663	131,389	919,722	106,151	743,057	<i>Not estimated</i>	<i>Not estimated</i>	106,151	743,057
2022	966,095	7,728,758	131,389	1,051,111	106,151	849,208	<i>Not estimated</i>	<i>Not estimated</i>	106,151	849,208
2023	966,095	8,694,853	131,389	1,182,500	106,151	955,359	<i>Not estimated</i>	<i>Not estimated</i>	106,151	955,359
2024	966,095	9,660,947	131,389	1,313,889	106,151	1,061,510	<i>Not estimated</i>	<i>Not estimated</i>	106,151	1,061,510

4.4. Leakage

(1) Ex-ante estimation of leakage

a. Ex-ante estimation of the decrease in carbon stocks and increase in GHG emissions due to leakage prevention measures

Leakage prevention activities in these areas in the REDD+ program scenario include the introduction of alternative livelihoods. Carbon stocks in the project area in the REDD+ program scenario are thus expected to increase compared to the baseline. However, we conservatively assume that they will remain non-forest land, and the carbon stock in the project area will consequently remain unchanged throughout the REDD+ program period.

b. Ex-ante estimation of CH₄ and N₂O emissions from grazing animals

REDD+ program activities associated with leakage prevention do not include significant livestock management, therefore emissions as result of grazing are not considered. Also activities for expanding paddy fields do not include significant non-CO₂ emissions, therefore emissions are not considered.

c. Total ex-ante estimated carbon stock changes and increases in GHG emissions due to leakage prevention measures

The results of the previous step are summarized (Table 49).

Table 49 Ex-ante estimated total emissions above the baseline from leakage prevention activities

Project year t	Carbon stock decrease due to leakage prevention measures		Total <i>ex-ante</i> GHG emissions from patrol activities		Total <i>ex-ante</i> increase in GHG emissions due to leakage prevention measures	
	Annual $CSDLKPM_t$ t-CO ₂ e	Cumulative $CSDLKPM$ t-CO ₂ e	Annual $GHGEIPA_t$ t-CO ₂ e	Cumulative $GHGEIPA$ t-CO ₂ e	Annual $CSDLKPM_t$ t-CO ₂ e	Cumulative $CSDLKPM$ t-CO ₂ e
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0
2019	0	0	0	0	0	0
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0

(2) Ex-ante estimation of the decrease in carbon stocks and increase in GHG emissions due to

In order to conservatively estimate, it was assumed that 5% of the deforestation within the project area in the baseline case will be displaced to the leakage belt in every year of the REDD+ program (Table 50). The calculation process of 5% to be displaced will be provided to the REDD+ program validator in validation process

Table 50 Ex-ante estimated leakage due to activity displacement

Project year t	Total <i>ex-ante</i> estimated decrease in carbon stocks due to displaced deforestation		Total <i>ex-ante</i> estimated emissions from patrol activities	
	Annual $CSDLK-dd_t$ t-CO ₂ e	Cumulative $CSDLK-dd$ t-CO ₂ e	Annual $GHG-pa_t$ t-CO ₂ e	Cumulative $GHG-pa$ t-CO ₂ e
2015	60,182	60,182	0	0
2016	60,182	120,363	0	0
2017	60,182	180,545	0	0
2018	60,182	240,727	0	0
2019	60,182	300,909	0	0
2020	60,182	361,090	0	0
2021	60,182	421,272	0	0
2022	60,182	481,454	0	0
2023	60,182	541,636	0	0
2024	60,182	601,817	0	0

(3) Ex-ante estimation of total leakage

The total ex-ante leakage estimation is reported in Table 51.

Table 51 Ex-ante estimated total leakage

Project year t	Total <i>ex-ante</i> estimated decrease in carbon stocks due to displaced deforestation		Total <i>ex-ante</i> estimated emissions from patrol activities		Carbon stock decrease or non-CO ₂ emissions due to leakage prevention measures		Total <i>ex-ante</i> decrease in carbon stocks due to displaced deforestation		Total net increase in emissions due to leakage	
	Annual $CSDLK-dd_t$ t-CO ₂ e	Cumulative $CSDLK-dd$ t-CO ₂ e	Annual $GHG-pa_t$ t-CO ₂ e	Cumulative $GHG-pa$ t-CO ₂ e	Annual $GHGLKn-co2_t$ t-CO ₂ e	Cumulative $GHGLKn-co2$ t-CO ₂ e	Annual ΔCLK_t t-CO ₂ e	Cumulative ΔCLK t-CO ₂ e	Annual ΔELK_t t-CO ₂ e	Cumulative ΔELK t-CO ₂ e
2015	60,182	60,182	0	0	0	0	60,182	60,182	60,182	60,182
2016	60,182	120,363	0	0	0	0	60,182	120,363	60,182	120,363
2017	60,182	180,545	0	0	0	0	60,182	180,545	60,182	180,545
2018	60,182	240,727	0	0	0	0	60,182	240,727	60,182	240,727
2019	60,182	300,909	0	0	0	0	60,182	300,909	60,182	300,909
2020	60,182	361,090	0	0	0	0	60,182	361,090	60,182	361,090
2021	60,182	421,272	0	0	0	0	60,182	421,272	60,182	421,272
2022	60,182	481,454	0	0	0	0	60,182	481,454	60,182	481,454
2023	60,182	541,636	0	0	0	0	60,182	541,636	60,182	541,636
2024	60,182	601,817	0	0	0	0	60,182	601,817	60,182	601,817

4.5. Total GHG Emission Reductions and/or Removals

(1) Ex-ante total net anthropogenic GHG emission reductions

a. Significance assessment

The carbon stored in the above and below ground biomass pools were considered by the REDD+ program. Root-to-shoot ratios and data to estimate the carbon stocks in the below-ground biomass pool were sourced from regional literature in accordance with IPCC (2006) guidance.

On the other hand, harvested wood products were excluded as significant timber removal is not associated with the baseline scenario. This is because that there were no legal and official logging activities in project area and reference region and there were not so much harvest wood products to be accounted.

b. Calculation of ex-ante estimation of total net GHG emissions reductions

The ex-ante estimation of total net GHG emissions reductions to be generated through the proposed REDD+ program activity are calculated.

$$\Delta REDD_t = \Delta CBSLPA_t - \Delta CPSPA_t - (\Delta CLK_t + ELK_t)$$

where;

$\Delta REDD_t$ Ex-ante estimated net anthropogenic GHG reduction attributable to the REDD+ program activity at year t ; tCO₂e

$\Delta CBSLPA_t$ Sum of baseline carbon stock changes in the project area at year t ; tCO₂e

$\Delta CPSPA_t$ Sum of ex post estimated actual carbon stock changes in the project area at year t ; tCO₂e

ΔCLK_t Sum of ex post estimated leakage net carbon stock changes at year t ; tCO₂e

ELK_t Sum of ex post estimated leakage emissions at year t ; tCO₂e

t 1, 2, 3 ... t , a year of the proposed crediting period; dimensionless

Ex-ante buffer credits are calculated based on a 20% risk factor estimated through expert judgment (as tentative).

c. Calculation of ex-ante Verified Carbon Units (VCUs) (VCUs are in case we applied VCS)

The calculation of ex-ante Verified Carbon Units (VCUs) to be generated through the proposed REDD+ program activity are summarized in Table 52. Ex-ante buffer credits are calculated based on a 20% risk factor.

Table 52 Ex-ante estimated net anthropogenic GHG emission reductions ($\Delta REDD_t$) and Voluntary Carbon Units (VCUt)

Project year <i>t</i>	Baseline carbon stock changes		Baseline GHG emissions		<i>Ex-ante</i> project carbon stock changes		<i>Ex-ante</i> project GHG emissions		<i>Ex-ante</i> leakage carbon stock changes		<i>Ex-ante</i> leakage GHG emissions		<i>Ex-ante</i> net anthropogenic GHG emission reductions		<i>Ex-ante</i> VCU tradable		<i>Ex-ante</i> buffer credits	
	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.
	C_t t-CO ₂ e	C t-CO ₂ e	$BLghg_t$ t-CO ₂ e	$BLghg$ t-CO ₂ e	PCS_t t-CO ₂ e	PCS t-CO ₂ e	$Pghg_t$ t-CO ₂ e	$Pghg$ t-CO ₂ e	LKC_t t-CO ₂ e	LKC t-CO ₂ e	$LKghg_t$ t-CO ₂ e	$LKghg$ t-CO ₂ e	$REDD_t$ t-CO ₂ e	$REDD$ t-CO ₂ e	VCU_t t-CO ₂ e	VCU t-CO ₂ e	VBC_t t-CO ₂ e	VBC t-CO ₂ e
2015	1,097,484	1,097,484	106,151	106,151	768,239	768,239	74,306	74,306	54,874	54,874	5,308	5,308	782,362	782,362	625,890	625,890	156,472	156,472
2016	1,097,484	2,194,967	106,151	212,302	768,239	1,536,477	74,306	148,611	54,874	109,748	5,308	10,615	782,362	1,564,725	625,890	1,251,780	156,472	312,945
2017	1,097,484	3,292,451	106,151	318,453	768,239	2,304,716	74,306	222,917	54,874	164,623	5,308	15,923	782,362	2,347,087	625,890	1,877,670	156,472	469,417
2018	1,097,484	4,389,935	106,151	424,604	768,239	3,072,954	74,306	297,223	54,874	219,497	5,308	21,230	782,362	3,129,450	625,890	2,503,560	156,472	625,890
2019	1,097,484	5,487,418	106,151	530,755	768,239	3,841,193	74,306	371,528	54,874	274,371	5,308	26,538	782,362	3,911,812	625,890	3,129,450	156,472	782,362
2020	1,097,484	6,584,902	106,151	636,906	768,239	4,609,431	74,306	445,834	54,874	329,245	5,308	31,845	782,362	4,694,175	625,890	3,755,340	156,472	938,835
2021	1,097,484	7,682,385	106,151	743,057	768,239	5,377,670	74,306	520,140	54,874	384,119	5,308	37,153	782,362	5,476,537	625,890	4,381,230	156,472	1,095,307
2022	1,097,484	8,779,869	106,151	849,208	768,239	6,145,908	74,306	594,445	54,874	438,993	5,308	42,460	782,362	6,258,900	625,890	5,007,120	156,472	1,251,780
2023	1,097,484	9,877,353	106,151	955,359	768,239	6,914,147	74,306	668,751	54,874	493,868	5,308	47,768	782,362	7,041,262	625,890	5,633,010	156,472	1,408,252
2024	1,097,484	10,974,836	106,151	1,061,510	768,239	7,682,385	74,306	743,057	54,874	548,742	5,308	53,075	782,362	7,823,625	625,890	6,258,900	156,472	1,564,725

Note: Ex-ante buffer credits are calculated based on a 20% Risk Factor (RF) estimated through expert judgment (as tentative).

5. Monitoring

This Chapter should be described after stakeholder's meeting regarding monitoring structure in GPNP and its surrounding area. Following are example which is quoted from the PD in Luang Prabang Province, Lao PDR, prepared by JICA PAREDD Project.

5.1. Monitoring Data Reconciliation

(1) Monitoring of project implementation

Monitoring of the HK-VC project implementation is conducted through different components that together form an integrated monitoring system. Quarterly reports will be available describing the progress of the activities listed in the management plans. The project will keep a copy of all spatial and tabular data, maps, reports and any relevant documentation, securely backed-up. This information will be available to verifiers for inspection. The project will also be responsible for monitoring project activities to be implemented by local partners. See section “4.3 Description of the Monitoring Plan” of the PD for a detailed description of the HK-VC data management plan.

(2) Monitoring of land-use and land-cover change within the project area

As of the date of validation no regional, national or jurisdictional monitoring system of land-cover change was in place. Therefore, the project proponent will be responsible for developing the land-cover change component of the monitoring plan for the project area. The analysis will cover the monitoring of forest land converted to non-forest. The land cover and change maps will be produced following the technical steps described below, including quality assurance procedures.

The project proponent will complete the following technical steps:

- Acquire appropriate LANDSAT images with minimal cloud cover from multiple sources. Multiple images will be used in the verification to fill areas obscured by clouds;
- Atmospherically correct images;
- Orthorectify images to within one pixel using a single base image (generally a GeoCover image, or similar image, used to generate the forest benchmark map);
- In areas where no-data values exist in the base image (due to clouds, cloud shadows and so on), composited images will be generated using the base image and multiple gap-filling images. A cloud and cloud shadow will first be generated and gap-filling scenes identified to fill the mask of the base image. Temporal and gap extent criteria will be used to select the gap-filling scenes; scenes with similar acquisition dates will be given preference, as well as minimal cloud and cloud shadow.

a. Monitoring of carbon stock changes and non-CO₂

Monitoring of carbon stock changes emissions from forest fires within the project area: The

ex-ante estimated average carbon stocks per in Mixed forest is not expected to change during the fixed baseline period. There are no areas subject to significant carbon stock decrease due to controlled deforestation and planned harvest activities (e.g. planned logging, fuel-wood collection and charcoal production activities) in the project scenario. Similarly, no areas subject to significant unplanned carbon stock decrease e.g. due to uncontrolled forest fires or other catastrophic events were identified. Although protection of forest by the project will likely lead to an increase in carbon stocks, monitoring of increases in carbon stocks are conservatively omitted because the project does not intend to claim credits for this category. Therefore, carbon stocks will not be monitored within the project area.

Monitoring of carbon stock changes emissions from forest fires within leakage management areas (LMAs): No areas will be subject to planned and significant carbon stock decrease in the project scenario in the LMAs according to the ex-ante assessment. On the contrary, carbon stocks are expected to increase in LMAs but are conservatively omitted from project accounting. Therefore, carbon stocks will not be monitored within LMAs.

Monitoring of carbon stock changes emissions from forest fires within the leakage belt: Carbon stocks will not be monitored within the leakage belt as this is optional.

b. Monitoring of non-CO₂ emissions form forest fires

Monitoring of impacts of natural disturbances and other catastrophic events: Natural disasters that might affect the carbon stocks (i.e. hurricanes, volcanic eruptions, flooding, severe droughts, earthquakes) in the project area are uncommon and do not represent a significant risk for the project area as assessed in the Non-Permanence Risk Report. However, the project proponent will use medium-resolution satellite images to monitor catastrophic events, applying the methodology described in above.

Total ex post estimated actual net carbon stock changes and GHG emissions in the project area: Relevant tables will be updated using the new measurements of changes in carbon stocks and GHG emissions in each monitoring period. The results will be summarized: Total ex-post estimated actual net changes in carbon stocks and emissions of GHG in the project area.

c. Monitoring of leakage

Monitoring of carbon stock changes and GHG emissions associated to leakage prevention activities: The major leakage prevention activity to be implemented is the capacity building and technical assistance for alternative livelihoods. No planned deforestation or degradation is expected to occur as part of leakage prevention activities, and no changes in carbon stocks are expected to occur according to the ex-ante analysis.

Monitoring of carbon stock decrease and increases in GHG emissions due to activity displacement leakage: Deforestation in the leakage belt will be monitored. Any deforestation above the baseline in the leakage belt will be discounted from the carbon emissions avoided to due to project activities. If emissions in the leakage belt are higher than the baseline due to activities not attributed to the project,

the project proponent will collect robust evidence to justify that the deforestation is not linked to project activities.

Emissions from forest fires are included in the baseline therefore increases in GHG emissions will be monitored in the leakage belt.

Total ex post estimated leakage: The results of all ex-post estimations of leakage through monitoring will be summarized using the same table format used in the ex-ante assessment and will be reported.

d. Ex post net anthropogenic GHG emission reductions

The calculation of ex-post net anthropogenic emission reductions will be estimated similarly to the ex-ante calculation using the equation below:

$$\Delta REDD_t = \Delta CBSLPA_t - \Delta CPSPA_t - (\Delta CLK_t + ELK_t)$$

where;

$\Delta REDD_t$	Ex-post estimated net anthropogenic GHG reduction attributable to the project activity at year t ; tCO ₂ e
$\Delta CBSLPA_t$	Sum of baseline carbon stock changes in the project area at year t ; tCO ₂ e
$\Delta CPSPA_t$	Sum of ex post estimated actual carbon stock changes in the project area at year t ; tCO ₂ e
ΔCLK_t	Sum of ex post estimated leakage net carbon stock changes at year t ; tCO ₂ e
ELK_t	Sum of ex post estimated leakage emissions at year t ; tCO ₂ e
t	1, 2, 3 ... t , a year of the proposed crediting period; dimensionless

5.2. Data and Parameters Available at Validation

Complete the table below for all data and parameters that are determined or available at validation, and remain fixed throughout the program crediting period (copy the table as necessary for each data/parameter). Data and parameters monitored during the operation of the jurisdictional REDD+ program are included in Section 5.3 (Data and Parameters Monitored) below.

Data / Parameter	Forest cover benchmark in 2016
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Data unit	Map
Description	Digital map showing the location of forest land within the project area at the beginning of the crediting period
Source of data	LANDSAT 7
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	LANDSAT-based land cover classification is applied. The map accuracy is ensured at least 80% for the classification of forest and non-forest in the satellite imagery analysis.
Purpose of data	Indicate one of the following: <ul style="list-style-type: none"> ● Determination of baseline scenario ● Calculation of baseline emissions ● Calculation of program emissions

Data / Parameter	Project area
Data unit	Map
Description	Digital map of project area boundaries
Source of data	GIS dataset (elevation, slope, forest edges, project boundaries)
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	LANDSAT-based land cover classification is applied. The map accuracy is ensured at least 80% for the classification of forest and non-forest in the satellite imagery analysis.
Purpose of data	Indicate one of the following: <ul style="list-style-type: none"> ● Determination of baseline scenario ● Calculation of baseline emissions ● Calculation of program emissions

Data / Parameter	Reference region
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Data unit	Map
Description	Digital map of reference region boundaries
Source of data	GIS dataset (elevation, slope, forest edges, project boundaries)
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	LANDSAT-based land cover classification is applied. The map accuracy is ensured at least 80% for the classification of forest and non-forest in the satellite imagery analysis.
Purpose of data	Indicate one of the following: <ul style="list-style-type: none"> ● Determination of baseline scenario ● Calculation of baseline emissions ● Calculation of program emissions

Data / Parameter	Leakage belt
Data unit	Map
Description	Digital map of leakage belt boundaries
Source of data	GIS dataset (elevation, slope, forest edges, project boundaries)
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	LANDSAT-based land cover classification is applied. The map accuracy is ensured at least 80% for the classification of forest and non-forest in the satellite imagery analysis.
Purpose of data	Indicate one of the following: <ul style="list-style-type: none"> ● Determination of baseline scenario ● Calculation of baseline emissions ● Calculation of program emissions

5.3. Data and Parameters Monitored

Not addressed in IJ-REDD+.

5.4. Description of the Monitoring Plan

Not addressed in IJ-REDD+.

6. Safeguard Information System

In Indonesia, Ministry of Environment and Forestry have developed jurisdiction's safeguard information systems, SIS-REDD+ Indonesia (Principles, Criteria and Indicators for a System for Providing Information on REDD+ Safeguards Implementation in Indonesia) for assessing safeguards implementation to address and respect the decision Dec.1/CP.16 on COP16. SIS-REDD+ is according to "SIS-REDD+ Indonesia" developed referring various existing instruments related to social and environmental assessment. The project will provide information in accordance with this SIS guidance.

6.1. Data and Parameters Available at Validation

Refer to SIS-REDD+ Indonesia

6.2. Description of the Safeguards Information System

Refer to SIS-REDD+ Indonesia

7. Further Information

In addition to stakeholder engagement specifically on the PD, the concept is based on Indonesia's REDD+ strategy documents and on related reforms that have been built on strong stakeholder engagement and outreach activities. The National REDD+ Strategy and the province-level REDD+ strategies and action plans were developed through consultation processes at the national and local levels, reaching out to communities, NGOs, universities and the government (central, provincial and district). The RAN-GRK used a consultation and communication platform to develop Province Level Strategies and Action Plans based on local needs and priorities.

A preliminary stakeholder engagement process specific to the design of the PD was begun on XX 20XX with a focus group discussion (FGD). This involved representatives from the Dinas XXX, GPNP, XXX, the private sector, and universities and research institutions. Specific topics discussed were: site selection, action plan, potential non-carbon benefits (such as NTFPs), consultation processes, REL and expected emissions reductions, MRV, readiness, and payment mechanisms. The participants of the meeting agreed that the PD will be submitted into XX.

Results of its Review

No.	Reviewer	Comments type	Comments, recommendation and question	Improved points/sentences
1	IJ-REDD+ members	CAR	There is no reference map location to Indonesia area	Yes, we added geographical map of West Kalimantan Province, Gunung Palung National Park and our REDD+ target area.
2	IJ-REDD+ members	CAR	Structure refer to management structure or particular as REDD+ proponent?	Yes, the proponent structure in the PD is just assumption according to IJ-REDD+ activities and some discussions with IJ-REDD+ stakeholders.
3	IJ-REDD+ members	CAR	Mentioned about 30 organization. Where is it refer?	Total participants/responsible organizations were improved, the total number of organizations will be finalized before submitting PD.
4	IJ-REDD+ members	CAR	Need to check on address	Contact address of each organization were blanked, and main address of the forum is just mentioned.
5	IJ-REDD+ members	CAR	Sub chapter 1.3 what the explanation of this sub chapter? Just Forum members? Or others that closed to the location?	Organizations in this part are regarding proponents who were assumed by IJ-REDD+
6	IJ-REDD+ members	CL	Ther mention “.....REDD+ related activities”, what is the meaning?	REDD+ related activities are activities to reduce deforestation and forest degradation directly and/or indirectly.
7	IJ-REDD+ members	CL	Is there any footnote for reference on the data (where’s data come?)	The data were results of estimation of GHG emission reductions. Estimation methodologies are mentioned.
8	IJ-REDD+ members	CL	Same picture?	We revised pictures.
9	IJ-REDD+ members	CL	There sentence, “In certain ases,.....ownership” Could you explain on this?, is there any reference for this sentence?	This sentence is quoted from SRAP prepared by West Kalimantan Province. We added reference in the document.
10	IJ-REDD+ members	CAR	Need to shorted from highest regulation to lowest	This part was improved by IJ-REDD+ members
11	IJ-REDD+ members	CAR	It needs brief explanation on GPNP including meaning of abbreviation.	In top page, explanation of the GPNP was added.

12	IJ-REDD+ members	R	Other brief explanation on forum would be needed rather than STATUTA.	Yes, the proponent structure in the PD is just assumption according to IJ-REDD+ activities and some discussions with IJ-REDD+ stakeholders.
13	IJ-REDD+ members	CAR	There are 30 organizations not 20, and community leaders are also included.	Total participants/responsible organizations were improved. Total number of organizations will be finalized before submitting PD.
14	IJ-REDD+ members	CL	What are example of “human activities”?	In REDD+ project, mainly address to deforestation and forest degradation by human activities (e.g. illegal logging, illegal land conversion), then human activities means direct and indirect activities bringing deforestation and forest degradation.
15	IJ-REDD+ members	CL	It is not clear why private company such as oil palm plantation is not included as agents of deforestation.	In this PD, we can not reach to agreement whether the PD is based on all of stakeholders or some parts of stakeholders. Therefore, we will have to decide collaboration system with oil palm plantation in near future (when we submit this document).
16	IJ-REDD+ members	CL	Why not add explanation on oil palm development?	Such explanation will not be required in this PD because we can not reach to agreement wit oil palm company.
17	IJ-REDD+ members	CAR	Need explanation on Year	Yes, we added explanation on the year to Figure 8.
18	IJ-REDD+ members	CAR	It may need more clear explanation for forum members (esp. NGO)	Total participants/responsible organizations were improved. Total number of organizations will be finalized before submitting PD.
19	IJ-REDD+ members	CL	It would need confirmation that it is not overlapped with RAD-GRK target especially on KPH program.	Target are in this PD do not been implemented by KPH-base, therefore the PD do not consider some kind of overlap issues with other programs.
20	IJ-REDD+ members	CL	How about explanation on internal distribution internal forum and how to allocate for community?	Indicated point is under discussion with the forum. When this PD submitted, such a point will be discussed.
21	IJ-REDD+ members	R	It would be better to clarify that this consultation is not yet been done. So, MoF or Forum need to conduct.	Yes, after review process by IJ-REDD+ members, national experts kindly review this PD according to their experiences and Indonesian national forest related laws and concepts.

22	IJ-REDD+ members	R	It would better to add and remind that the current situation on lack of understanding on boundary and zoning will be risk for REDD+ in the future.	This PD focuses on only two sub-districts in Kayong Utara District. Therefore the boundary is not eligible in line with VCS requirements. But this PD was prepared to clarify points to be solved when someone will implement REDD+ project in the area. Also we prepare the cover letter to explain situation of the PD.
23	IJ-REDD+ members	CAR	It is not sure the who will be agent 1-4 (ethnic group or which village?)	Agent(s) should be identified by not only specific group(s), but also some kind of general/common group(s). In this PD, all of agents are explained by general group whose activities sometime become drivers of deforestation and/or forest degradation.
24	IJ-REDD+ members	CL	1) Targets (agent groups) for each activity are not clear. 2) benefit of eco-tourism will be very limited. So, it would better to add other alternative livelihood. 3) use of term “monitoring system for illegal logging” will be difficult to accept by forum members. 4) Awareness raising not rising; 5) it would be more appropriate to use “environmental education and community facilitation” as a set.	Yes, in order to show evidences that each activities have potential to reduce deforestation are not prepared, because demonstration activities in the area are on process now. Also mentioned activities just include some idea-based, therefore we recognize that it is required to have consultation process with all of proponents to finalizing activities by using this materials.
25	IJ-REDD+ members	CAR	It is not clear which is map by WI	We added explanation for indentifying map developer.
26	IJ-REDD+ members	R	Add requirement of proponent for future recommendation.	From process of PD preparation, we were not able to discuss about proponent(s) and other entities. We prepare the cover letter to explain situation of the PD.
27	IJ-REDD+ members	CL	In all section, need to clarify what need to be clarified/fulfilled for finalizing PDD.	Yes, we prepare the cover letter to explain situation of the PD.
28	IJ-REDD+ members	R	Provide several options of Baseline and REL/RL; 1) whole 2 sub-districts, 2) in case PT PAS area is excluded, 3) in case HP area is excluded.	Yes, we prepare the cover letter to explain situation of the PD.

29	IJ-REDD+ members	R	Describe all necessary measures on social and environmental safeguard as recommendation for REDD+ implementation.	Yes, after finalizing demonstration activities, we would add specific measures on safeguards.
30	IJ-REDD+ members	R	Describe all REDD+-related activities implemented/planned by forum members.	Yes, after finalizing demonstration activities, we would add concept of REDD+ activities.
31	IJ-REDD+ members	R	Provide several activity options which are effective for REDD+ in the landscape. Based on each activity, estimated GHG reduction amount and basis/way of calculation need to be explained for PDD revision in the future.	Yes, after finalizing demonstration activities, we would add effectiveness of each REDD+ activity.
32	IJ-REDD+ members	R	As supplemental guide, difference of requirement/format/information among VCS, JCM and GCF need to be clarified. As optional value addition for carbon credit, requirement for CCBA need to be explained.	Yes, we prepare the cover letter to explain situation of the PD.
33	IJ-REDD+ members	R	Add information on zoning system and use rights of national park. Based on the current situation on NTFP use, the REDD+ project needs to take care for not to seize local people's rights and access.	We recognize the comments are very important. On suitable opportunity, we would like to discuss with National Park and other stakeholders.
34	IJ-REDD+ members	CAR	Information on Hutan Desa by Yayasan Palung and monitoring activities by ASRI need to be included.	Yes, activities by Hutan Desa and its related activities are added.
35	Ari	CAR	NPD clearly stated his expectation that the project should produce emission reduction target through Eligible Activities according to available mechanism or standards	The word of "NPD" is not clear. Regarding activities for reducing deforestation and forest degradation are mentioned in chapter ""

36	Ari	CL	Referring to JNR Requirement in 3.5.6 The lowest eligible jurisdictional level is the second administrative level below the national level. For example, in Brazil this would be a municipality (i.e., one administrative unit below the state) or, in Indonesia, a regency (i.e., one administrative level below the province), therefore Sub-district is not eligible for Jurisdictional REDD	This PD focuses on only two sub-districts in Kayong Utara District. Therefore the boundary is not eligible in line with VCS requirements. But this PD was prepared to clarify points to be solved when someone will implement REDD+ project in the area. Also we prepare the cover letter to explain situation of the PD.
37	Ari	CL	Under new law No. 23/2014, on local government, the authority of forestry sector is under central and province government, therefore implementation of REDD+ should be under jurisdiction of Province Government and even Central Government if involving National Park.	As same as comments of No. 36
38	Ari	CL	Project Proponents : Project Proponents must be clear and must able to show control over the project area and ownership of carbon rights for the project area. Current proposed jurisdictional proponents of Responsible Organization XX should proof their right and ability to control of the project area.	As same as comments of No. 36
39	Ari	CL	This project applied jurisdictional approach for two Sub Districts (Kecamatan). In this case, the Head of administrative region or Camat has no control of some forest areas as project area (including GPNP).	As same as comments of No. 36
40	Ari	CL	All land areas registered under any other voluntary or regulatory carbon trading scheme must be transparently reported and excluded from the project area (e.g. PT CUS).	Yes, before finalizing and submitting the PD, we have to identify other projects in our target area. Also we recognize to avoid double submitting, counting and insurance of credits.

41	Ari	R	A need to consider eligible project activities (ARR, IFM and REDD under VCS),	Yes, this PD assumed jurisdictional or sub-national REDD+, then our activities are consist of all of forest management practices except for A/R. it was because A/R activities sometime overlap with A/R CDM under the UNFCCC crediting mechanism
42	Ari	CL	A need to define landscape condition in proposed project area, based on its status and condition such as forestry land (production forest, national park, protection forest) and non forestry land with forest (forested APL).	Yes, we would explain condition prior to program initiation which include area of APL.
43	Ari	CL	An individual eligible project of REDD may be developed based on available eligible land, clear proponent and boundaries. This project may be refer to VCS, JCM, Plan Vivo or others.	As same as comments of No. 41
44	Ari	CL	When preparing reference level or baseline for a REDD project, a need to refer to Indonesian FREL with Historical land cover change analysis from 1990-2012.	Yes, methodologies for developing reference level keep consistency with national FREL. We add some explanation in page 51.
45	Ari	CAR	Make sure the decision to continue the preparation of PDD that refer to VCS JNR. Considering the eligibility of jurisdictional approach for sub district level.	As same as comments of No. 36
46	Ari	CL	Make sure to apply the right template for PDD or PD (Project Description) under VCS	The project description (PD) is correct. We revised it.
47	Ari	R	In the Title, Landscape Forest Conservation in West Kalimantan Province should have clear meaning of landscape, conservation and jurisdiction area in sub district.	Yes, we add some explanation.

48	Ari	R	Table of content depend on selected PD template.	In this PD, we used VCS JNR template, so all of tables are according to the template.
49	Ari	CL	Table 1. If possible to indicate total area and forest status/function of each driver as input for each stand alone project	Yes, we added such data and information.
50	Ari	CL	1.2. Jurisdictional proponent: eligibility of Responsible Organization XX as proponent (are they eligible? Right to Control over forest)	As same as comments of No. 36
51	Ari	CL	1.3. Other Entities Involved in the Jurisdictional REDD+ Program: should consider entity as eligible project proponent, to support the possibility of stand alone project	As same as comments of No. 36
52	Ari	CL	Boundaries : project area, reference area and leakage belt should clear	Yes, we added detailed map including reference area, leakage belt and project area
53	Ari	CL	Table 4, land cover to include area and forest function and management authority	According to VCS requirements, Table 4 just explains definition of forest types.
54	Ari	CL	Figure 7 Concept of deforestation, forest degradation and carbon enhancement in the forest in this PDD should be improved (e.g. enhancement of C stock from plantation to primary forest is not correct.	REDD+ project will be verified by "results base" and it will be results from carbon emission reduction and enhancement. Therefore Figure 7 just explain forest type changes which bring carbon stock changes.
55	Ari	CL	1.8. Conditions Prior to Program Initiation should be proven with historical land cover change analysis including fire history in project area	Yes, we added land and forest management history including fire fighting team activities.
56	Ari	CL	1.9 Approval: proof of Responsible Organization XX as eligible entity.	As same as comments of No. 36
57	Ari	CL	Nested Project: Consider of nested project as an eligible activity	As same as comments of No. 36

58	Ari	CL	1.10. Compliance with Laws, Statutes and Other Regulatory Frameworks : UU No 23/2014, forestry authority in province and central government level	the part of laws you indicated was improved by IJ-REDD+ national experts.
59	Ari	CL	3.5. Description of Jurisdictional Baseline Method -> should be prepared using historical land cover change and data of degradation over jurisdiction area, the future projection of baseline is based on historical trend and/or forward looking with document of evidence	Yes, baseline is based on historical data and its methodologies are consist with national FREL.
60	Ari	CAR	Quantification of GHG Emission Reductions and/or Removals; Should refer to IPCC Gl 2006: emission = activity data (area of land cover change) x emission factors (local or default values)	Yes, all of estimation process are in line with IPCC guidelines.
61	Ari	CAR	Table 32 Factors identified for use in the area for estimating GHG from peat soil -> consider peat decomposition??	Yes, soil decompositions are considered.
62	Ari	CL	JNR requires eligible jurisdiction : district or even province, therefore sub districts are not eligible for JNR under VCS	As same as comments of No. 36
63	Ari	CL	To consider eligible proponent for REDD+ activity who has right/authority over project area. Current society of Responsible Organization XX may not eligible	As same as comments of No. 36
64	Ari	CL	To consider Scenario 1 according to VCS JNR requirements with stand alone projects but with jurisdictional baseline	This PD will be categorized in scenario 2 according to VCS JNR, because West Kalimantan Province already developed sub-national REDD+ strategy and the are targeted by this PD is just part of it.

65	Ari	CL	From PDD : basic concept of REDD+, estimation of emission and others require more common understanding	In figure 7, we explained concept of emission reductions and carbon enhancement.
66	Ari	CL	A need to consider REDD project according to available standard with eligible activity, proponent and available approved methodology	As same as comments of No. 36
67	Ari	CL	Put all information /data in a Comprehensive Technical Report	The PD was prepared by using VCS formats. As supplemental explanations, IJ-REDD+ is now preparing manuals. These manuals will be useful to share detailed methodologies.
68	Arif	CL	I am wondering the role (objective) of this document. Should this document prepared for submit to comply with VCS crediting mechanism or a recommendation draft to be fulfilled by the candidate of project proponent?	The PD was prepared by using VCS formats. As supplemental explanations, IJ-REDD+ is now preparing manuals. These manuals will be useful to share detailed methodologies.
69	Arif	CL	Please check the correct term ! Is it Project Design Document (PDD) OR Project Description or Program Description (PD)?	This PD was prepared by according to VCS guidelines. We replaced from PDD to PD.
70	Arif	CL	The Title of this program is somehow too specific on conservation. I am thinking if the standard title such as "Jurisdiction REDD+ Program in" will be more understandable to the reader.	IJ-REDD+ had been focused on landscape level's activities. We think that current title is not specific and can include all of conservation activities in the area.
71	Arif	CL	Is this the Project Proponent? What is their role to the overall Jurisdiction Area? Do they have adequate power (authority) to reduce or control/oversight deforestation?	This PD focuses on only two sub-districts in Kayong Utara District. Therefore the boundary is not eligible in line with VCS requirements. But this PD was prepared to clarify points to be solved when someone will implement REDD+ project in the area. Also we prepare the cover letter to explain situation of the PD.

72	Arif	CL	Should this expressions appear on the Project Description Document? Please clarify !	As same as comments of No. 69
73	Arif	CL	Please clarify their role in this Project Description more clearly.	As same as comments of No. 71
74	Arif	CL	Please refer to the previous comment !	As same as comments of No. 71
75	Arif	CL	Please see previous comment !	This PD was prepared by according to VCS guidelines. We replaced from PDD to PD.
76	Arif	CL	Not 1.36 million but 136 million ha	We replaced 1.36 to 94.4 according to national data in 2010.
77	Arif	CL	Not 1.92 million but 192 million ha	We replaced 1.92 to 190.5 according to national data in 2010
78	Arif	R	Classified or designated? From the data that showed, it refers to a "forest area (forestland)". Some of the forest area (forestland) are not covered by forest.	Yes, we applied Indonesian definition.
79	Arif	R	Maybe you can add : "By increasing global awareness on climate change mitigation action from land use change and forestry; therefore,....	A great thanks for your kind suggestion. We added sentence.
80	Arif	R	Please indicate the reference for this statement !	This part was quoted from un-published document prepared by JICA IJ-REDD+. We eliminated the sentence.
81	Arif	CL	Delete "forest exploitation for timber products"	A great thanks for your kind suggestion. We eliminated sentence.
82	Arif	CL	Timber production is using selective cutting system, so they are the driver of forest degradation, not deforestation !!!	A great thanks for your kind suggestion. We mentioned both deforestation and forest degradation.
83	Arif	R	Forest conversion to agriculture is the main driver of deforestation, not forest degradation !!!	A great thanks for your kind suggestion. We mentioned both deforestation and forest degradation.
84	Arif	R	If you use this expression, this means a process of conversion, which is actually not. So please change the wording, for example : Typical converted forest to	A great thanks for your kind suggestion. We replace into your suggested explanation.

85	Arif	CL	Does it refer to the total area of forested area, forest land or Province area? Please make it clear !!!	Total area means total land area in West Kalimantan Province. Yes, we added explanation.
86	Arif	CL	This expression is confusing, please rephrase !!!	We replace "to reduce " into "reduction of".
87	Arif	R	Use a consistent decimal number !	In this PD, total area with some decimal number will be not necessary. We would explain a little bit rough area information.
88	Arif	CL	Confusing statement...Please rephrase !!!	We added explanation that forest conservation is in line with Provincial strategy (SRAP).
89	Arif	CL	Please refer to the previous comment !	As same as comments of No. 69
90	Arif	CL	Confusing statement...Please rephrase !!!	As same as comments of No. 71
91	Arif	CL	Forest area and dynamic is similar? Confusing statement ...Please rephrase !!!	The word of "dynamics" is used as forest area increase and/or decrease. Anyway we replace the word.
92	Arif	CL	How can they manage the activity to reduce deforestation when they don't have enough authority on the area management.	As same as comments of No. 71
93	Arif	CL	The structure of who's doing what is somehow confusing	As same as comments of No. 71
94	Arif	CL	Who is the REDD+ Program?	As same as comments of No. 71
95	Arif	CL	What/who is the REDD+ Program?	REDD+ program means all of activities by the forum. We added some explanation in XX.
96	Arif	CL	What is the Indonesian forest inventory?	Indonesian Forest Inventory means National Forest Monitoring System in Indonesia. We replace "Indonesian Forest Inventory" into "Indonesian National Forest Inventory" accordingly.
97	Arif	CL	What/who is the REDD+ Program?	REDD+ program means all of activities by the forum. We added some explanation.
98	Arif	CL	"Site specific" emission will not be found in the IPCC EF database	Yes, we revised the sentence

99	Arif	CL	What is a new model? This statement is unclear.	Yes, we revised the sentence
100	Arif	CL	Please refer to the previous comments !	As same as comments of No. 2
101	Arif	CL	Can the Responsible Organization XX do this work?	As same as comments of No. 2
102	Arif	CL	Does this structure suitable enough to counter deforestation and forest degradation?	As same as comments of No. 2
103	Arif	CL	Who is the proponent who responsible for tackling deforestation and forest degradation in West Kalimantan (or GPNP)? What Ministerial Decree? Forestry? Environment? Mining? Energy?	As same as comments of No. 2
104	Arif	CL	What is the relation between this organization and GPNP? It is quite unclear !	As same as comments of No. 2
105	Arif	CL	Please refer to the previous comment !	As same as comments of No. 2
106	Arif	CL	What is the role and institutional arrangement of these institutions?	As same as comments of No. 2
107	Arif	CL	Already started?	Not yet. The program is assumed to start on 1th June 2016. We revised Table 2.
108	Arif	CL	Maximum?	Blue line is minimum and red line is maximum. We revised them.
109	Arif	CL	What is the different between seasonal tropical forest and tropical rain/humid forest?	We improved the word to "tropical forest".
110	Arif	CL	Land use or Land cover?	In this PD, we applied land-cover approach according to Indonesia's national FREL methodology.
111	Arif	CL	Land cover analysis is using satellite imagery. Land use analysis is using...?	In this PD, we applied land-cover approach according to Indonesia's national FREL methodology.
112	Arif	CL	There are : (1) Project area; (2) target area; (3) Jurisdictional Area. This un-consistent is confusing !	Yes, we improved specific words; project area (farmer target area) and we eliminate jurisdictional area in this PD.

113	Arif	CL	Confusing...see previous comment !	Yes, we improved specific words; project area (farmer target area) and we eliminate jurisdictional area in this PD.
114	Arif	CL	Please refer to the Provincial/District Land Use Planning to make an analysis for infrastructure driver !	We checked current situation, but we did not identify specific infrastructure projects.
115	Arif	CL	Both reference region? Which is...?	In this PD, we set reference region in allover Kayoung Utra District. Therefore, we used "both". But for clear understanding, we use "sub-districts of XX and CC"
116	Arif	CL	What about coal mining? Forest and peat fire?	In the project area, there are not mining activities.
117	Arif	CL	Both reference region? Which is...?	As same as comments of No. 115
118	Arif	CL	Both reference region? Which is...?	As same as comments of No. 115
119	Arif	CL	Both reference region? Which is...?	As same as comments of No. 115
120	Arif	CL	What is Indonesian forest inventory?	Indonesian Forest Inventory means National Forest Monitoring System in Indonesia. We replace "Indonesian Forest Inventory" into "Indonesian National Forest Inventory" accordingly.
121	Arif	CL	What is mobility analysis?	The mobility analysis in this PD was resulted from discussions with all of stakeholder in and around GPNP, and means both easy and difficult for moving from village to village as results of working style and others.
122	Arif	CL	This statement is difficult to understand	We set leakage belts as neighbor sub-districts of Sukadana and Simpang Hilir sub-districts. We added some explanation.
123	Arif	CL	This statement is difficult to understand	As same as comments of No. 122
124	Arif	CL	Based on which reference?	As same as comments of No. 120
125	Arif	CL	This definition seems like in-line with the National FREL	Yes, all of methodologies are in line with the national FREL of Indonesia.
126	Arif	CL	Did you mean Indonesia's National Forest Inventory System?	As same as comments of No. 120

127	Arif	CAR	What is the "specific methodology"? Do you attach any information regarding the methodology?	All of processing methodologies are compiled by another product (document) which will be prepared until end of March. When we have third-party variation in the future, we will be able to explain by the product (document).
128	Arif	CL	Is it possible? For this definition, IJ-REDD+ project can proposed a definition based on the results of the project	In order to replace from secondary forest to primary forest takes very long time. But such succession is not impossible and REDD+ project is expected such effects.
129	Arif	CL	What kind of national strategies and action plans?	This means Indonesian National target according to UNFCCC COP15
130	Arif	CAR	This sentence is abruptly appear in this paragraph	Yes, we eliminate this sentence.
131	Arif	CAR	Figure number?	The pictures do not have figure number.
132	Arif	R	So..?? What is the relation between fire and conditions Prior to Program Initiation? I cannot follow the argument correctly.	This REDD+ program will start from June 2016. therefore fire condition until 2015 will be included in prior information.
133	Arif	CL	Can they do this? Do they have enough authority?	As same as comments of No. 2
134	Arif	CL	The project need to define jurisdiction REDD+ program, since the definition (where refer to) is still mixed up.	As same as comments of No. 36
135	Arif	CL	Co-Cheer?	Yes, this is spell-missed. We revised into "co-chairs".
136	Arif	CL	I cannot follow the argument.	Yes, indicated sentence is unclear. We eliminated it.
137	Arif	CL	Will logging activity deforest the area? Didn't they select the bigger tree? Not all trees were cutted down.	Yes, we added explanation that deforestation driver is illegal or unplanned logging activities.
138	Arif	CL	Are these REDD+ activities differ with Chapter 1.7?	REDD+ activities mentioned in this part is same as Chapter
139	Arif	CL	REDD+ activities are Reduction of D, D and +.	REDD+ activities mean direct and indirect activities for reducing deforestation, forest degradation and enhancing carbon stock. Therefore activity mentioned in this page is suitable as REDD+ activities.
140	Arif	CL	REDD+ activities are Reduction of D, D and +.	As same as comments of No. 139

141	Arif	CL	REDD+ activities are Reduction of D, D and +.	As same as comments of No. 139
142	Arif	CL	REDD+ activities are Reduction of D, D and +.	As same as comments of No. 139
143	Arif	CL	REDD+ activities are Reduction of D, D and +.	As same as comments of No. 139
144	Arif	CL	REDD+ activities are Reduction of D, D and +.	As same as comments of No. 139
145	Arif	CAR	Program Bo?	Yes, this is spell-missed. We revised into "boundary".
146	Arif	CL	What is the relation of this Carbon pool with the activities measured?	All of activities effect on carbon stock directly or indirectly. This table is according to VCS format.
147	Arif	CL	baseline land use?	Baseline land use is not specific word. In this part, the word is used as baseline scenario.
148	Arif	CL	What is pioneer shifting cultivation?	This chapter will be improved.
149	Arif	CL	What is REDD+ program scenario?	Program scenario means land use dynamics (forest conservation scenario) during activities introduced by the REDD+ project.
150	Arif	CL	Difficult to understand the meaning. Consistent with national forest management system?	Yes, this PD is consist with national forest management system. Because this PD applied land-use system (not apply land-based system)
151	Arif	CL	Means? I cannot follow the argument.	As above, this PD has no information gap with national system.
152	Arif	CL	What is JCM? Did you state any reference to the JCM?	If we applied VCS format, we should use the word of baseline scenario. To reduce confusion, we just added explanation by using JCM concept.
153	Arif	CL	If I am not mistaken, the VCS methodology for REDD+ has been established	The VCS allows to use CDM methodological tool, then we used it.
154	Arif	CL	?????	The word of "y" was mistake by us. We eliminated it.
155	Arif	CAR	Difficult to understand	This part is related in Additionality and indicated sentence is one of the assumptions which is according to baseline scenario. We added explanation.
156	Arif	CAR	Difficult to understand	This part is related in Additionality and indicated sentence is one of the assumptions which is according to baseline scenario. We added explanation.
157	Arif	CL	Three or Four alternatives?	Yes, three is correct. We revised from four to three in this sentence.

158	Arif	CL	Why did you say illegal because of Forum? Illegal is based on Law...	If the REDD+ program is implemented by specific concession, other land use activities including large agriculture project will be excluded by the concession. Therefore we mentioned as illegal.
159	Arif	CL	Difficult to understand. It is better to rephrase the sentence	Yes, we eliminated the sentence.
160	Arif	CL	Too expensive..	Yes, this was rough estimation by IJ-REDD+. This chapter mentioned REDD+ needs big budget and baseline scenario can not supply such budget.
161	Arif	CL	Overhead Costs (Transaction Costs) are too high...This is not the way REDD+ project should be !!! For the community it is better to invest other business such as palm oil which is more economically feasible than to support this project !!!	Yes, this was rough estimation by IJ-REDD+. This chapter mentioned REDD+ needs big budget and baseline scenario can not supply such budget.
162	Arif	CL	Too costly and no other REDD+ revenue???	Estimated cost is just assumption, but total cost will be very high and over district's annual budget. Details estimation will be included in final report of the IJ-REDD+ consultation team.
163	Arif	CL	This part need to be elaborated more clearly to the government and the project proponent.	Yes, after finalizing proponent, this part will be revised again. We added some explanation in this part.
164	Arif	CL	Is it possible? Please refer to the other best practice in foreign country or in Indonesia	As same as comments of No. 2
165	Arif	CAR	Difficult to understand. Please rephrase ...	Yes, we eliminated the sentence.
166	Arif	CAR	Was spent?	Estimated cost is just assumption, but total cost will be very high and over district's annual budget. Details estimation will be included in final report of the IJ-REDD+ consultation team.
167	Arif	CL	Who is the proponent? Getting more confuse with institutional arrangement and consistency of terminology on writing this document	As same as comments of No. 71
168	Arif	CL	What is "this REDD+ program" refer to?	As same as comments of No. 2

169	Arif	CAR	Figure number?	In the part of pictures, it will be not necessary to mentioned Figure No.
170	Arif	CL	What is this all special thing? Do you attach the methodology on processing the image? Or is it the data that purchased from the MoEF?	All of processing methodologies are compiled by another product (document) which will be prepared until end of March. When we have third-party variation in the future, we will be able to explain by the product (document).
171	Arif	CL	Too small....!!!	We revised the table.
172	Arif	CAR	???	This part was described according to VCS guidelines, and our sentences were to be assumed as general.
173	Arif	CL	Please refer to the Provincial/District Land Use Planning !	We checked current situation, but we did not identify specific infrastructure projects.
174	Arif	CAR	???	This part was described according to VCS guidelines, and our sentences were to be assumed as general.
175	Arif	CL	Please state the purpose of this observation points !	Our observation points were according to VCS guidelines, especially methodology 0015.
176	Arif	CL	The sequential processes of the overall methodology is not written in a process-based. Please ask related expert to write this part !!!	Overall methodology was reviewed by Prof. Amano who has much experiences in the field of IPCC and/or UNFCCC.

Appendix 7-2 Final Report

Indonesia-Japan Project for Development of REDD+ Implementation Mechanism (REDD+ Planning Study)

Report of REDD+ Options from Planning Study

Japan International Cooperation Agency (JICA)

Mitsubishi UFJ Research and Consulting

Japan Forest Technology Association

Landscape Forest Conservation in West Kalimantan Province, Indonesia

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Structure of This Document

- By using all of outcomes of the IJ-REDD+, future REDD+ implementation with some options are compiled in this document.
- Even in end of March 2016, international and/or national (Indonesian) REDD+ status had not been finalized and guidelines, modality and procedure for REDD+ also had not been developed under the UNFCCC and the Joint Crediting Mechanism (JCM). Therefore, based on some criteria (GHG emission reductions, proponent's status and so on), this document analyzed and showed following 4 directions (Project level with 2 scales, Landscape level and Sub-national level) of REDD+ in Southern West Kalimantan Province (Figure 1).

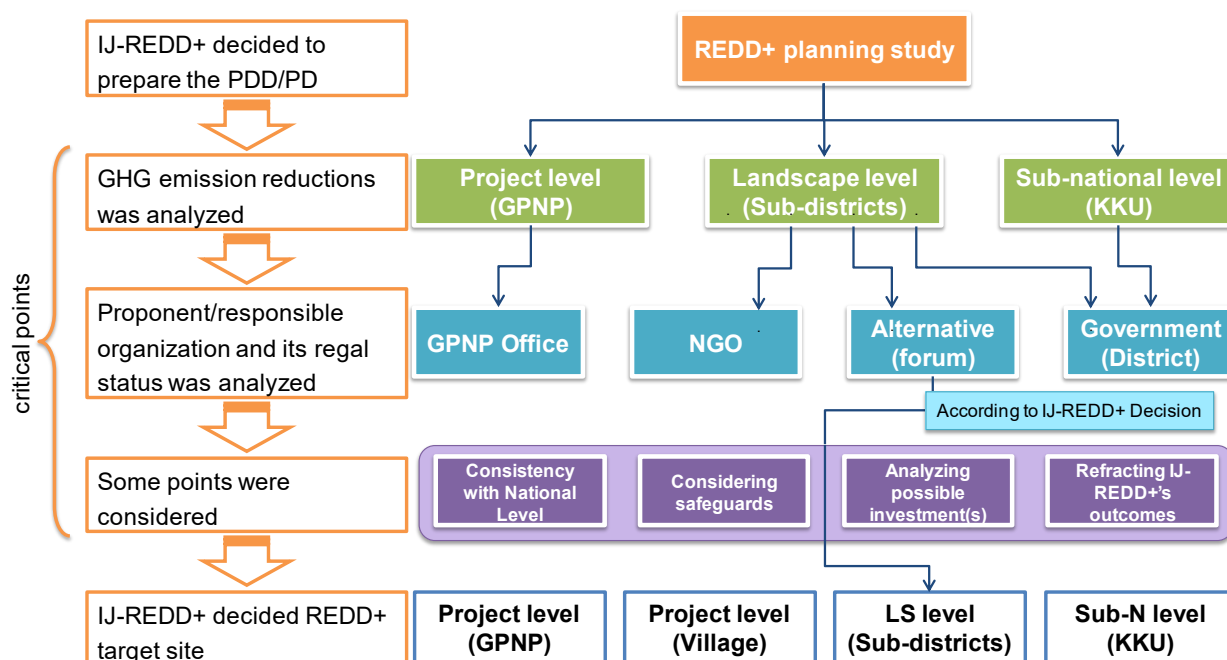


Figure 1 Some consultation points for deciding direction of REDD+ activities

- All of directions of REDD+ in Figure 1 will have potential to be implemented in the future, and this document addressed all of 4 options respectively. While mainly targeted landscape (LS) based REDD+ because most outcomes of the IJ-REDD+ overlapped with LS based REDD+ and LS based REDD+ was expected to get many GHG emission reductions by analyzed and identified counter-measure/activities (REDD+ activities) which was main outcome of the IJ-REDD+.

Note: some options and assumptions in each part are based on outcomes of the IJ-REDD+, but not according to actual results/demonstration/implementation, is actually options and assumptions.

Executive Summary

Executive Summary of the REDD+ plan (i.e., Project Design Document, PDD) is compiled by contents of each REDD+ planning (direction) respectively. Following is an example of landscape REDD+ planning targeting Sukadana and Simpang Hilir Sub-Districts in Kayong Utara District located in southern West Kalimantan Provinces. In cases of other directions; GPNP; village; and district (sub-national) based REDD+, their Executive Summary will be very similar with follows.

REDD+ plan targeting landscape is based on national and provincial forest conservation/REDD+ strategies and targeted adequate scale, which are focusing on Sukadana and Simpang Hilir Sub-Districts in Kayong Utara District located in southern West Kalimantan Provinces. Also all of activities under the REDD+ program are focusing on reducing deforestation and forest degradation through forest conservation concept of the proponent named as “Society of Friends of GPNP”. Forest area and its dynamics in Sukadana and Simpang Hilir Sub-districts are similar as overall West Kalimantan Province, which showed severe deforestation (land conversion from forest to other land categories) caused by human activities of expansion of plantation of oilpalm, rubber and other cash crops and mining. From results of fundamental survey for identifying land use change dynamics conducted by West Kalimantan Province, drivers of deforestation and forest degradation in target area are identified as mentioned below (Table 1).

Table 1 Identified drivers and categorized types of deforestation and forest degradation¹

GHG Sources	Drivers	
Deforestation	Planned	1) Expansion of local administrative/governance regions for infrastructure and other uses; 2) Approved legal forest conversion (based on spatial plans/RTRW); 3) Forest conversion on lands reserved for other purposes (APL); 4) Forest conversion for mining concessions (e.g., coal, copper, gold, silver, nickel, tin); 5) Forest conversion for estate crop plantations (e.g., oil palm, rice, rubber, coffee, cocoa)
	Unplanned	1) Unplanned forest conversion for estate crop plantations (e.g., oil palm, rice, rubber, coffee, cocoa); 2) Encroachment for timber, fuel wood, agriculture and small-scale mining; 3) Uncontrolled forest fires; 4) Land claims leading to conversion of forest areas
Forest Degradation	Planned	1) Approval of timber utilization permits (concessions) in natural forests; 2) Approval of industrial plantations in natural forests
	Unplanned	1) Timber harvesting over annual allowance; 2) Illegal logging; 3) Forest fires; 4) Human-induced forest fires for land clearing

¹ Hardiansyah G. et al. 2014. REDD+ Strategy and action plan of West Kalimantan Province. REDD+ KALBAR.

By considering such severe situation of deforestation and forest degradation, this plan was started by the “Society of Friends of GPNP”, who was established to implement collaborative management in the area, to reduce pressures on forest resources in targets area by implementing counter measures/activities (REDD+ activities) and aimed to reduce deforestation and forest degradation, and also to enhance carbon stock in the forests of target area.

To monitor results of implemented counter-measures by “Society of Friends of GPNP”, which are GHG emission reductions and removals from the atmosphere after undertaking activities, the REDD+ plan analyzed satellite images (LANDSAT TM and SPOT 5) from 2000 to 2013 to identify forest dynamics (changes in land and forest areas) in the target site. Additionally, the REDD+ plan analyzed the dynamics of each forest type and revised them on the basis of a ground truth (field survey and application of high resolution satellite imagery of SPOT 5). The REDD+ plan classified each forest type based on the Indonesian National Forest Inventory. The REDD+ plan then quantified the amount of carbon stock per unit area of each forest type based on country-specific emission/removal factors provided in Indonesian national forest reference emission level (FREL) which was submitted into UNFCCC in 2015. Finally, since the change in the amount of carbon stock in project area and its surrounded area was closely related to human activity, the REDD+ plan developed a new activities for the area under reference scenario and quantified its dynamics. From above monitoring and calculation process, as an ex-ante estimate, the REDD+ plan is expected to reduce GHG by 7,823,620 tCO₂e within 10 years (i.e., 782,362 tCO₂e/year) of the REDD+ plan start date.

1. Land and Forest Condition in Kayong Utara District of West Kalimantan Province

This part is general description for explaining land and forest condition of REDD+ target site. Following will be applied in all of cases of REDD+ plan (GPNP, village and district) in Kayong Utara District with no revision, and in case of other directions; GPNP; village; and district (sub-national) based REDD+, additional and detail information will be required if necessary.

In Indonesia, 94.4 million ha out of 190.5 million ha of total land (approximately 50.0%) is classified as forest, which is the third biggest tropical forest (approximately 10% of world tropical forest) behind Brazil and Democratic Republic of the Congo (DRC). Therefore, forest management in Indonesia is not a domestic agenda but the particularly important to mitigate global warming on global basis. However, as a result of exploitation of forest development and timber products since the early 1970s, over 20 million m³ of logs had been produced per year till 1990s and this significant deforestation became a concern world widely. In addition, illegal logging, forest fire, and conversion of lands to agriculture enhance forest degradation.



Typical land conversion from forest to other land categories in West Kalimantan Province

Forests in West Kalimantan Province where this REDD+ program locates, that covers a total area of 14,732 thousand ha, has a great potential to contribute reduction of greenhouse gas (GHG) emissions and enhance carbon stocks. In light of this, West Kalimantan Province is committed to contributing up to 7.8% of the national target in 2020. Then the Government of West Kalimantan Province has established a team to draft a provincial REDD+ strategy and action plan document for West Kalimantan Province based on the decision of the Governor of West Kalimantan No. 437/BLHD/2013. Also decision of the Governor of West Kalimantan No 115/BLHD/2012 was enforced to establish the REDD+ Working Group in the West Kalimantan Province.

2. Proponent to be Expected

This part has 4 options;

Following is case 1 which is targeting “landscape” REDD+ in project in Sukadana and Simpang Hilir Sub-Districts in Kayoug Utara District and is managed by the specific forum among some organizations.

[Case 1: Landscape based REDD+]

The REDD+ plan is conducted by “Society of Friends of GPNP” and implementing structure is shown in Figure 2. This REDD+ plan requires participation of various stakeholders to identify solutions to problems related to deforestation and forest degradation, a practice arising from unplanned land and forestry resource use and a major cause of deforestation and forest degradation in the area. The following structure for implementing the REDD+ plan was developed as part of preliminary work (including discussions with stakeholders).

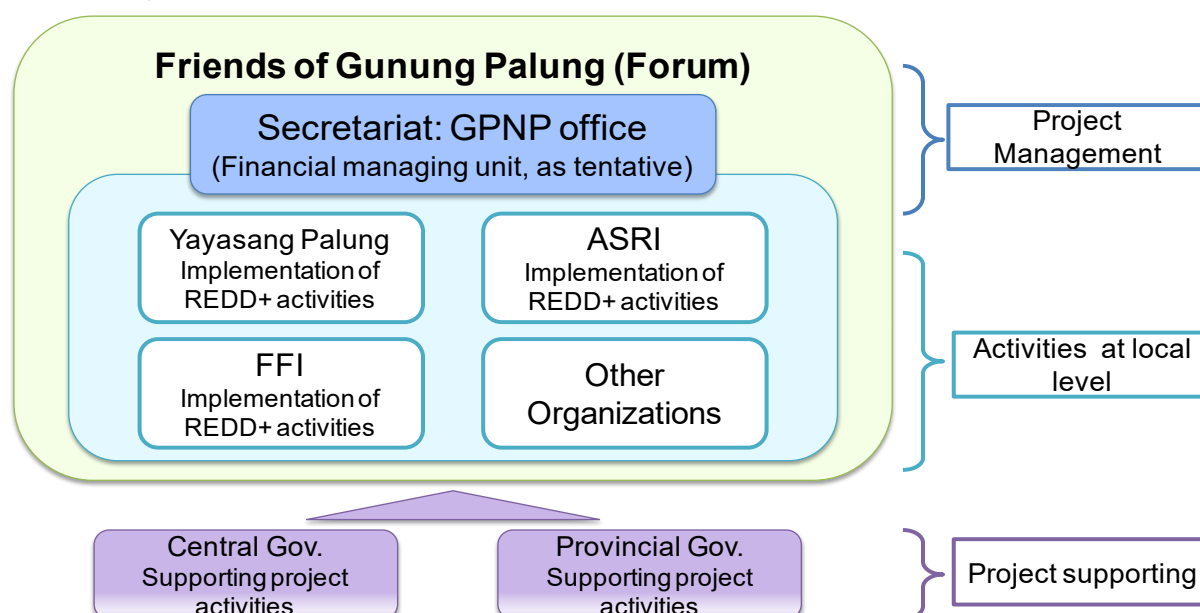


Figure 2 REDD+ plan implementation structure

The forum is consist of XX (Total number of organizations will be finalized later) organizations from central and local Governments, NGOs and private sectors, and has been established as a new organization those who have missions to 1) strengthen the communication of the parties in the landscape GPNP, 2) develop collaboration in the area of landscape management GPNP, 3) create synergy among the parties in the region and preserve the public welfare in the landscape of GPNP and 4) support and actively participate in the efforts of adaptation and mitigation of climate change in the landscape of GPNP to implement REDD+ plan in the area, which is according to Ministerial Degree No.45 (Amendment 2002). Also some related organizations who have specific technical advantages, for example, habitat management of Orangutan, carbon monitoring, participatory approach, introduction of alternative livelihood and so on, are joined to the forum as follows;

Organization name	Society of Friends of Gunung Palung (Forum)
Contact person	<i>Responsible person: under discussion (should be added)</i>
Title	The forum has been established according to Ministerial Degree No. 45, and consists of XX organizations from Governments, NGO and private sectors. Roles: <ol style="list-style-type: none"> 1. Strengthening the communication of the parties in the landscape GPNP 2. Develop collaboration in the area of landscape management GPNP 3. Creating synergy among the parties in the region and preserve the public welfare in the landscape GPNP 4. Support and actively participate in the efforts of adaptation and mitigation of climate change in the landscape GPNP
Address	Address: Jl. KH Wahid Hasyim 41-A, Ketapang, Kalimantan Barat, Indonesia
Telephone	Tel number: +62-(534) 33539
Email	E-mail (should be added)

Organization name	Gunung Palung National Park Office (GPNP)
Contact person	<i>Responsible person: under discussion (should be added)</i>
Title	Roles/ responsibilities: The GPNP office is responsible organization of the REDD+ program and secretariat of the Forum. The GPNP manages the task of forest conservation, forest monitoring. Also the GPNP has gathered opinions from all of stakeholders to help make profits as an incentive to sustain REDD+ over the mid- term and long-term.

This part has 4 options;

Following is case 2 and 3 which are “project” level which are targeting Gunung Palung National Park (GPNP) with management of GPNP Office and Village level with management of suitable body (e.g., NGO).

[Case 2 and 3: Project based REDD+ (GPNP or Village)]

The REDD+ plan is conducted by the GPNP (Figure 3). This REDD+ plan requires participation of various stakeholders to identify solutions to problems related to deforestation and forest degradation, a practice arising from unplanned land and forestry resource use and a major cause of deforestation and forest degradation in the area. The GPNP Office consults all of stakeholder; NGO, local people and international/national donor organizations and manage all of REDD+ related activities. The following structure for implementing the REDD+ plan was developed as part of preliminary work.

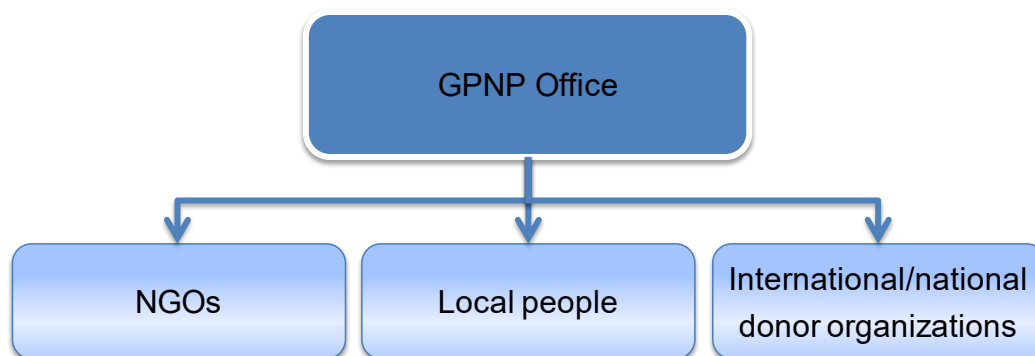


Figure 3 REDD+ plan implementation structure

Except for GPNP Office, some related organizations (e.g., NGO) who have specific technical advantages, for example, habitat management of Orangutan, carbon monitoring, participatory approach, introduction of alternative livelihood and so on, are joined to the REDD+ implementation team. Also in case of village level REDD+, similar implementation structure is to be developed, and suitable body/organization should be selected instead of GPNP Office,

This part has 4 options;

Following is case 4 which is targeting Kayong Utara (KKU) District and managed by KKU Government.

[Case 4: Sub-national based REDD+ (KKU)]

The REDD+ plan is conducted by KKU Government (Figure 4). This REDD+ plan requires participation of various stakeholders to identify solutions to problems related to deforestation and forest degradation, a practice arising from unplanned land and forestry resource use and a major cause of deforestation and forest degradation in the area. The KKU Government consults all of stakeholder; NGO, local people and international/national donor organizations and manage all of REDD+ related activities. The following structure for implementing the REDD+ plan was developed as part of preliminary work.

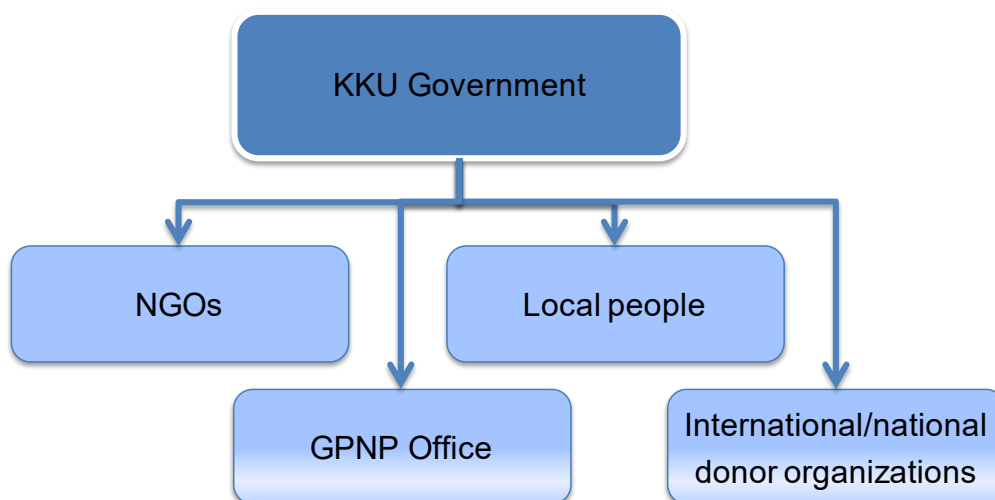


Figure 4 REDD+ plan implementation structure

Except for KKK Government, some related organizations (e.g., NGO) who have specific technical advantages, for example, habitat management of Orangutan, carbon monitoring, participatory approach, introduction of alternative livelihood and so on, are joined to the REDD+ implementation team.

3. Other Entities Involved in the REDD+ Program

This part has 4 options;

Following is case 1 which is targeting landscape REDD+ in project in Sukadana and Simpang Hilir Sub-Districts in Kayong Utara District and is managed by the specific forum among some organizations.

[Case 1: Landscape based REDD+]

This REDD+ plan has involved some organizations that have implemented REDD+ and their related activities. Each organization has many experiences to address to forest conservation activities in West Kalimantan Provinces and their knowledge is very specific to implement REDD+ activities in the area. Following organizations are core members and intensively implement REDD+ plan.

Organization	Yayasang Palung
Activity Start Year	From 2009 they have conducted “Gunung Palung Orangutan Conservation Program
Target village/area	Padu Banjar, Pulau Kumbang, Pemangkat, Nopah Kuning and Rantu Panjang villages in total 6,000 ha in SH. VV has planned to have concession of Hutan Desa (2,000 ha)
Activity Type	Hutan Desa (Village forest) in Simpang Hilir sub-district Habitat conservation: They have conducted “Gunung Palung Orangutan Conservation Program” which including scientific research, conservation and education activities. See details in Appendix 3
Concession type	Hutan Desa (2,000 ha, under preparing)

Organization	Alam Sehat Lestari (ASRI)
Activity Start Year	2007- Human health care services and forest care (against illegal logging) 2012- Environmental Education 2011- Forest Conservation (Forest guardians)
Target village/area	Total 24 villages, deeply 2 villages (Sudahan Jaya and) Reforestation 20 ha and restore 6 ha as key corridor for orangutan
Activity Type	Human healthcare service (against illegal logging): evaluating impact on illegal logging in village base in Sukadana sub-district Environmental Education: targeting children Forest Conservation: Forest Guardians monitor logging in their communities and conduct outreach for seeking alternative livelihood to loggers.
Concession type	-

Organization	Fauna & Flora International (FFI)
Activity Start Year	2007- Protecting carbon-rich peat forests in West Kalimantan (landscape-based HCVF assessment) 2011-2014 Asia-Pacific Community Carbon Pools and REDD+ Program
Target village/area	- Asia-Pacific Community Carbon Pools and REDD+ Program :Total 6 villages in Ketapang district (Including Laman Satong village) - Landscape-based HCVF assessment: Kapuas Hulu and Ketapang districts (working with oil palm plantation company, PT. PAS)
Activity Type	- Asia-Pacific Community Carbon Pools and REDD+ Program: conducting project pilot site included six villages, covering 14,325 ha of hutan desa (village forest) in Ketapang district. - High Conservation Value Forest (HCVF): protecting key orangutan habitat from conversion to palm oil plantations. FFI has been conducted HCVF at landscape level in community swamp forest.
Concession type	HCVF

Organization	Cipta Usaha Sejati Ltd (PT. CUS)
Activity Start Year	In 2008, a license was issued with letter No.280 by the forestry service.
Target village/area	Simpang Hilir sub-district The area including two village; Perawas and Sungai Rembawan,
Activity Type	- Under preparation for registering VCS VM0004, it aims to 1) Prevent conversion of the site to oil palm plantation Restore the vegetation to its original condition, 2) Improve the well-being of the local communities surrounding the project area by empowering their capacity, 3) Quantify avoided emissions associated with the conservation of this peat swamp forest and 4) Sell Verified Emission Reductions (VERs) generated by the project. - PT. CUS is a member of Roundtable on Sustainable Palm Oil (RSPO) operating two oil palm estate in Kayong Utara under PT.CUS (26,206 ha) and PT. Jalin Vaneo (18,909ha).
Concession type	The area is categorized as Other Land Use Areas (APL= Area untuk Penggunaan Lain), through Surat Keputusan Menteri Kehutanan No. SK.265/Menhut-II/2008 on 1 August 2008, for an area of 18,042.49 ha. PT CUS/JV has a clearing license for the area within the project site, and an Exploitation Rights (HGU = Hak Guna Usaha).

Organization	Forestry department of Kayong Utara District
Activity Start Year	In 2007, district was formed under Law No.6 of 2007 from Ketapang district.
Target village/area	24 in total and one ranger
Activity Type	Kayong Utara District
Concession type	- The department has 3 section; Protection forest, Rehabilitation forest and Plantation - Managing forest area (HL,HP,(HTI)) - Conducting Hutan Desa activities in Karimata island

This part has 4 options;

In case of case 2, 3 and 4, only GPNP Office or Village authority are proponent of the REDD+, and other entities involved in the REDD+ are depend on selection of REDD+ implementing scheme (whether collaborate with NGO or not). Therefore assuming each option's structure of the REDD+ is quite difficult by considering unclear REDD+ institutional arrangement in Indonesia.

[Case 2 and 3: Project based REDD+ (GPNP or Village)]

It is difficult to assume future implementing structure or collaboration system including other entities of NGO, local people and others.

This part has 4 options;

Following is case 4 which is targeting Kayong Utara (KKU) District and managed by KKU Government.

[Case 4: Sub-national based REDD+ (KKU)]

It is difficult to assume future implementing structure or collaboration system including other entities of NGO, local people and others.

4. REDD+ Start Date

This part is general description for explaining project start date. Following will be applied in various cases of REDD+ project in Kayong Utara District with no revision.

The start date of the proposed REDD+ plan's activities is June 1, 2016. The real activities of the REDD+ plan began on June 1, 2016, with the first orientation meeting in Sukadana Sub-district, Kayong Utara District.

5. REDD+ Crediting Period

This part is general description for explaining crediting period. Following will be applied in various cases of REDD+ project in Kayong Utara District with no revision.

The crediting period is 20 years: from June 1, 2016 to May 31, 2035 (the plan period is 40 years: from June 1, 2016 to May 31, 2055).

6. Estimated GHG Emission Reductions and/or Removals

This part is general description for explaining amount of GHG emission reduction or removals. Following will be applied in various cases of REDD+ project in Kayong Utara District with only revising and filling estimated values of its case.

Ex-ante estimates to determine plan scale were provided only for the first 10-year baseline period through to May 31, 2025.

The estimated mean annual GHG emission reductions by the plan (i.e., after accounting for leakage and prior to buffer withholding) are provided below (Table 2). Since the first baseline period is only 10 years, total GHG benefits are 7,823,620 tCO₂e.

Table 2 Estimated GHG emission reductions (tCO₂e) in the REDD+ program

Years	Estimated GHG emission reductions or removals (tCO ₂ e)
2016	782,362
2017	782,362
2018	782,362
2019	782,362
2020	782,362
2021	782,362
2022	782,362
2023	782,362
2024	782,362
2025	782,362
Total estimated ERs	7,823,620
Total number of crediting years	10
Average annual ERs	782,362

7. Location and Geographic Boundaries

This part is general description for explaining location and geographical boundaries. Following will be applied in various cases of REDD+ planproject in Kayong Utara District with only changing map and its related information.

West Kalimantan Province is located in the western part of the island of Kalimantan (formerly known as Borneo) or between 2°08'' North Latitude and 3°05' South Latitude and between 108°0' East Longitude and 114°10' East Longitude on the map of the earth. Based on that geographical location, West Kalimantan Province is traversed by the Equator (0° latitude) precisely on the city of Pontianak. West Kalimantan Province is also one of the tropical areas whose temperatures and humidity are quite high. Another characteristic of West Kalimantan Province is that it one of the provinces in Indonesia that is directly adjacent to a foreign country, that is, the State of Sarawak, East Malaysia.

Most of West Kalimantan Province is low-lying land with an area of 146,807 km² or 7.53% of the total area of Indonesia or 1.13 times the island of Java. The region stretches straight more than 600 km from north to south and about 850 km from west to east. In terms of size, West Kalimantan Province is the fourth largest province in Indonesia (204,534 km²). West Kalimantan Province is a sub-national Government administration with 14 districts/cities, including REDD+ plan site of Kayong Utara District (Figure 5).

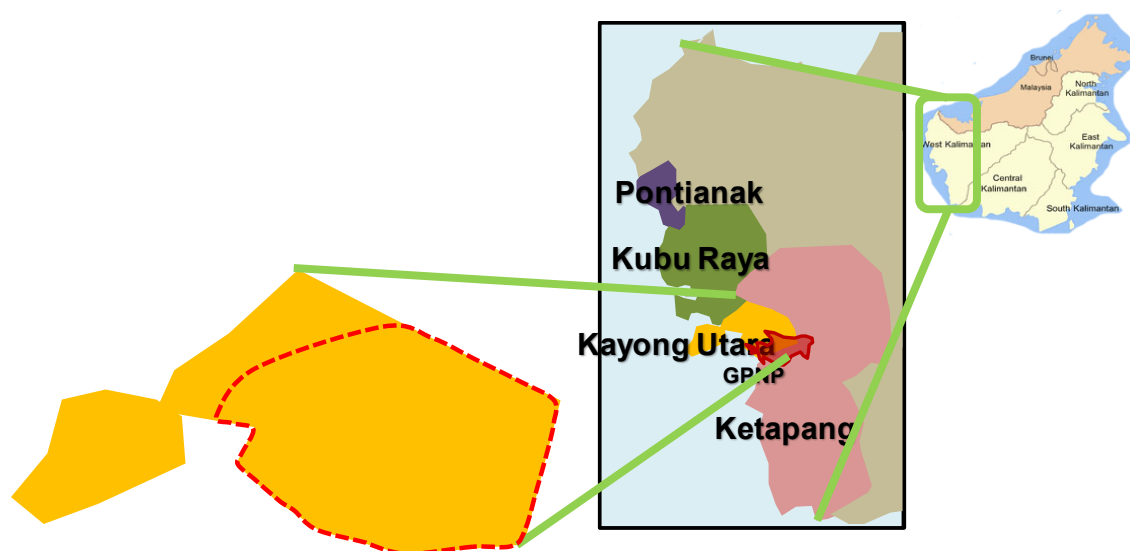


Figure 5 REDD+ program Location

The target site in this REDD+ program is Sukadana (1,027.1 km² in total) and Simpang Hilir Sub-districts (1,421.8km² in total) in Kayong Utara District (Figure 6). According to administrative boundary, there are 22 villages, which are 10 in Sukadana sub-district and 12 in Simpang Hilir sub-District. General information on each village is shown in Table 3.

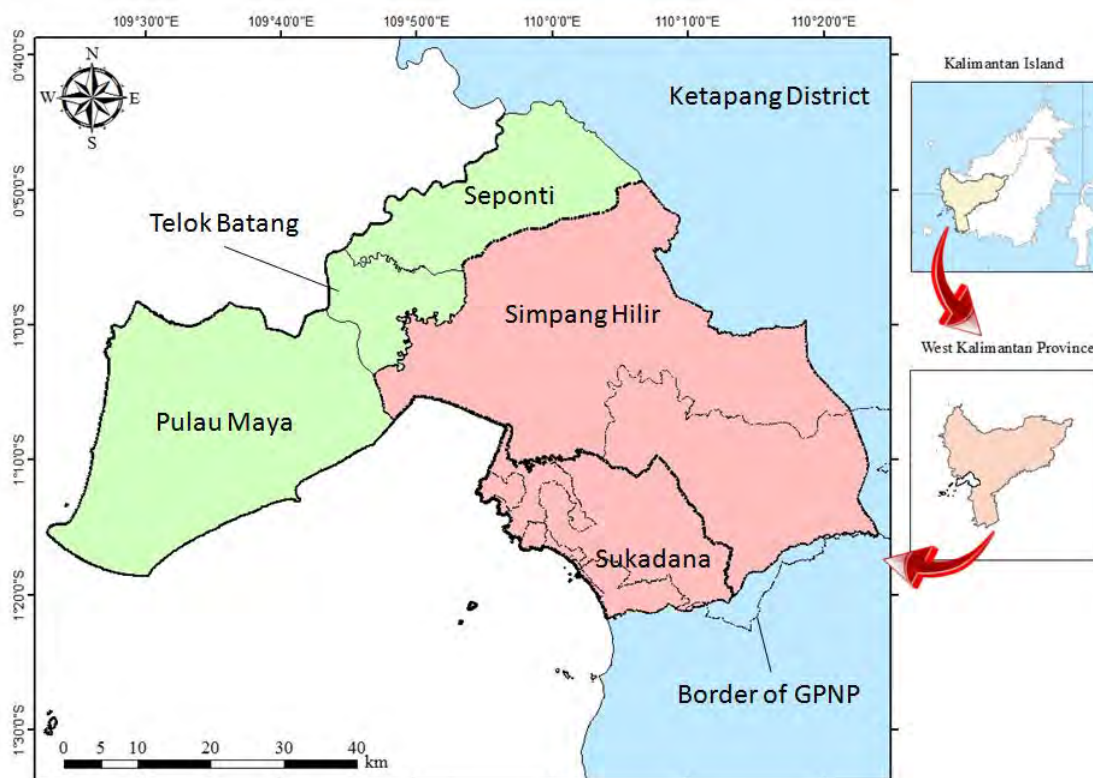


Figure 3 Location of both of Sukadana and Simpang Hilir sub-Districts

Table 3 General information on villages inside target area

Village name		Establishment of the Village	Registration of the Village	Number of sub-village in 2011	Number of households in 2011	Population	Major ethnic group	Land area (km ²)	Distance from District Center (km)
Sukadana	Simpang Tiga			3	466	1,730	Malay	75.0	21.0
	Sejahtera	N/A	1980	3	526	1,858	Malay, Bugis	126.7	5.0
	Pangkalan Buton	1978	1978	4	711	3,289	Malay	70.2	2.0
	Sutera			5	1074	4,733	Malay, Madura	63.3	0.0
	Benawai Agung	N/A	1985	3	588	2,084	Malay, Madura	144.4	6.0
	Harapan Mulia			3	702	2,492	Malay	192.0	12.0
	Sedahan Jaya	2005	2006	4	508	2,053	Malay, Jawa, Bali	41.3	7.5
	Gunung Sembilan	2005	2006	3	296	967	Malay	27.0	1.5
	Pampang Harapan	N/A	2007	3	269	1,136	Malay	64.3	21.5
	Riam Berasap Jaya			3	423	1,699	Malay	75.0	20.5
Simpang Hilir	Padu Banjar	1913	N/A	6	1028	3268	Malay	105.8	23.2
	Pulau Kumbang			4	572	2284	Malay	5.3	17.1
	Pemangkat			3	459	1597	Malay, Jawa	27.0	9.2
	Nipah Kuning			5	712	2536	Malay	27.0	4.8
	Rantau Panjang	1942	N/A	8	1012	3935	Malay, Jawa, China	49.3	5.0
	Penjalaan	1987	1992	3	647	2509	Malay	96.3	4.0
	Telok Melano			3	748	2822	Malay, China	7.4	0.6
	Sungai Mata Mata	1931	1958	4	887	3109	Malay	323.2	3.8
	Batu Barat	1942	1981	4	483	1903	Malay	183.2	16.0
	Matan Jaya			4	564	2475	Malay	312.1	87.0
	Lubuk Batu			2	234	890	Malay	276.5	60.0
	Medan Jaya	2005	2005	3	503	2010	Malay, Bugis	8.7	0.3

(1) Climatic conditions

The climate in West Kalimantan Province, including the project area of Sukadana and Simpang Hilir Sub-districts, is classified as “Tropical Rainforest Climate” under the Köppen climate classification. In Ketapang District facing on Kayong Utara District, the mean monthly high temperature ranges from 30.66°C in January to 32.36°C in May. The mean monthly low ranges from 23.34°C in July to 24.64°C in January (Figure 6). Annual rainfall is 3,134 mm (with monthly low of 125.1 mm in September and monthly high of 455.2 mm in November) (Figure 7).

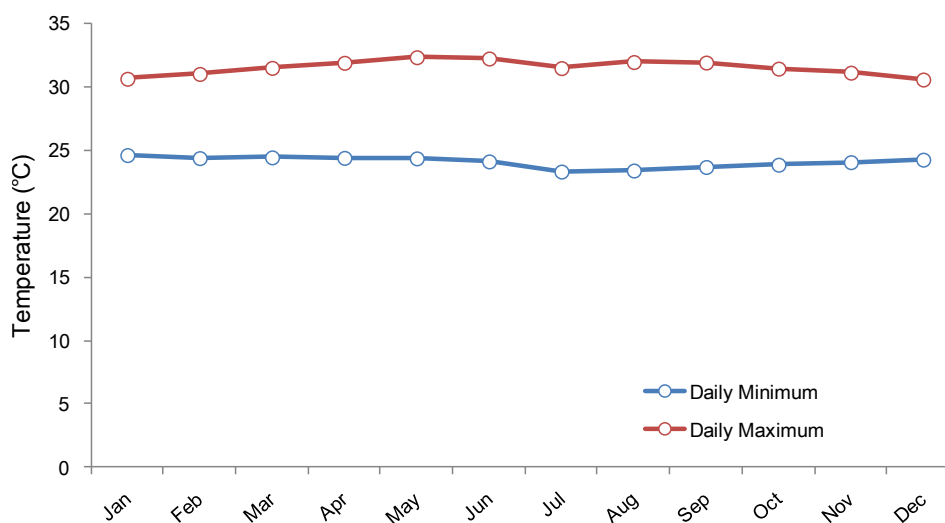


Figure 6 Temperature at the target site in West Kalimantan Province (Based on monthly averages for the 50-year period 1951-2000)

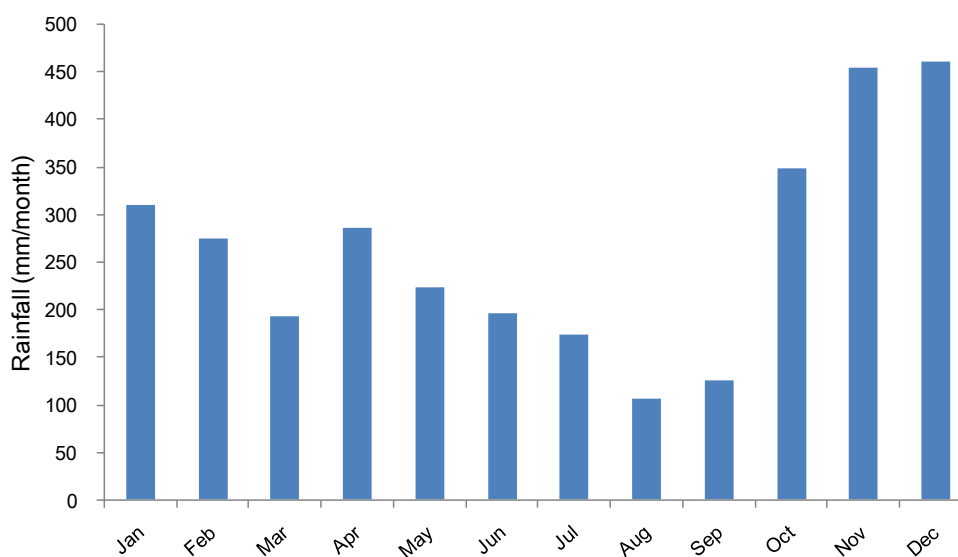


Figure 7 Rainfall at the target site in West Kalimantan Province (monthly averages for the 5-year period 2008-2012)

(2) Ecosystem conditions

The reference region of Kayong Utara District is located in southern West Kalimantan Province. The altitude of the main settlement in the REDD+ plan site is under 100 m. The native vegetation is the typical forest.

(3) Land use condition

Current land use is significantly affected by human activities. Rich forests have been converted to degraded forests. The results of land use analysis based on satellite imagery in Kayong Utara District or reference region show “Secondary Swamp Forest” was decreased 71,235 ha (approximately 61% compared with 2000). Land use in the project area is very similar to the typical pattern in Kayong Utara District in West Kalimantan Province.

(4) Endangered species

The reference region is including the habitat area of Orangutan. The some organizations have had activities/works to protect endangered wild Orangutans especially around the GPNP. This REDD+ program also makes consideration for endangered species.

All target area (i.e. project area) is under control by the REDD+ plan. Spatial boundaries consist of reference region, project area, leakage belt and forest (Figure 5). In this REDD+ plan, the plan set spatial boundaries based on following concepts.

8. Reference region

The concept of reference region should be different with each REDD+ plan (direction), but in all of directions of REDD+ target site are almost inside KKKU. Therefore following will be applied in various cases of REDD+ project in Kayong Utara District with no revision.

As shown in Figure 8, reference region in this plan (landscape base) are overall area in Kayong Utara District, West Kalimantan Province and it was because West Kalimantan Province and/or Kayong Utara District had not been developed sub-national baselines. Therefore, reference region was identified as overall Kayong Utara District including the project area of Sukadana and Simpang Hilir Sub-districts. It was because there is a typical forest ecosystem which is similar to the project area. Therefore, it is appropriate to set overall Kayong Utara District as the reference region for the project area. In the overall Kayong Utara District, the area under severe deforestation and forest degradation is expanding due to some drivers, which makes it even more appropriate to identify the overall district as the reference region for the project area. The reference region has an area of 413,208 ha (consist of 220,793 ha of forest area and 192,415 ha of non-forest area) – approximately 2 times bigger than the project area.

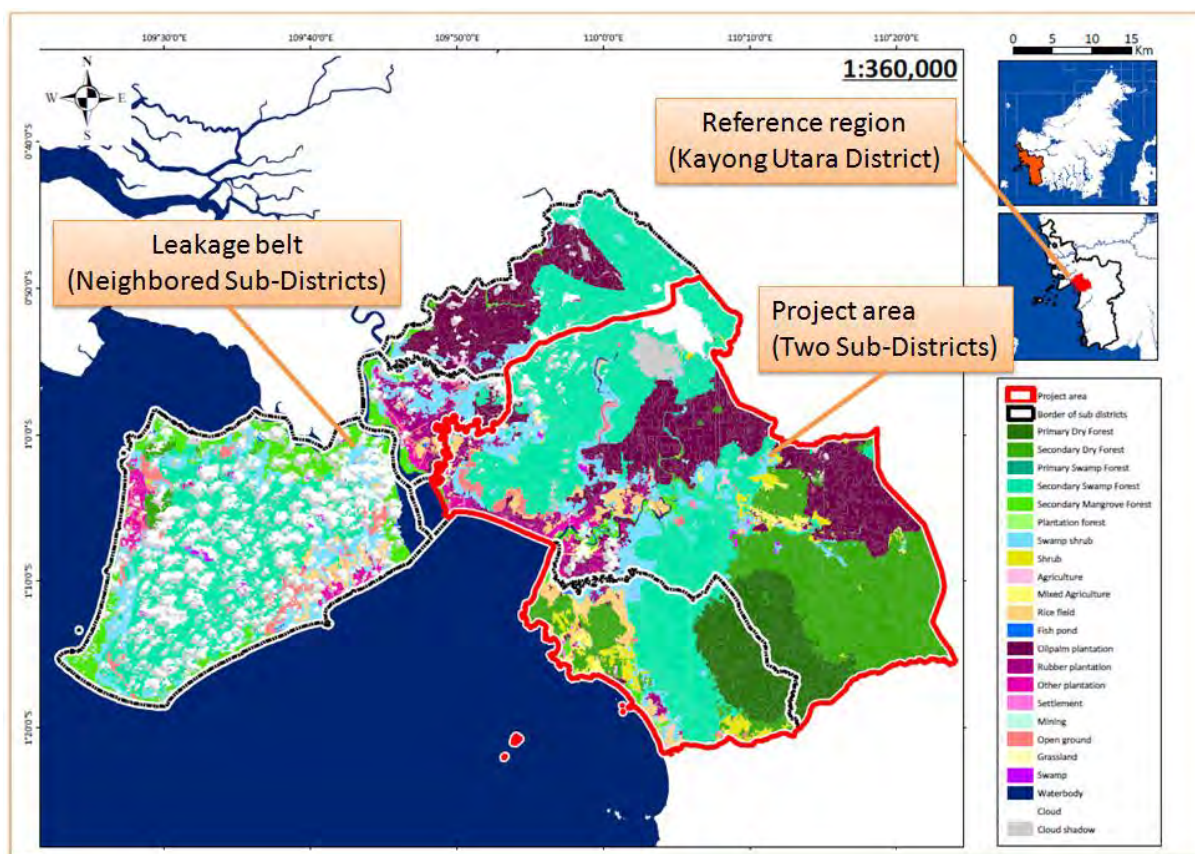


Figure 8 Spatial boundaries of reference region, project area and leakage belt

9. Project area

This part is general description for explaining project area. Following will be applied in various cases of REDD+ project in Kayong Utara District with revision of map and its explanation.

As shown in Figure 6, project area, which is project area in this PD are Sukadana and Simpang Hilir Sub-districts in Kayon Utara District, West Kalimantan Province. The location of the project area, including each village, main road and other related information are shown in Figure 9.

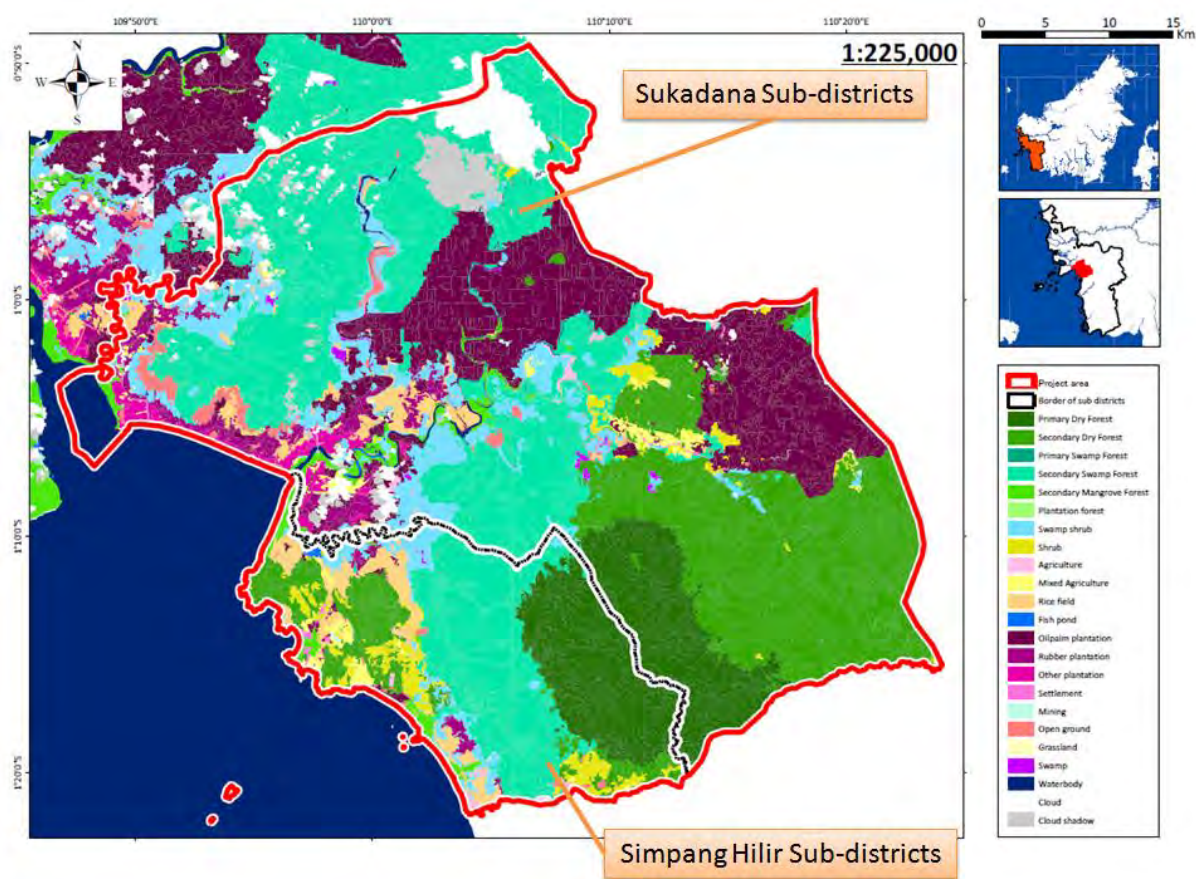


Figure 9 Project area of Sukadana and Simpang Hilir Sub-districts

The project area includes all forests area observed according to Indonesian National Forest Inventory within the boundaries of the project area and reference region, as illustrated in Figure 8. The total project area is 222,324 ha (project area is 133,615 ha including 88,709 ha of non-forest area) and location in each village is mentioned in Figure 9.

10. Leakage belt

This part is general description for explaining leakage belt. Following will be applied in various cases of REDD+ project in Kayong Utara District with revision of map and its explanation.

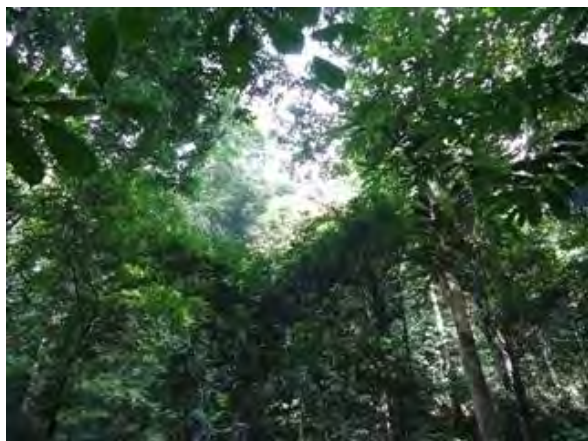
As shown in Figure 8, leakage belt in this project are same as reference region (overall area in Kayong Utara District, West Kalimantan Province). From results of preliminary survey before the commencement of the REDD+ program and mobility analysis by expert opinion and participant rural appraisal (PRA) of the REDD+ program, leakage belt was identified as neighbor regions in Kayong Utara District where is same as reference levels. Opinions from Officials of Kayong Utara District Government had been supported such concept of leakage belt.

11. Definition of Forest

This part is general description for explaining definition of forest. Following should be applied in all of cases of REDD+ plan in Indonesia.

According to the definition of Indonesian National Forest Inventory, the specific definition of forests in this REDD+ program is identified and applied to the REDD+ program as follows;

Minimum area of land	0.25 ha
Average tree height	5 m
Minimum tree crown cover	30% and above



Primary Dry Forest around GPNP



Oil palm (categorized as cropland) around GPNP

Also, forest classification such as primary dryland forest, Secondary dryland forest, Primary swamp forest and so on are adopted by Indonesian National Forest Inventory according to Minister Degree of SNI 8033, 2014. The baseline scenario is based on a multi-temporal historical analysis of deforestation. The analysis yielded a digital map of forest cover, deforestation that was filtered to a minimum-mapping unit (MMU) of 1.0 ha; the forest class has an overall accuracy of 80%. The forest benchmark was generated from the multi-temporal historical analysis. Also some area covered by clouds and shadows were analyzed according specific methodology. This forest class is according to Indonesian National Forest Inventory (Table 4).

Table 4 Applied forest class in this REDD+ program²

Forest class	Definition	Land clarification according to IPCC
Primary dryland forest	Natural tropical forests grow on non-wet habitat including lowland, upland, and montane forests with no signs of logging activities. The forest includes pygmies and heath forest and forest on ultramafic and lime-stone, as well as coniferous, deciduous and mist or cloud forest.	Forest
Secondary dryland forest	Natural tropical forest grows on non-wet habitat including lowland, upland, and montane forests that exhibit signs of logging activities indicated by patterns and spotting of logging. The forest is including pygmies and heath forest and forest on ultramafic and lime-stone, as well as coniferous, deciduous and mist or cloud forest.	Forest
Primary swamp forest	Natural tropical forest grows on wet habitat including brackish swamp, sago and peat swamp, with no signs of logging activities	Forest
Secondary swamp forest	Natural tropical forest grows on wet habitat including brackish swamp, sago and peat swamp that exhibit signs of logging activities indicated by patterns and spotting of logging	Forest
Primary mangrove forest	Inundated forest with access to sea/brackish water and dominated by species of mangrove and Nipa (Nipa frutescens) that has no signs of logging activities	Forest
Secondary mangrove Forest	Inundated forest with access to sea/brackish water and dominated by species of mangrove and Nipa (Nipa frutescens) that exhibit signs of logging activities indicated by patterns and spotting of logging	Forest
Plantation forest	Planted forest including areas of reforestation, industrial plantation forest and community plantation forest	Forest
Dry shrub	Highly degraded log over areas on non-wet habitat that are ongoing process of succession but not yet reach stable forest ecosystem, having natural scattered trees or shrubs	Grassland
Wet shrub	Highly degraded log over areas on wet habitat that are ongoing process of succession but not yet reach stable forest ecosystem, having natural scattered trees or shrubs	Grassland
Savanna and Grasses	Areas with grasses and scattered natural trees and shrubs. This is typical of natural ecosystem and appearance on Sulawesi Tenggara, Nusa Tenggara Timur, and south part of Papua island. This type of cover could be on wet or non-wet habitat	Grassland
Pure dry agriculture	All land covers associated to agriculture activities on dry/non-wet land, such as tegalan (moor), mixed garden and ladang (agriculture fields)	Cropland

² Directorate General of Climate Change 2015. National Forest Reference Emission Level for Deforestation and Forest Degradation in the Context of the Activities Referred to in Decision 1/CP.16, Paragraph 70 UNFCCC

Table 4 *continued*

Forest class	Definition	Land clarification according to IPCC
Mixed dry agriculture	All land covers associated to agriculture activities on dry/non-wet land that mixed with shrubs, thickets, and log over forest. This cover type often results of shifting cultivation and its rotation, including on karts	Cropland
Estate crop	Estate areas that has been planted, mostly with perennials crops or other agriculture trees commodities	Cropland
Paddy field	Agriculture areas on wet habitat, especially for paddy, that typically exhibit dyke patterns (pola pematang). This cover type includes rain-fed, seasonal paddy field, and irrigated paddy fields	Cropland
Transmigration areas	Kind of unique settlement areas that exhibit association of houses and agroforestry and/or garden at surrounding	Settlement
Fish pond/aquaculture	Areas exhibit aquaculture activities including fish ponds, shrimp ponds or salt Ponds	Wetland
Bare ground	Bare grounds and areas with no vegetation cover yet, including open exposure areas, craters, sandbanks, sediments, and areas post fire that has not yet exhibit regrowth	Other land
Mining areas	Mining areas exhibit open mining activities such as open-pit mining including tailing ground	Other land
Settlement areas	Settlement areas including rural, urban, industrial and other settlements with typical appearance	Settlement
Port and harbor	Sighting of port and harbor that big enough to independently delineated as independent object	Other land
Open water	Sighting of open water including ocean, rivers, lakes, and ponds	Wetland
Open swamps	Sighting of open swamp with few vegetation	Wetland
Clouds and no-data	Sighting of clouds and clouds shadow with size more than 4 cm ² at 100.000 scales display	No data

12. Program Boundary

This part is general description for explaining definition of forest. Following should be applied in all of cases of REDD+ plan in Indonesia.

In line with 2006 IPCC Guidelines for National Greenhouse Gas Inventories “Volume 4 Agriculture, Forestry and Other Land Use”, carbon pools, which are target of GHG emissions and removals, are defined as following Table 5.

Table 5 Selected Carbon Pools

Carbon pools	Included/excluded	Justification/Explanation of choice
Aboveground	Included	The baseline land use in the project area is conversion of forests to other land use, and degradation of natural and secondary forests by pioneer shifting cultivation. Therefore the carbon stock in this pool is likely to be relatively large compared to the REDD+ program scenario.
Belowground	Included	Recommended by the methodology as it usually represents between 15% and 30% of the above-ground biomass.
Dead wood	Excluded	Conservatively excluded (the carbon stock in this pool is not expected to be higher than the baseline compared to the REDD+ program scenario).
Harvest wood products	Excluded	Under the baseline scenario, illegal or selective logging occurs at very small scale. Such results were supported by results of preliminary survey. Therefore, harvested wood products have been considered insignificant.
Litter	Excluded	Not to be measured
Soil organic carbon	Included	To be measured

Also GHG types which are target of GHG emissions and removals are defined as following Table 6.

Table 6 Identified source of GHG types

	Gas	Included?	Justification/Explanation
Biomass burning	CO ₂	Excluded	Counted as carbon stock change
	CH ₄	Excluded	Considered insignificant
	N ₂ O	Excluded	Considered insignificant
Livestock emissions	CO ₂	Excluded	Not counted as carbon stock change
	CH ₄	Excluded	Not a significant source.
	N ₂ O	Excluded	Not a significant source.
Paddy field	CO ₂	Excluded	Not counted as carbon stock change
	CH ₄	Excluded	Not a significant source.
	N ₂ O	Excluded	Not to be measured

13. Land and Forest Dynamics

This part is general description for estimation process of land and forest area dynamics according to the methods of Indonesian national forest reference emission levels. Following should be applied in various cases of REDD+ project in Kayong Utara District with revision of target site. But land cover map in each year and estimated land and forest area dynamics as follows should be revised according to selected REDD+ site (directions).

The REDD+ program defined 23 land-cover classes, and many possible combinations of land-cover change categories.

The best practice in the remote sensing field emphasizes the use of medium resolution imagery as a very cost-effective method for classifying and monitoring forest cover and loss, and the type of spectral analysis using such imagery is sufficient to accurately distinguish closed-canopy forest from many vegetation formations. LANDSAT imagery, one such type of medium resolution imagery, was used in this REDD+ program to map the forest cover and loss. Following pictures shows areas of typical fallow in the REDD+ program site.



Landscape in Kayong Utara District facing GPNP

Land-cover change data for the reference region were mapped by JICA IJ-REDD+, via time-series analysis using satellite imagery of optical sensor data: LANDSAT-Thematic Mapper (TM) LANDSAT-Enhanced Thematic Mapper Plus (ETM+), for the reference period of 2000 to 2013. As a result, 23 classes were mapped, including forest cover and loss, non-forest, cloud, and water. In order to assure a high quality analysis, IJ-REDD+ special pre-processing, IJ-REDD+ interpretation and classification, and IJ-REDD+ post-processing steps was applied, and land-cover maps were developed (

Figure 10 to Figure 14).

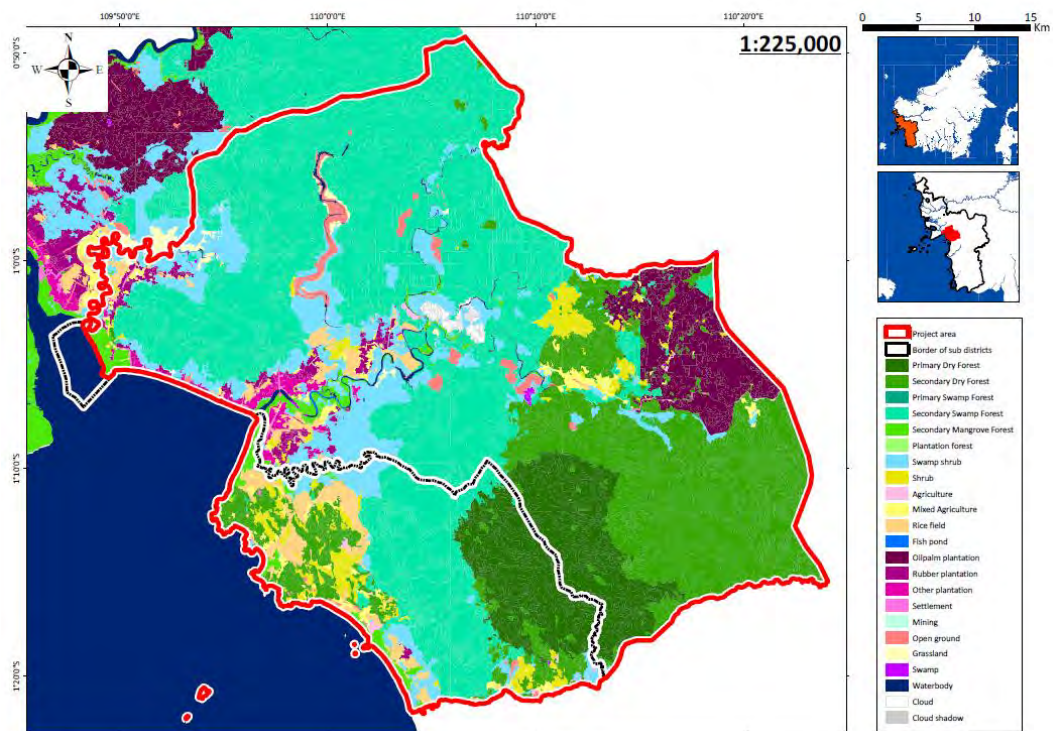


Figure 10 Land cover in reference period from 2000

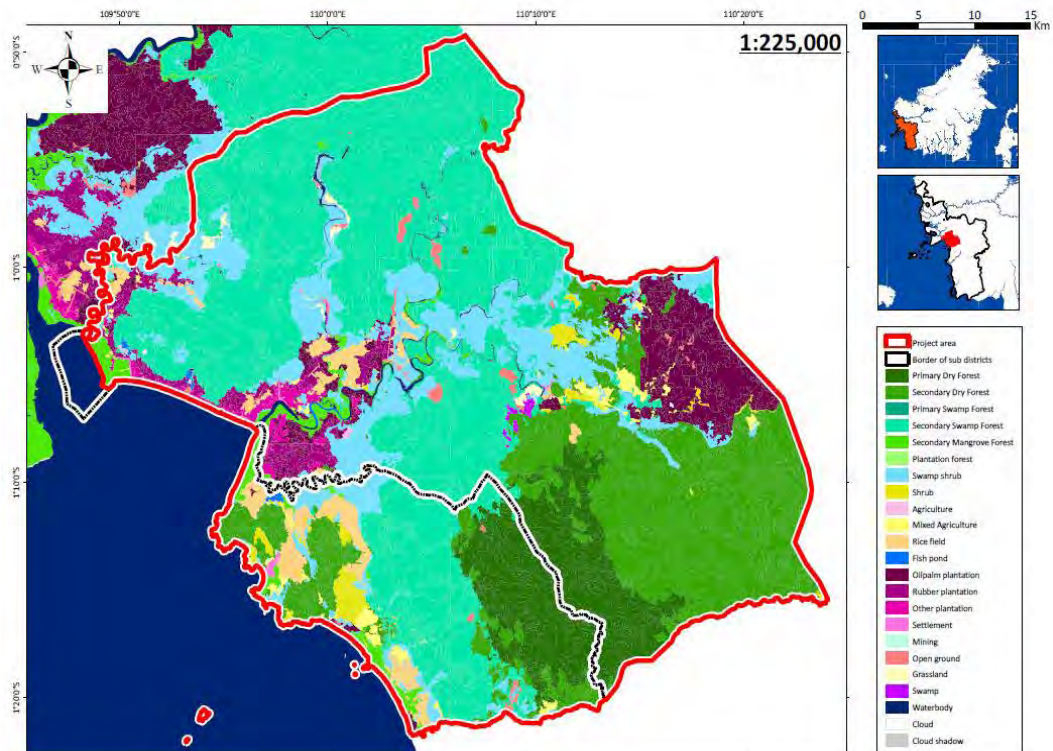


Figure 11 Land cover in reference period from 2006

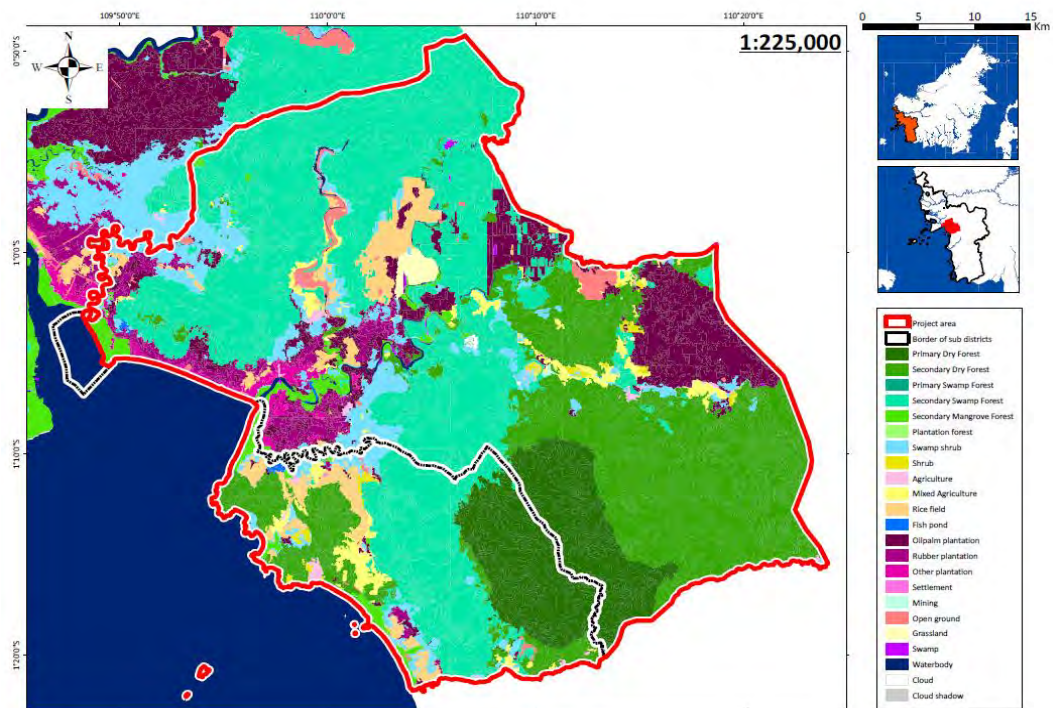


Figure 12 Land cover in reference period from 2009

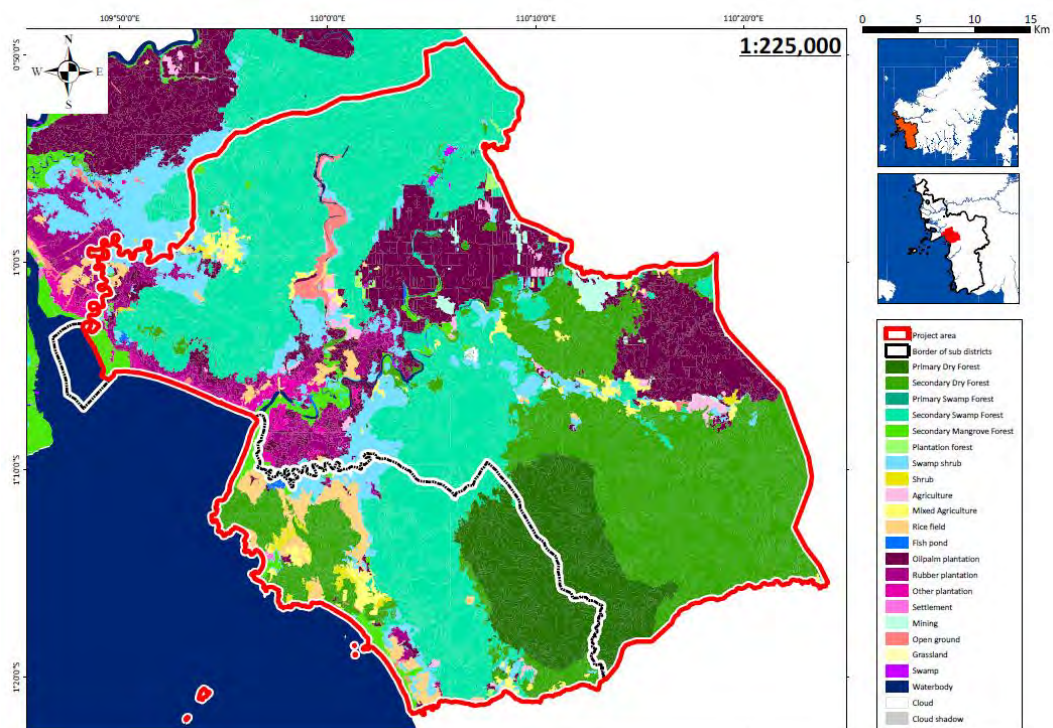


Figure 13 Land cover in reference period from 2011

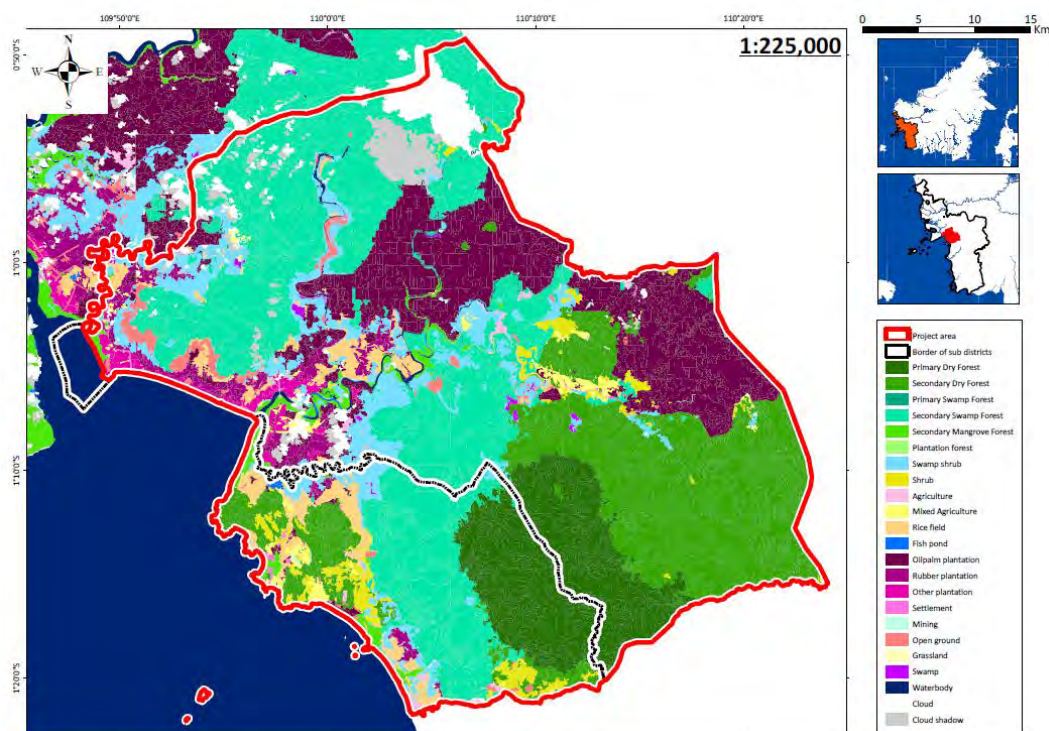


Figure 14 Land cover in reference period from 2013

From analysis by using land cover map in

Figure 10 to Figure 14, land dynamics in each category of reference region, project area and leakage belt are shown in

Figure 15 to

Figure 17 .

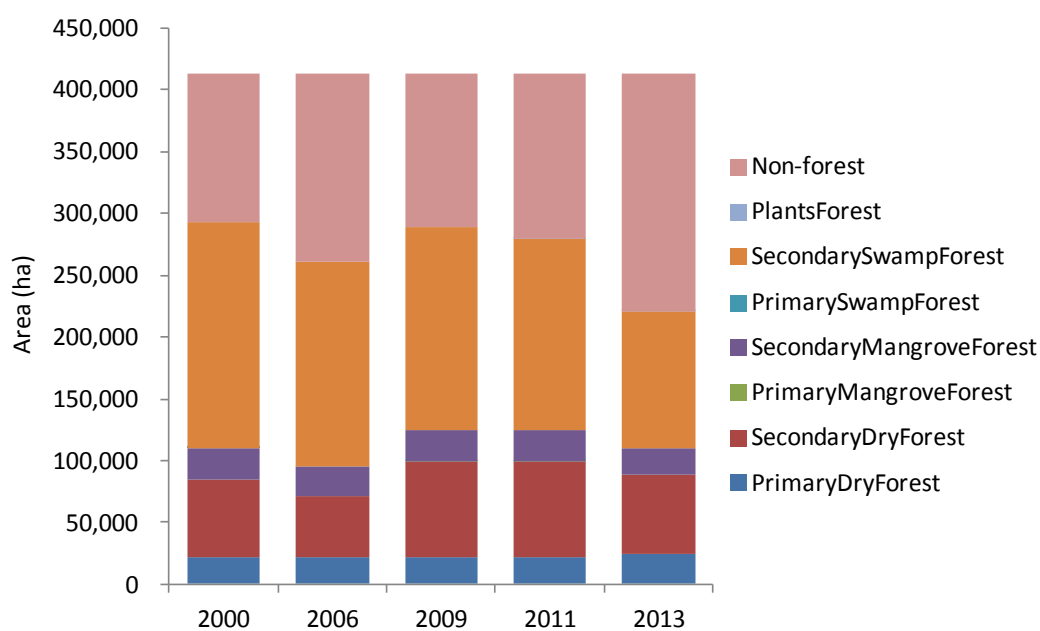


Figure 15 Dynamics of each type of forest area in reference region

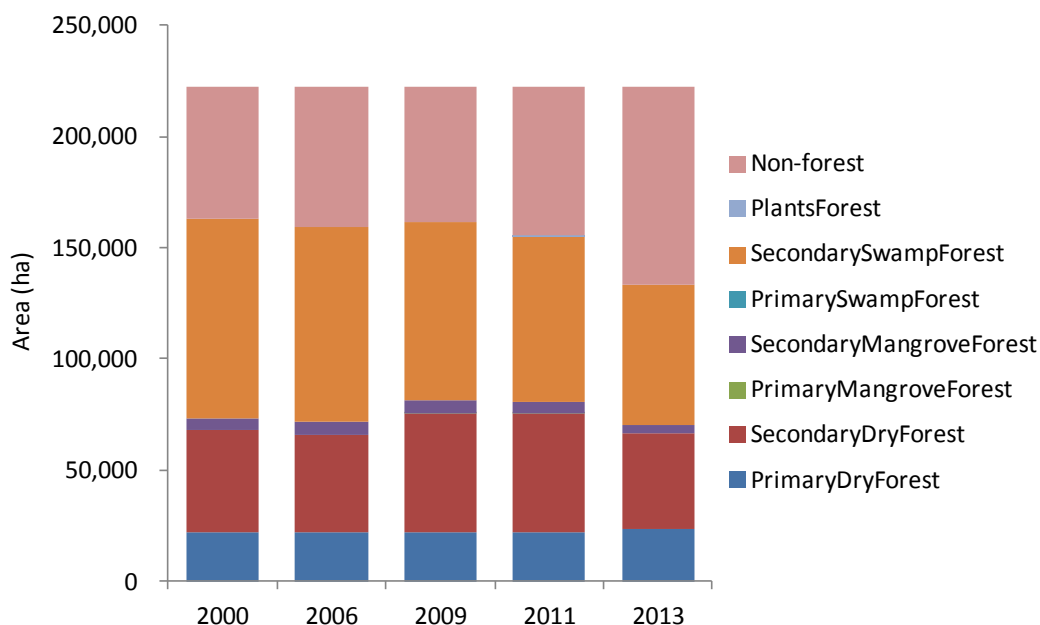


Figure 16 Dynamics of each type of forest area in project area

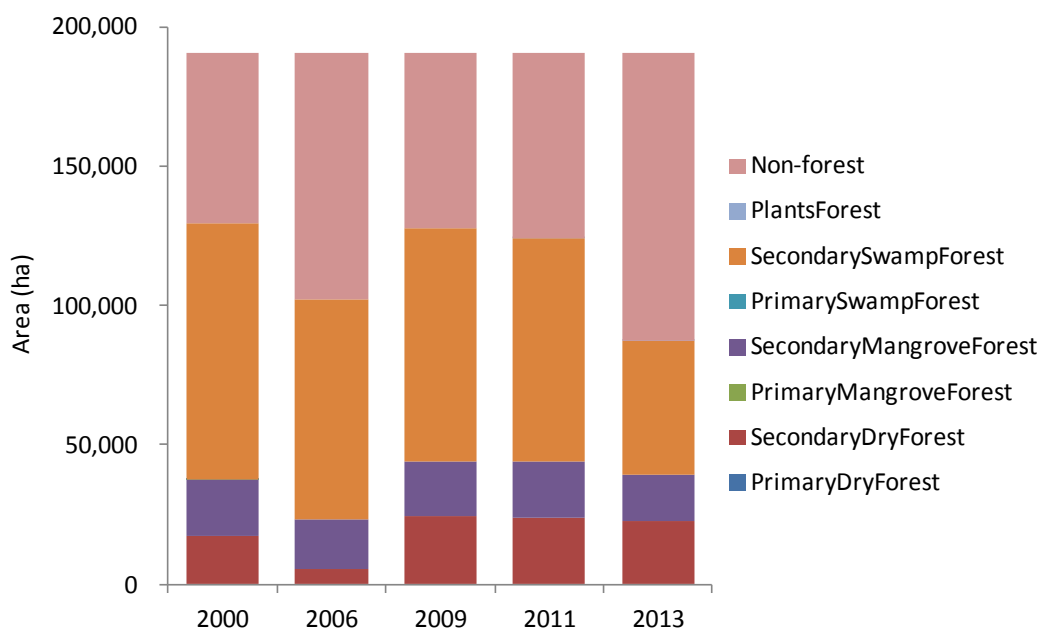


Figure 17 Dynamics of each type of forest area in leakage belt

The 2013 land cover classification developed by the methodology of this REDD+ program was validated by ground truth data of 1,143 points within West Kalimantan Province, which was acquired by IJ-REDD+. All plots were located within forested areas in project area, reference region and some plots are located in outside of reference region (but from same forest type and vegetation). The resulting confusion matrix for

forest and non-forest is presented in Table 7. The overall accuracy was 82.1%.

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Table 7 Result of accuracy assessment for forest and non-forest (2010 land cover classification by this REDD+ program's methodology)

V4_13		Verf																							Matched data	Class accuracy	
		2001_PrimaryDryForest	2002_SecondaryDryForest	2004_PrimaryMangroveForest	20041_SecondaryMangroveForest	2005_PrimarySwampForest	20051_SecondarySwampForest	2006_PlantsForest	2007_Shrub	20071_SwampShrub	20091_Agriculture	20092_MixedAgriculture	20093_RiceField	20094_FishPond	2010_Plantation_oilpalm	2010_Plantation_others	2010_Plantation_rubber	2012_Settlement	2014_OpenGround	20141_Mining	3000_GrassLand	5001_WaterBody	50011_Swamp	SubTotal			
Classification	2001_PrimaryDryForest	40																						40	40	100.0	
	2002_SecondaryDryForest		86						2			4												92	86	93.5	
	2004_PrimaryMangroveForest																										
	20041_SecondaryMangroveForest				73		2			3												3		81	73	90.1	
	2005_PrimarySwampForest					29	1																	30	29	96.7	
	20051_SecondarySwampForest		1		2	1	84			8						1			1					98	84	85.7	
	2006_PlantsForest						1	36											2					39	36	92.3	
	2007_Shrub		4						48	13	1	6				1			2						75	48	64.0
	20071_SwampShrub			1	1		3		6	81	1	2	1			1	3	1	1						102	81	79.4
	20091_Agriculture									1	6	38					3	1	1						50	38	76.0
	20092_MixedAgriculture			5						10	2		45	2				3	1	3		1			72	45	62.5
	20093_RiceField									1	8	4		63			5			5					86	63	73.3
	20094_FishPond										1				2	36							2	1	42	36	85.7
	2010_Plantation_oilpalm						2			1	4	2				71	1		1	5					87	71	81.6
	2010_Plantation_others									1	2	2	1	3			66	2	1						78	66	84.6
	2010_Plantation_rubber										6	2		3				66						1	78	66	84.6
	2012_Settlement										2	2							53	12				2	71	53	74.6
	2014_OpenGround									1	5		1	2		3	1			75					88	75	85.2
	20141_Mining										1		1	2				1		9	31			2	47	31	66.0
	3000_GrassLand																					9			9	9	100.0
5001_WaterBody							1															78	1	80	78	97.5	
50011_Swamp							4			5									4					35	48	35	72.9
SubTotal		40	96	1	76	30	98	36	71	147	52	60	78	36	76	81	73	57	119	31	10	85	40	1393	1143	82.1	

14. Peat Soil Distribution

This part is general description for identifying peat soil distribution. In case of IJ-REDD+ activities in West Kalimantan Province, new peat distribution map was prepared and applied it in REDD+ plan of landscape level as follows. However national adopted methodologies to identify peat distribution map is still unclear even in March 2016. Therefore it is very difficult to select suitable methodologies or select official peat distribution map.

To estimate carbon stock change in above-ground and below-ground biomass, we used analyzed land cover maps and emission factors. On the other hand, as specific situation in West Kalimantan Province, GHG emissions from peat soil were also important when we estimate landscape level's GHG emission with high accuracy. Then, in this PD, peat soil distribution was improved by field survey (*see pictures below*), which was based on internationally used peat soil distribution map prepared by the Wetland International³.



Survey of peat soil distribution

For improving peat soil distribution in 4 districts facing on ocean in West Kalimantan Province, 324 points are surveyed and soil type and peat depth are monitored and recorded (

Figure 18). From such survey, peat soil distribution applied in this PD was improved (Figure 19).

³ Wetlands International 2004. Maps of peatland distribution and carbon content in Kalimantan, 2000-2002. 51.

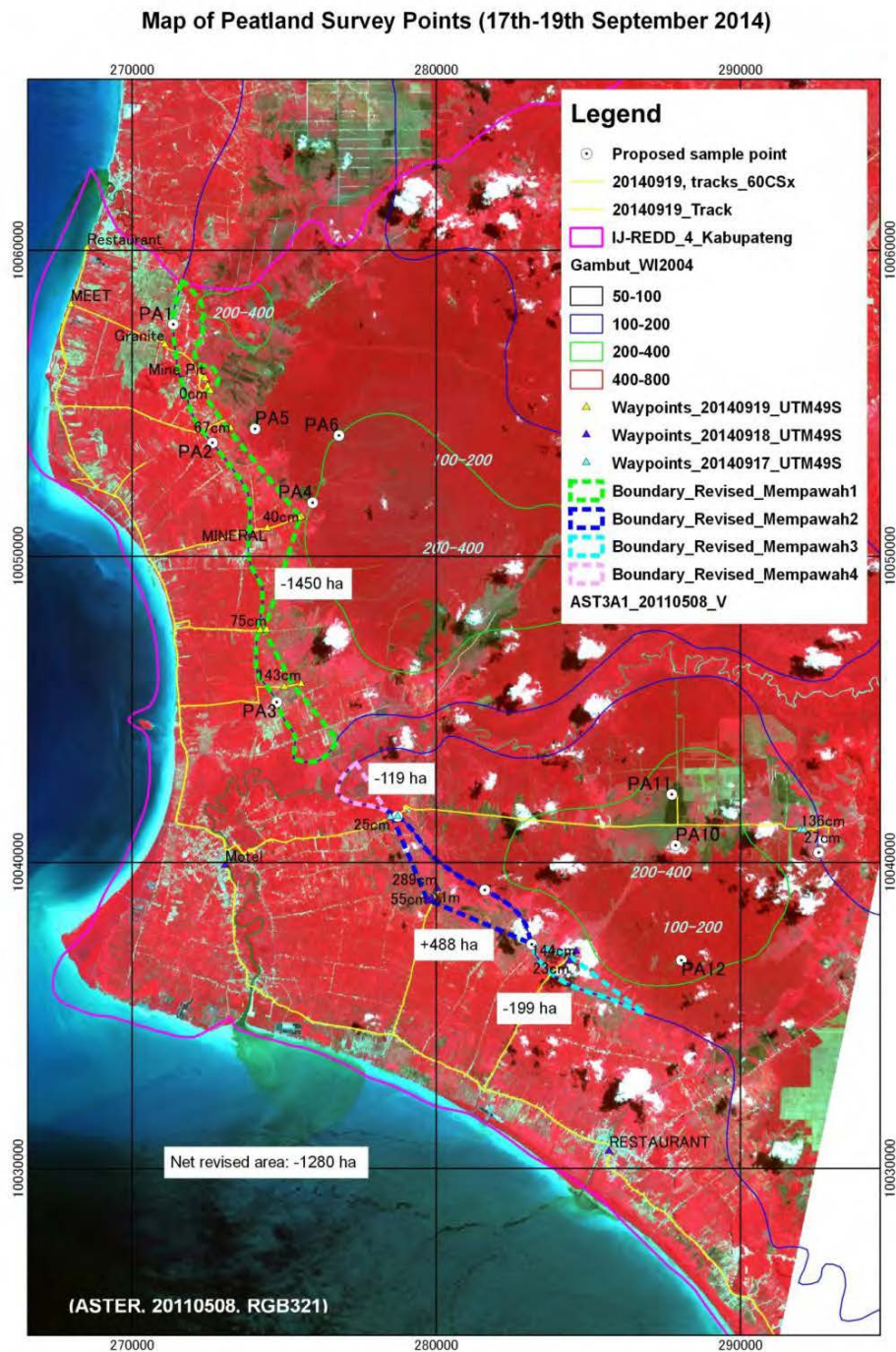
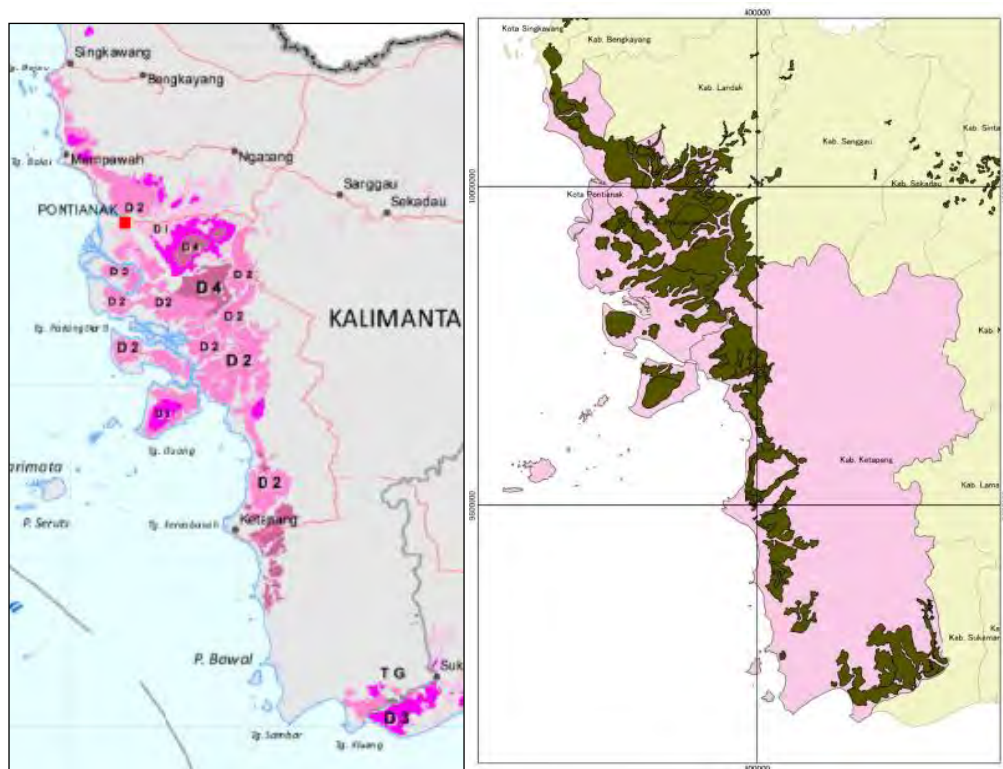


Figure 18 Survey points of peat soil distribution



Left: map prepared by Ritung et al (2011) Right: map prepared by Wetlands International (2004)

Figure 19 Image of peat soil distribution compared with the map prepared by the Wetland International

As results of improvement of peat soil distribution, total area of peat soil are estimated as mentioned in Table 8.

Table 8 Improved peat soil area in 4 districts

	Wetland International 2004	Ritung 2011	IJ-REDD+
Kayong Utara	163,303	214,054	193,930
Ketapang	337,552	255,873	259,283
Kubu Raya	410,241	519,885	503,990
Pontianak	70,889	74,755	74,441
Kab Pontianak	398	2,280	2,801
Total	982,383	1,066,847	1,034,445

15. Compliance with Laws, Statutes and Other Regulatory Frameworks

This part is general description for explaining project start date. Following will be applied in various cases of REDD+ project in Kayong Utara District with no revision.

The REDD+ program aims to be in compliance with Indonesia's laws and regulations, as well as those

governing international trade. Specifically, the most relevant local laws and regulations related to the REDD+ program activities include:

- Law No. 5 of 1990 on Natural Resources Conservation and Biological Ecosystem
- Law No. 41 of 1999 on Forestry
- Law No. 32 of 2004 on Regional Government
- Law No. 26 of 2007 on regarding Spatial Planning
- Law No. 32 of 2009 on Environmental Protection and Management
- Presidential Regulation No. 61/2011 regarding National Action Plan on GHG Emission Reduction
- Presidential Decree No. 62/2013 regarding managing agency for the reduction of emission from deforestation and degradation of forest and peatlands
- Government Regulation No. 44 of 2004 on Forestry Planning
- Government Regulation No. 45 of 2004 on Forest Protection
- Government Regulation No. 6 of 2007 on Forest Management and Formulation of Forest Management and Forest Utilization Plan
- Government Regulation No. 38 of 2007 on the Division of Governmental Affairs Between the Government, Provincial Government and Regency/Municipal Government
- Government Regulation No. 10 of 2010 on the procedure of altering the appropriation and function of forest areas
- Government Regulation No. 24 of 2010 on the Use of Forest Areas
- Government Regulation No. 60 of 2012 on the amendment of No. 10/2010 on Procedures for altering the appropriation and function of forest areas
- Minister of Forestry Regulation No P.68/Menhut-II/2008 on the Implementation of Demonstration Activities on Reduction of Emission from Deforestation and Degradation
- Minister of Forestry Regulation No. P.61/Menhut-II/2008 regarding Provisions and Procedures for the Granting of Business Permits for the Utilization of Products of Wood Forest Ecosystem Restoration in Natural Production Forests thru Application.
- Minister of Forestry Regulation No.P.30/Menhut-II/2009 Reduction of Emissions from Deforestation and Forest Degradation Procedure
- Minister of Forestry Regulation No. P.4/Menhut-II/2011 - Forest Reclamation Guidelines
- Minister of Forestry Regulation P. 20/Menhut-II/2012 on Implementation of Forest Carbon
- Minister of Forestry Decree No. 259/Kpts-II/2000 regarding harmonization of Central and Provincial Spatial Plans
- Minister of Forestry Decree No. SK.455/Menhut-ii/2008 on Working Group on Climate Change in the Department of Forestry
- Ministry of Forestry Decree No.P.36/Menhut-II/2009 regarding Procedures for Licensing of Commercial Utilization of Carbon Sequestration and/or Storage in Production and Protected Forests.
- Minister of Forestry Decree No. SK 13/Menhut-II/2009 on Climate Change Working Group in the Ministry of Forestry

- Minister of Forestry Decree No SK.199/Menhut-II/2012 on Creation of The Preparatory Unit for The Macro Plan for Forestry Tenure

16. Baseline Details

This part is general description for explaining project start date. Following will be applied in various cases of REDD+ project in Kayong Utara District with no revision.

The historical reference period is from 2000 to 2013, totaling 14 years. The start and end date of the REDD+ program crediting period, 20 years in total, are June 1, 2015 and May 31, 2034, respectively. The REDD+ program crediting period is subject to renewals. The fixed baseline period covers a 10 years period from 2016 to 2025. The minimum duration of a monitoring period will be one year and will not exceed the fixed reference period. It is expected that monitoring reports will be issued every 3-5 years, depending on REDD+ program circumstances.

17. Drivers of Deforestation and Forest Degradation

This part is general description for explaining project start date. Following will be applied in various cases of REDD+ project in Kayong Utara District with revision of specific name and location.

17.1. Agents and drivers of deforestation

To analyze the agents and drivers of deforestation in the project area of Sukadana and Simpang Hilir Sub-districts, the REDD+ program proponents used participatory methods. Interviews to Officials of Kayong Utara District Government, proponents were conducted to identify that there are similar condition of agents and drivers of deforestation between Kayong Utara District (reference region) and the Sukadana and Simpang Hilir Sub-districts (project area). The first main deforestation drivers in both areas are exploitation of the forest area for oil palm plantation and second one is the land conversion from forest area to substantial small scale crops land.

17.2. Agents groups

The agents of deforestation both within Kayong Utara District (reference region) and the project area of Sukadana and Simpang Hilir Sub-districts are almost all of small farm holders using conventional techniques to convert natural forests and secondary forests into croplands.

17.3. Infrastructure drivers

In both reference region and project area, there is no new improved infrastructures related deforestation and forest degradation.

17.4. Other spatial drivers expected to influence the project area

From interviews to Officials of Kayong Utara District Government, no other major drivers were identified in both reference region and the project area, therefore, no additional drivers are expected to emerge near or inside the project area.

17.5. Socio-economic conditions

According to the information from the officials in Kayong Utara Government, legal status of the land, land tenure, enforced policies/regulations and socio-economic conditions in both reference region and the project area are similar, therefore, it is appropriate to set overall Kayong Utara District as the reference region for the project area.

18. REDD+ Activities

This part is general description for explaining project start date. Following will be applied in various cases of REDD+ project in Kayong Utara District with revision of specific name and location.

The agents, drivers, and underlying causes of deforestation and forest degradation in the project area were identified through the socio-economic survey, such as interviews with local stakeholders (officials from the GPNP, NGOs and community leaders) a review of socio-economic study conducted by the IJ-REDD+, participatory workshops in community, and experts opinions. The process of identifying drivers and agents and selecting REDD+ activities for reducing GHG emissions are shown in Figure 20.

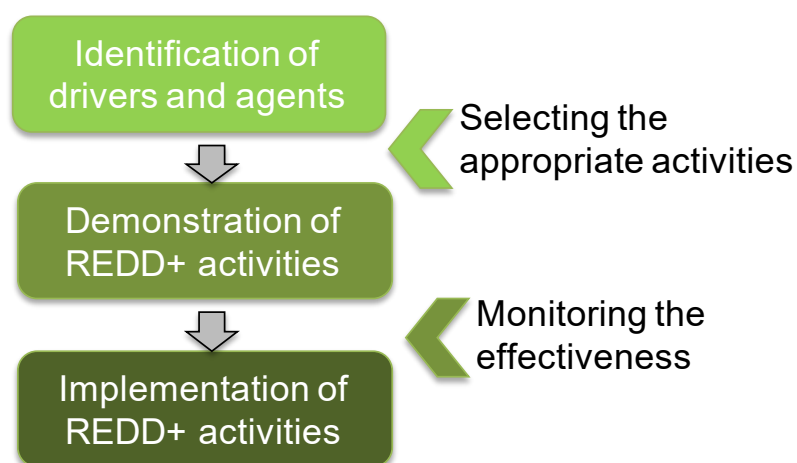


Figure 20 Process of identifying drivers and agents and selecting REDD+ activities

18.1. Identification of agents and drivers of deforestation and forest degradation

Based on the sources described above, 1 agent group was identified in planned deforestation and 3 agents group were identified in unplanned deforestation and forest degradation. Oil palm plantation settler is the main agents responsible for deforestation since around the year of 2007. Other agents, small scale subsistence farmers who converted forest area to crops land and forest resource user, also present in the

project area.

18.2. Identification of underlying causes of deforestation

The underlying causes make the unsustainable exploitation of forest in the project area are summarized below;

- Market price of palm oil
- Market price of rubber
- Lack of land use and natural resource management policies/ rules and their enforcements in community level
- Lack of coordination for forest governance among local government
- Lack of coordination for forest management among local stakeholders (community, government and NGOs)
- Lack of agricultural techniques
- Lack of economic opportunities other than working in oil palm plantation
- Population Growth

18.3. REDD+ Activities (Counter-measure/activities for Deforestation and Forest Degradation)

As mentioned above, the landscape level has multi agents and drivers, and multi underlying causes for deforestation and forest degradation. Thus the REDD+ activities are implemented through the two scales to avoid the baseline deforestation and forest degradation. One is small scale activity which carried out by the NGOs in order to approach multi agents and drivers in each village level. The other is wide scale to handle with the underlying causes. This approach ensures that the communities are undertaking activities or benefiting from the inputs that are well suited to their circumstances and needs, and are more likely to succeed since the forest governance condition will be put into place (Figure 21).

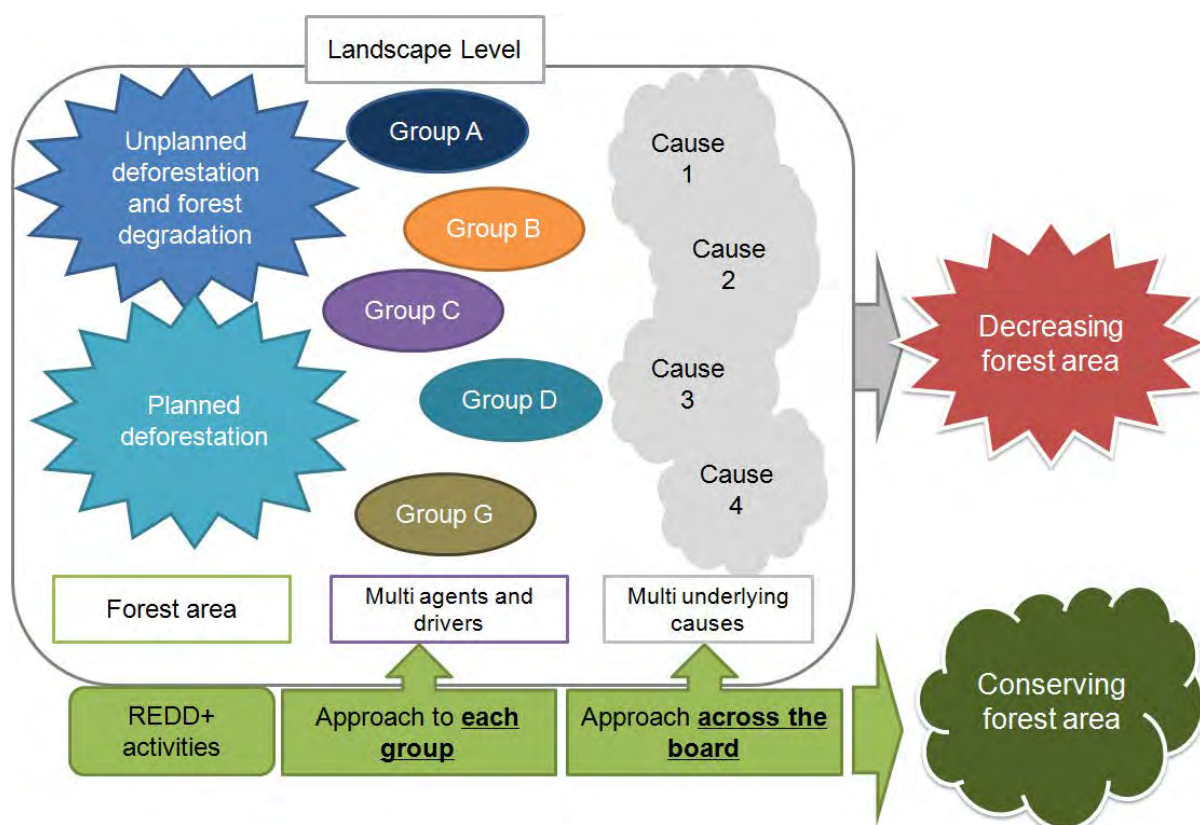


Figure 21 REDD+ approach to landscape level

19. Quantification of GHG Emission Reductions and/or Removals

This part is general description for explaining project start date. Following will be applied in various cases of REDD+ project in Kayong Utara District with revision of specific name and location.

19.1. Baseline Emissions

To estimate carbon stock in each forest type, i.e. GHG emissions, it is required to apply stratification methods according to forest and land types in target site. Therefore this REDD+ program applied following stratifying the reference region according to the results from the analysis of agents and drivers of deforestation (Table 9).

Table 9 Stratification of the reference region

Stratum ID		Description	Area at year (ha)			
ID	Name		2000	2006	2009	2011
1	Primary dryland forest	See Table 4	21,616	21,612	22,243	22,243
2	Secondary dryland forest		63,051	49,876	77,234	76,822
3	Primary swamp forest		0	0	239	224
4	Secondary swamp forest		25,608	23,244	25,431	25,206
5	Primary mangrove forest		101	0	0	0
6	Secondary mangrove forest		182,610	166,454	163,762	154,783
7	Plantation forest		0	0	0	528
8	Non-forest	Land use except for forests (See Table 4)	120,222	152,022	124,298	133,402

19.2. Program Emissions

The actual GHG emissions reductions generated by the REDD+ program will be determined through ex-post measurements of REDD+ program results based on its monitoring plan. Here, under the assumption of REDD+ program effectiveness and following the methodology requirements, the ex-ante carbon stock changes within the project area are estimated by multiplying the annual total baseline carbon stock change by the factor (1-EI), where (EI) is an Effectiveness Index ranging from 0 (no effectiveness) to 1 (maximum effectiveness).

The EI was estimated based on the demonstration of REDD+ program activities. We also assumed that higher effectiveness rate will be achieved. We assumed that in the effectiveness rate will be 20%.

19.3. Leakage

a. Ex-ante estimation of the decrease in carbon stocks and increase in GHG emissions due to leakage prevention measures

Leakage prevention activities in these areas in the REDD+ program scenario include the introduction of alternative livelihoods. Carbon stocks in the project area in the REDD+ program scenario are thus expected to increase compared to the baseline. However, we conservatively assume that they will remain non-forest land, and the carbon stock in the project area will consequently remain unchanged throughout the REDD+ program period.

b. Ex-ante estimation of CH₄ and N₂O emissions from grazing animals

REDD+ program activities associated with leakage prevention do not include significant livestock management, therefore emissions as result of grazing are not considered. Also activities for expanding paddy fields do not include significant non-CO₂ emissions, therefore emissions are not considered.

c. Total ex-ante estimated carbon stock changes and increases in GHG emissions due to leakage

prevention measures

The results of the previous step are summarized (Table 10).

Table 10 Ex-ante estimated total emissions above the baseline from leakage prevention activities

Project year t	Carbon stock decrease due to leakage prevention measures		Total <i>ex-ante</i> GHG emissions from patrol activities		Total <i>ex-ante</i> increase in GHG emissions due to leakage prevention measures	
	Annual $CSDLKPM_t$ t-CO ₂ e	Cumulative $CSDLKPM$ t-CO ₂ e	Annual $GHGEIPA_t$ t-CO ₂ e	Cumulative $GHGEIPA$ t-CO ₂ e	Annual $CSDLKPM_t$ t-CO ₂ e	Cumulative $CSDLKPM$ t-CO ₂ e
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0
2019	0	0	0	0	0	0
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0

19.4. Total GHG Emission Reductions and/or Removals

a. Significance assessment

The carbon stored in the above and below ground biomass pools were considered by the REDD+ program. Root-to-shoot ratios and data to estimate the carbon stocks in the below-ground biomass pool were sourced from regional literature in accordance with IPCC (2006) guidance.

On the other hand, harvested wood products were excluded as significant timber removal is not associated with the baseline scenario. This is because that there were no legal and official logging activities in project area and reference region and there were not so much harvest wood products to be accounted.

b. Calculation of ex-ante estimation of total net GHG emissions reductions

The ex-ante estimation of total net GHG emissions reductions to be generated through the proposed REDD+ program activity are calculated.

$$\Delta REDD_t = \Delta CBSLPA_t - \Delta CPSPA_t - (\Delta CLK_t + ELK_t)$$

where;

$\Delta REDD_t$	Ex-ante estimated net anthropogenic GHG reduction attributable to the REDD+ program activity at year t ; tCO ₂ e
$\Delta CBSLPA_t$	Sum of baseline carbon stock changes in the project area at year t ; tCO ₂ e
$\Delta CPSPA_t$	Sum of ex post estimated actual carbon stock changes in the project area at year t ; tCO ₂ e
ΔCLK_t	Sum of ex post estimated leakage net carbon stock changes at year t ; tCO ₂ e
ELK_t	Sum of ex post estimated leakage emissions at year t ; tCO ₂ e
t	1, 2, 3 ... t , a year of the proposed crediting period; dimensionless

Ex-ante buffer credits are calculated based on a 20% risk factor estimated through expert judgment (as tentative).

c. Calculation of ex-ante Verified Carbon Units (VCUs) (VCUs are in case we applied VCS)

The calculation of ex-ante Verified Carbon Units (VCUs) to be generated through the proposed REDD+ program activity are summarized in Table 11. Ex-ante buffer credits are calculated based on a 20% risk factor.

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Table 11 Ex-ante estimated net anthropogenic GHG emission reductions ($\Delta REDD_t$) and Voluntary Carbon Units (VCUt)

Project year <i>t</i>	Baseline carbon stock changes		Baseline GHG emissions		<i>Ex-ante</i> project carbon stock changes		<i>Ex-ante</i> project GHG emissions		<i>Ex-ante</i> leakage carbon stock changes		<i>Ex-ante</i> leakage GHG emissions		<i>Ex-ante</i> net anthropogenic GHG emission reductions		<i>Ex-ante</i> VCU tradable		<i>Ex-ante</i> buffer credits	
	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.	Ann.	Cum.
	C_t t-CO ₂ e	C t-CO ₂ e	$BLghg_t$ t-CO ₂ e	$BLghg$ t-CO ₂ e	PCS_t t-CO ₂ e	PCS t-CO ₂ e	$Pghg_t$ t-CO ₂ e	$Pghg$ t-CO ₂ e	LKC_t t-CO ₂ e	LKC t-CO ₂ e	$LKghg_t$ t-CO ₂ e	$LKghg$ t-CO ₂ e	$REDD_t$ t-CO ₂ e	$REDD$ t-CO ₂ e	VCU_t t-CO ₂ e	VCU t-CO ₂ e	VBC_t t-CO ₂ e	VBC t-CO ₂ e
2015	1,097,484	1,097,484	106,151	106,151	768,239	768,239	74,306	74,306	54,874	54,874	5,308	5,308	782,362	782,362	625,890	625,890	156,472	156,472
2016	1,097,484	2,194,967	106,151	212,302	768,239	1,536,477	74,306	148,611	54,874	109,748	5,308	10,615	782,362	1,564,725	625,890	1,251,780	156,472	312,945
2017	1,097,484	3,292,451	106,151	318,453	768,239	2,304,716	74,306	222,917	54,874	164,623	5,308	15,923	782,362	2,347,087	625,890	1,877,670	156,472	469,417
2018	1,097,484	4,389,935	106,151	424,604	768,239	3,072,954	74,306	297,223	54,874	219,497	5,308	21,230	782,362	3,129,450	625,890	2,503,560	156,472	625,890
2019	1,097,484	5,487,418	106,151	530,755	768,239	3,841,193	74,306	371,528	54,874	274,371	5,308	26,538	782,362	3,911,812	625,890	3,129,450	156,472	782,362
2020	1,097,484	6,584,902	106,151	636,906	768,239	4,609,431	74,306	445,834	54,874	329,245	5,308	31,845	782,362	4,694,175	625,890	3,755,340	156,472	938,835
2021	1,097,484	7,682,385	106,151	743,057	768,239	5,377,670	74,306	520,140	54,874	384,119	5,308	37,153	782,362	5,476,537	625,890	4,381,230	156,472	1,095,307
2022	1,097,484	8,779,869	106,151	849,208	768,239	6,145,908	74,306	594,445	54,874	438,993	5,308	42,460	782,362	6,258,900	625,890	5,007,120	156,472	1,251,780
2023	1,097,484	9,877,353	106,151	955,359	768,239	6,914,147	74,306	668,751	54,874	493,868	5,308	47,768	782,362	7,041,262	625,890	5,633,010	156,472	1,408,252
2024	1,097,484	10,974,836	106,151	1,061,510	768,239	7,682,385	74,306	743,057	54,874	548,742	5,308	53,075	782,362	7,823,625	625,890	6,258,900	156,472	1,564,725

Note: Ex-ante buffer credits are calculated based on a 20% Risk Factor (RF) estimated through expert judgment (as tentative).

20. Safeguard Information System

This part is general description for explaining safeguard information system (SIS) in Indonesia. Following should be applied in all of cases of REDD+ plan in Indonesia.

In Indonesia, Ministry of Environment and Forestry have developed jurisdiction's safeguard information systems, SIS-REDD+ Indonesia (Principles, Criteria and Indicators for a System for Providing Information on REDD+ Safeguards Implementation in Indonesia) for assessing safeguards implementation to address and respect the decision Dec.1/CP16 on COP16. SIS-REDD+ is developed referring various existing instruments related to social and environmental assessment. The project will provide information in accordance with this SIS guidance.